

SECTOR SKILLS PLAN FOR THE CHEMICAL SECTOR



Sector Skills Plan 2020 – 2025
01 August 2019



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FOREWORD

It is with pleasure that the Chemical Industries Education and Training Authority (CHIETA) Board, submits the Sector Skills Plan (SSP) for the Chemicals Industry for the period 2020 to 2025 to the Department of Higher Education, Science and Technology (DHEST). The Sector Skills Plan has been prepared in accordance with the National Skills Development Plan (NSDP) as well as the DHEST requirements for Sector Skills Plans. Feedback received from the DHEST on previous SSPs has been taken into account in the development of this report. In addition, current debates around skills development, including sector specific and broader national discussions around the growth and development of the economy have also been considered. Specific consideration was given to the National Development Plan (NDP), which provides the guiding principles for further development of the country, including skills development. The White Paper for Post School Education and Training gives effect to some of the principles outlined in the NDP and provides a roadmap for the further development of the education and training and skills development system. This SSP has been developed as guided by the requirements of the Sector Skills Plan Framework and Requirements. The SETA Grant Regulations (3 December 2012, Amended in 2013) have also been factored into this SSP.

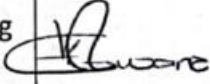
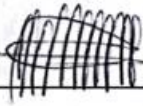

The NDP and The Industrial Policy Action Plan (IPAP) are the two key mechanisms through which Government intends to stimulate economic growth and development. The IPAP focuses on key aspects of the Chemicals Industry for which the CHIETA has a responsibility to support economic development plans with corresponding skills development initiatives. The skills needs resulting from IPAP interventions are factored into the CHIETA's planning. The NDP emphasises the importance of science and technology as the keys to development. Innovation is the most important driver of the kind of technology-based growth that is associated with higher living standards. The Chemicals Industry is at the forefront of the drive towards an 'innovation economy' and the improvement of the skills of our workforce is imperative for the achievement of this.

Addressing the energy challenges faced by the country is at the forefront of CHIETA's skills priorities and plans. The energy, oil, and gas subsector in the CHIETA is one of the biggest, and partnerships with relevant stakeholders in this regard are being expanded and new ones are being fostered to ensure a sustainable energy situation for the country and to see to an energy mix supportive of economic growth. The main purpose of this SSP is to guide and inform skills development initiatives in the sector. It is the result of not only a thorough research process, but also of extensive stakeholder consultation. Through the various consultative processes undertaken in the development of this plan, the CHIETA stakeholders have taken ownership of this plan and now all stakeholders are urged to work together over the next five years to address the skills development priorities and to achieve the goals and objectives set out in this SSP. The SSP will be revised and updated on an annual basis and will be aligned to government policies and growth plans, as these become operational.

Ms Mashila Matlala
Chairperson
Chemical Industries Sector Education and Training Authority

BOARD ENDORSEMENT

This is the Sector Skills Plan prepared by the Chemical Industries Education and Training Authority for the Chemicals Industry (2020 – 2025). It is submitted to the Minister of Higher Education, Science and Technology in compliance with the requirements of the Skills Development Act of 1998 as amended. The Sector Skills Plan is hereby approved by the CHIETA Accounting Authority (Governing Board). While we endeavour to maintain credibility and ensure quality, the information presented is based on the research available and information as reported by our member companies.

Endorsed by	For	Title	Signature	Date
Ms Kedibone Moroane	CHIETA	Executive Manager: Research and Skills Planning		30/07/19
Mr Mike Khathutshelo Ramukumba	CHIETA	Chief Executive Officer		30/07/19
Ms Mashila Matlala	CHIEF Accounting Authority	Chairperson		01/08/19

ACRONYMS AND ABBREVIATIONS

AAG	Average Annual Growth
ABET	Adult Basic Education and Training
AQP	Assessment Quality Partners
ATR	Annual Training Report
BBEE	Broad-Based Black Economic Empowerment
CAIA	Chemical and Allied Industries' Association
CEE	Commission for Employment Equity
CHIETA	Chemical Industries Sector Education and Training Authority
CPD	Continuing Professional Development
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DHEST	Department of Higher Education, Science and Technology
DEA	Department of Environmental Affairs
DMRE	Department of Mineral Resources and Energy
DoH	Department of Health
DoL	Department of Labour
DEL	Department of Employment and Labour
DQP	Development Quality Partners
DST	Department of Science and Technology
DTTC	Decentralised Trade Test Centre
dti	Department of Trade and Industry
EE	Employment Equity
EU	European Union
FETC	Further Education and Training Certificate
FMCG	Fast Moving Consumer Goods
GDP	Gross Domestic Product
GET	General Education and Training
GVA	Gross Value Added
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
HET	Higher Education and Training
HETC	Higher Education and Training Certificate
HRDS	Human Resource and Development Strategy
IDC	Industrial Development Council
IPAP	Industrial Policy Action Plans
IRP	Integrated Resource Plan
ISOE	Institute of Sectoral or Occupational Excellence
LFC	Liquid Fuels Charter
MTSF	Medium Term Strategic Framework
NAMB	National Artisan Moderator Body
NADSC	National Artisan Development Support Centre
NSFAS	National Student Financial Aid Scheme
Nedlac	National Economic Development and Labour Council

NC(V)	National Certificate (Vocational)
NDP	National Development Plan
NGP	New Growth Path
NIPF	National Industrial Policy Framework
NQF	National Qualifications Framework
NSC	National Senior Certificate
NSLP	New Seta Landscape Proposal
OFO	Organizing Framework of Occupations
PIVOTAL	Professional, Vocational, Technical and Academic Learning
PG Dip/Cert	Post Graduate Diploma / Certificate
QCTO	Quality Council for Trades and Occupations
QLFS	Quarterly Labour Force Survey
R&D	Research and Development
RPL	Recognition of Prior Learning
SAPIA	South African Petroleum Industry Association
SAQA	South African Qualifications Authority
SARS	South African Revenue Services
SDA	Skills Development Act
SETA	Sector Education and Training Authority
SIC	Standard Industrial Classification
SIP	Special Infrastructure Project
SMME	Small, medium-sized, and micro-enterprises
SSP	Sector Skills Plan
StatsSA	Statistics South Africa
TVET	Technical and Vocational Education and Training
UG Dip/Cert	Under Graduate Diploma / Certificate
UIF	Unemployment Insurance Fund
UoT	University of Technology
YEA	Youth Employment Accord
WSP	Workplace Skills Plan

EXECUTIVE SUMMARY

The South African Chemicals Industry plays a critical role in the South African economy. The industry's contribution is approximately a quarter of South Africa's manufacturing production and it produces significant outputs that are used in almost all other economic sectors of industry, as indicated in chapter 1 of the SSP, with reference to the GVA indicator. It is therefore clear that the Chemicals Industry plays a vital role in the South African economy. The Chemicals Industry contracted during the 2008/2009 recession and although it recovered in the subsequent two years, growth has been somewhat stifled again in the economic downturn to 2018. The industry is highly dependent on imports, which makes it vulnerable to global economic changes such as competition from rapidly growing chemical producers like China and India, and the exchange rate fluctuations.

At this stage the domestic economic outlook for the next few years appears to be somewhat sluggish due to various factors such as the volatile currency, the constrained global economy, and the uncertain regulatory environment which may affect production processes and export and import prices. The Petroleum Subsector in particular is affected by uncertainty regarding legislation such as tariffs, health and safety, waste management and other current and pending environmental legislation, while the fluctuating crude oil prices are putting companies in this subsector under financial pressure. It should be noted that crude oil prices have slumped due to the current geo-political climate that has resulted in international trade relations uncertainty. Consequently oil producers' have been attempting to stabilize the market. Industrial growth potential of the sector in South and Southern Africa remains undisputed partly due to Africa's economy of scale. Skills development must continue in order to build the competencies and capacity to unlock this potential.

This SSP reflects 2019 WSP-ATR data. There were increases in the Chemical Industry's estimated employment from 2015 to 2019. In 2018 there was a significant decline of just under 9000 employees from 169 181 in 2017 to 160 308 in 2018, however a strong recovery of just over 11 000 to 171 376 employees in 2019 as discussed in chapter 1 of the SSP. The 2018 drop in employment corresponds with the sluggish economic performance seen in the sector and the recovery may be due to business realignment as a response to economic pressures. There are a myriad of factors that impact on the performance of the Chemicals Industry and on the demand for skills in the sector. Some of these factors tend however, to increase the demand for high-level and specialised skills. The Chemicals Industry is dependent on professional and technical skills which are in short supply locally and globally. The dependence of industry on these skills makes it more susceptible to occupational shortages because of the long lead-times in the training of high-level and specialised skills.

Regarding racial equity in employment in the Chemicals Industry, White people dominate Managerial and Professional occupations, followed by African people. African women are particularly under-represented in the Managerial and Professional occupations. Transformation therefore remains an important objective for the sector and is a transversal theme that this sector is grappling with, just as other economic sectors are. The industry is highly regulated and organisations have to contend with a host of local, and in many cases international legislative and regulatory requirements. Regulations are also ever-changing and organisations have to keep up to remain compliant.

The South African Government is actively involved in the Chemicals Industry, through the Industrial Policy Action Plan (IPAP) and various other national strategies and plans such as Operation Phakisa, the SIPS, and the White Paper for Post School Education and Training. The Government also attempts to stimulate economic and employment growth in the Chemicals Industry as expressed in chapter 2 under National Strategies and Plans. The Government is also a key player in the industry through various state-owned enterprises such as PetroSA and NECSA. If the national strategies and plans bear fruit, the sector will certainly experience growth in employment. However, the actual effect of government initiatives as well as new developments such as the mooted shale gas exploration will only become evident in the next few years. At the same time these initiatives and developments are dependent on the availability of skills and the CHIETA, together with other role players need to continue to ensure a steady flow of people with the right skills to take up positions in current and new enterprises.

This SSP identifies four issues that are pertinent in the industry and that underpin skills planning for the period 2020-2025. The first is the need for a more robust and refined skills information and planning system. The second is the need for long-term planning for the provision of professionals and scientists with specialised skills needed for the sector. In fulfilment of one of the NSDS III goals the CHIETA has made considerable inroads in creating a credible institutional mechanism for skills planning by creating a Management Information System (MIS) that has enabled CHIETA to collect detailed credible employee information from HR desks of CHIETA Levy paying organisations.

The section on Research Process in the SSP briefly describes the importance and utility of the CHIETA MIS. The MIS is also referred to in Chapter 3 in relation to the WSP-ATR source data collection, analysis of skills gaps, and the development of the Sectoral Priority Occupations list by CHIETA. Continuous research and development is applied by CHIETA to enhance the system, to ensure collection of quality time-series data and broader research engagement to best inform skills planning. This also includes a stakeholder perception survey that is conducted after WSP-ATRs submissions and usage of the MIS for continuous development purposes.

The capacity of the TVET colleges and the quality and relevance of their educational offerings is a third issue that the sector has been contending with. In this regard, CHIETA has developed a tried and tested Public Private Partnership model and uses this as best practice in the imparting of industry relevant training and workplace opportunities to learners, in collaboration with industry. Furthermore, CHIETA has been conducting studies into identifying institutional challenges faced by TVET colleges in the implementation of Work Integrated Learning (WIL); such studies will add great value in improving the TVET system.

The last issue that the SSP identifies as pertinent to industry for the 2020-2025 period is RPL and also the availability of articulation pathways for qualifications between various levels at public institutions. CHIETA has excelled in the area of RPL, however there needs to be institutional buy-in, particularly with regards to articulation pathways for qualifications, intra and inter institutions. In addition there is a need to enhance approaches in conducting RPL such that candidates that have requisite technical skills but not able to write are afforded opportunities for assessment through other means such as oral assessments.

Based on the skills needs of the Chemicals Industry as reflected in the analysis presented in this SSP, CHIETA has set itself five strategic priorities for the planning period:

Priority 1: Enhancing the skills of the existing workforce of the Chemicals Industry

Priority 2: Supporting skills development of new entrants to the Chemicals Industry

Priority 3: Responding to changing sectoral needs and priorities within the industry

Priority 4: Strengthening and expanding strategic partnerships to maximise sustainability and impact of skills development interventions

Priority 5: Support national imperatives including transformation in relation to skills development, with emphasis on the Chemicals and Manufacturing Industry

This report concludes with key issues against the five strategic priorities for the planning period based on the analysis from the information provided as a summary in the four chapters of the document.

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RESEARCH PROCESS AND METHODS

The CHIETA Sector Skills Plan (SSP) is a culmination of rigorous research processes inclusive of several research projects that are conducted throughout the year in line with the Research Agenda. While we endeavour to maintain credibility and ensure quality, the information presented is based on the research available and information as reported by our member companies. For the 2018/2019 – 2019/2020 year these research projects and processes included:

- Core labour market research that includes Trends in Employment and Training in the Chemicals Industry;
- Subsector skills plans developed for each of the nine subsectors in the Chemicals Industry;
- Research projects that interrogate specific issues relevant to skills planning in the industry, aligned to the CHIETA Strategic Research Agenda;
- A study on the impact of CHIETA interventions;
- The refinement of the CHIETA electronic Skills Supply and Demand Database (SSDD) in order to track learners and measure the impact of interventions; and
- A dedicated SSP research process.

Trends in Employment and Training in the Chemicals Industry

Over the last five years CHIETA has been collecting individual employee records from firms as part of their mandatory grant applications (Workplace Skills Plans (WSPs) and Annual Training Reports (ATRs)). The return rates (i.e. sector participation) in these processes were extremely good in 2018; the employees included in the WSP submissions represented about 83% of the employees in the sector. Over the last five years the CHIETA has been analysing these datasets systematically. The specific objectives of the analyses are to:

- Determine the changes that occur in the Chemicals Industry in terms of the geographic distribution and the size and composition of organisations that submit WSPs and ATRs to the CHIETA.
- Describe changes in the profile of the workforce of the Chemicals Industry in terms of various biographical variables.
- Analyse trends and changes in the training offered by organisations in the Chemicals Industry.
- Monitor trends in occupational shortages reported by employers in the sector.

Subsector Skills Plans

Skills' planning at CHIETA is done from ground level upwards. According to the CHIETA constitution the Chambers are (among other things) responsible to consult with the nine subsectors in areas of skills development and planning. The ultimate objective of such consultation is to compile subsector skills plans for the Chemicals Industry that take into consideration areas of skills demand, skills supply, and skills gaps as they manifest in the respective subsectors and to compile an SSP and a strategic plan that addresses the needs of the total Chemicals Industry and its subsectors.

Over the last five years the CHIETA has developed and updated subsector skills plans for each of the subsectors. These documents utilise high quality quantitative information from

the WSP-ATR submissions as well as qualitative information that is gathered systematically from the employers in the various subsectors. They are then presented to and discussed in depth in the respective Chamber meetings. Ultimately the subsector skills plans and the consultative processes feed into the preparation of the SSP.

Strategic Research Agenda

The CHIETA Governing Board reviews and approves the Strategic Research Agenda and the Research Policy Framework on an annual basis. The main purpose of this is to guide research based on themes relevant to the sector. CHIETA commissions research projects that look at specific skills issues in the Chemicals Industry aligned to the research agenda. Some of the key projects initiated previously and were concluded and presented to stakeholders during the 2018 – 2019 financial year are listed in the table of research considered in the development of the SSP.

Effecting a dedicated SSP research process

In addition to the research projects outlined above, the SSP requires a dedicated research process. This process consists mainly of desktop research and the analysis of various existing databases. It also includes the development of a list of hard-to-fill vacancies and priority occupations in the Chemicals Industry and a Sectoral Priority Occupations list that is submitted to the DHEST.

Desktop research

The desktop research includes an analysis of recent legislation and policy documents, progress with Government initiatives aimed at the stimulation of the Chemicals Industry, international and local developments in the industry that may impact on the skills needs of the sector, the economic performance of the sector and changes in the education and training environment that impact on the sector.

The analysis of existing databases and datasets

The databases and datasets that are analysed include:

- The CHIETA database of levy paying organisations;
- WSP-ATR submissions (consisting of the individual records of employees in the sector – also referred to as “source data”);
- The CHIETA’s learnership and apprenticeship databases;
- The CHIETA’s database of discretionary grant applications;
- The HEMIS database of the Department of Higher Education, Science and Technology;
- The TVETMIS database of the Department of Higher Education, Science and Technology;
- Economic time series data (originally produced by the SA Reserve Bank and Statistics South Africa and provided to the CHIETA by Quantec); and
- The Quarterly Labour Force Survey of Statistics South Africa.

The weighting of source data

The source data referred to above is regarded as the most comprehensive source of information of employees in the Chemicals Industry. The source data is validated through various stages to ensure its credibility. Company employee data is generated from the Human Resource desk which is then approved and signed off by their labour and employer representatives. It is then consolidated into sector data then analysed and compared with previous

trends for consistency, inclusive of internal and external data. The findings are then presented and engaged with at various stakeholder forums for further validations.

The source template in 2019 was augmented with DHEST's draft Workplace Skills Survey (WSS) template. The survey is intended to replace the current Annexure 2 (WSP-ATR) template. The WSS is more standardised and in comparison to the WSP-ATR template, the survey prompts for employee level data. CHIETA has been collecting employee level data thus there were minor amendments and additions made. This final SSP reflects the latest data submissions with newly augmented data from the WSS.

In May 2019 a total of 890 organisations had submitted source data for individual employees into the CHIETA data system. These organisations employed almost 143 705¹ people (approximately 84% of the employees in the industry, including contract workers). In order to extrapolate the information to industry totals the following weighting methodology was used:

The size of the levy amount paid was used as a proxy for employment. Weighting was calculated separately for each subsector and for the different sized organisations in each one. (This was done because of wage differentials that occur between subsectors and organisations of different sizes, which in turn have an effect on the levy amounts paid). In each of the subsector-size categories, the weights applied were calculated as follows:

Weight = Levy amount paid (all organisations)/levy amount paid (organisations who submitted WSPs). The weights were applied to the individual employee records and were used throughout the analysis of the data.

The development of a list of priority occupations

The WSP submissions include a table in which employers are required to first name the occupations in which they experience hard-to-fill, they then select from two possible descriptions the one that best describes the hard-to-fill vacancies they experience— i.e. “relative hard-to-fill vacancy” (referring to a situation where people who are available in the labour market do not meet other employment criteria of the company such as employment equity considerations or cannot be attracted due to the geographical location of the company); and “absolute hard-to-fill vacancy” (where people are generally in short supply in the labour market).

For all the occupations in which scarcity is experienced employers also have to indicate how many vacancies they had available at the time they completed the WSP. This information assists CHIETA to make high quality planning interventions. In the analysis of the data a list of occupations is compiled. The list is selected by applying the following criteria: more than 2 employers identified the occupation as hard-to-fill, more than 5 vacancies existed in the sector, and the vacancies comprised more than 3% of employment in the occupation.

The hard-to-fill vacancy table which is included in the SSP also provides contextual information so that information can be seen in perspective. This includes information on the total number of people employed in each occupation, the number of employers who identified it as hard-to-fill, the subsectors in which it was identified as hard-to-fill, and the number

¹ Unweighted employment figures

of vacancies reported by employers and vacancies as percentage of the total number of positions in the occupations.

The table also indicates whether or not the particular occupation was identified as hard-to-fill in the previous year, whether it is hard-to-fill on the SIPS and DHEST's Occupations in High Demand lists, and whether it was funded through CHIETA discretionary grants in the previous financial year. The list is presented in the Chamber meetings and in various CHIETA committees and forums. Employers and stakeholders then have the opportunity to comment on the list and to provide qualitative information in support of or opposing the inclusion of occupations on the list.

The development of the Sectoral Priority Occupations list

The development of the Sectoral Priority Occupations list is described in Chapter 3 of the SSP.

Consultative processes

The draft SSP is evaluated and commented on by the Research and Skills Planning Committee, which consists of the chairpersons of the five Chambers and the Governance and Strategy Committee which is a board standing committee with the delegated responsibility for research and skills planning. The Governance and Strategy Committee tables the SSP document to the Board for ratification and approval.

Other research reports considered in the development of the SSP

Topic	Nature (Design) of the study	Objectives of study	Data collection methods	Sample size and scope	List of data sources and datasets	Time frame
Tracking and tracing of learners trained and completed in selected CHIETA programs (Learnerships, Apprenticeships and Work Integrated Learning)	-Quantitative -Qualitative	The project aims to track and trace learners trained and completed in selected CHIETA Programmes (Learnerships, Apprenticeships and Work Integrated Learning) in the first three quarters of the 2017-2018 Financial year and an impact study on 10 SMMEs trained through the CHIETA voucher scheme	-Cross-sectional survey -Semi-structured interviews -Case studies	Beneficiaries who have completed learnerships, apprenticeships and WIL programmes for the 2017/2018 cycle.	-CHIETA SSP 2017 -Stats SA -White Paper for Post-school Education and Training -Cape Peninsula University of Technology	2018 - March 2019
Possible future skills in the chemical sector (with a focus on the 4th Industrial Revolution and Green Skills as change drivers)	-Qualitative -Quantitative	The project aims to identify future skills in the chemical sector in line with global trends: the fourth industrial revolution and green skills as change drivers, which will ensure the SETA plans adequately in its Sector Skills Plan (critical and scarce skills) and funding opportunities to meet future skills identified.	-Mail surveys -Telephonic & personal interviews -Online survey	A relatively small, but representative sample of operations was chosen. The major operations within each sub-sector were targeted as well as a representative sample of the smaller operations.	-UNESCO -Microsoft -Deloitte -Forbes Magazine, News24, Engineering news -Tech Financials, Financial Times -McKinsey	2018 - April 2019
The correlation between performance in Maths and Science and other school subjects and in post-school education and training	-Qualitative -Quantitative	The project aims to evaluate the performance of learners supported by the CHIETA Maths and Science project against performance at school subjects and at post school education and training.	-Statistical data-dumps	The sample was taken from the total students/schools that participated in the CHIETA Maths and Science project. The entire population was included in the study.	-Dinaledi Schools Project - A progress report -UNESCO -Laerd Statistics -National Science & Technology Forum -HRDC	2018 - February 2019

Topic	Nature (Design) of the study	Objectives of study	Data collection methods	Sample size and scope	List of data sources and datasets	Time frame
Towards a needs-based Professional Development Model for WIL Officers in TVET Colleges of South Africa	-Qualitative -Quantitative	The aim of this research project is to produce a credible framework for a needs-based continuous professional development programme for WIL Managers, WIL Officers and all functionaries linked to the implementation of an effective WIL programme at a TVET college in South Africa.	-Questionnaires -Interviews	The study will focus on 2 public TVET Colleges in North West, Mpumalanga and Limpopo. Participation will be drawn from WIL senior management, WIL Managers and all WIL Officers with role functions in TVET WIL Offices.	-Institute for Continuing Professional Development -Second Chance	2018 - December 2018
Impact Assessment of CHIETA's SMME Voucher Training programme	-Qualitative	This impact assessment aims to determine whether CHIETA's voucher training programme delivered positive impacts on the SMMEs which participated.	-Semi-structured interviews	A target sample size of 63% (10 companies based in Gauteng, Eastern Cape, Mpumalanga, KwaZulu Natal and Limpopo).	-SSP 2017 -Trading Economics -Evaluation Toolbox	2018 - March 2019

1. SECTOR PROFILE

1.1 INTRODUCTION

The sector profile starts with the coverage of the Chemicals Industry and the key role players involved in the industry's activities. This profile includes the industry's contribution to the South African economy and a short overview of the current economic performance of the industry. The chapter also provides an overview of the employers in the Chemicals Industry and its subsectors, including the size of employer businesses and their geographic distribution. The labour market profile includes information on trends in employment in the Chemicals Industry, employees' geographical (provincial) location, age, race and gender distribution and information on employees with disabilities. The labour market profile provides insight into the sub-sectors in which people work within the Chemicals Industry and how employment in the sector and sub-sectors has changed over the last few years. The statistical data analysed for this chapter is mainly from 2018-2019 WSP-ATR submissions, Stats SA and Quantec, as well as secondary research referenced accordingly.

1.2 SCOPE OF COVERAGE

1.2.1 SIC Codes, Subsectors and Chambers

The Chemicals Industry, as determined by the skills development legislation, consists mainly of companies engaged in manufacturing activities (SIC Major Division 3). The CHIETA has grouped the SIC Codes allocated to the Chemicals Industry into nine subsectors and the subsectors into five Chambers. The Chambers consist of industry representatives and form part of the organisational structure of the SETA. Much of the work pertaining to skills planning takes place in the respective Chambers.

Table 1-1 shows the SIC codes allocated to the sector, the SIC codes that are combined to form subsectors and the combinations of subsectors that make up the five Chambers. It should be noted that the subsectors included in the CHIETA scope of coverage do not fully correspond with the dti delineation of the Chemicals Industry. Direct comparisons are therefore not always possible.

Table 1-1 Industrial coverage, subsectors and Chambers of the Chemicals Industry

SIC Code	Scope of Coverage/Description	Subsector	Chamber
33410	Manufacture of basic chemicals, except fertilisers and nitrogen compounds	Base Chemicals	Petroleum, and Base Chemicals
33430	Manufacture of plastics in primary form and of synthetic rubber		
34000	Manufacture of other non-metallic mineral products		
41210	Manufacture of industrial gases in compressed, liquefied or solid forms	Petroleum	
33100	Manufacture of coke oven products		
33200	Petroleum refineries/synthesisers		
61410	Wholesale trade in solid, liquid and gaseous fuels and related products		
87140	Industrial research, e.g. fuel research	Fast Moving Consumer Goods	
33501	Chemically-based general household and personal care products		
33541	Manufacture of soap and other cleaning compounds		
33543	Manufacture of beauty products	Pharmaceuticals	Fast Moving Consumer Goods and Pharmaceuticals
33530	Manufacture of pharmaceuticals, medicinal chemicals and botanical products		
33592	Manufacture of explosives and pyrotechnic products	Explosives	Explosives and Fertilisers
11600	Production of organic fertiliser	Fertilisers	

SIC Code	Scope of Coverage/Description	Subsector	Chamber
33420	Manufacture of fertilizers and nitrogen compounds		
33421	Manufacture raw materials and chemical compounds used in agriculture		
33502	Manufacture, sale and/or distribution of diversified speciality chemicals for industrial use	Speciality Chemicals	Speciality Chemicals and Surface Coatings
36400	Manufacture of accumulators, primary cells and primary batteries		
33520	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	Surface Coatings	
39005	Powder coating		
34110	Manufacture of glass and glass products		
34112	Manufacture of glass containers; glass kitchenware and tableware; scientific and laboratory glassware, clock and watch glasses and other glass products	Glass	Glass

1.2.2 Overview of subsectors

1.2.2.1 Base Chemicals

The Base Chemicals Subsector includes organisations involved in the production of petrochemicals, derivatives and basic inorganics. Base chemicals act as essential starting products for intermediates, agrochemicals, polymers, coatings and a variety of other products. Part of the Base Chemicals subsector is the Nuclear Energy Corporation South Africa whose operations are primarily in nuclear application (not to be confused with nuclear generation). Some of their product services are; industrial use of radioactive isotopes, new strategic initiatives relating to research and development on nuclear technologies in medicine and the biosciences, and the design and manufacturing of nuclear components.

1.2.2.2 Petroleum

The Petroleum Subsector includes upstream recovery from the earth's resources, mid-stream conversion into a number of core elements and downstream commercial applications. The economic activity in the subsector includes the exploration of oil and gas, refining of crude oil, gas to liquid (GTL) refining, storage and distribution, and wholesaling. Industrial research, and specifically fuel research, is also included in this subsector. The two synfuel facilities in the country, which are owned by Sasol and by PetroSA, are included in the Petroleum subsector. The subsector furthermore includes the manufacturing of coke and coke by-products, including coke oven gas. In terms of wholesaling, the main players in the South African industry operate storage terminals and distribution facilities throughout the country.

1.2.2.3 Fast Moving Consumer Goods

Fast Moving Consumer Goods (FMCG) is defined as products that are sold quickly and that are commonly replaced or used up over a relatively short period. FMCG products are generally sold in supermarkets and have a high customer demand. In the CHIETA the FMCG Subsector consists of all consumer chemicals, such as soaps and cleaning chemicals, as well as cosmetics and toiletries. Industrial cleaning chemicals, which are regarded as speciality chemicals, are excluded.

1.2.2.4 Pharmaceuticals

The Pharmaceutical Subsector comprises companies involved in the manufacturing of pharmaceuticals, medicinal chemicals and botanical products. This includes the manufacturing of medicinally active substances; processing of blood; manufacture of medicament (antiseras and other blood fractions, vaccines and diverse medicaments, including homeopathic preparations); manufacture of medical diagnostic preparations; manufacture of radioactive

in-vivo diagnostic substances; manufacture of biotech pharmaceuticals. The manufacturing and distribution of pharmaceutical products are strictly controlled. This subsector is also unique in the sense that Government controls the major share of the end-use market, i.e. the public health system.

1.2.2.5 Explosives

The Explosives Subsector comprises the activities surrounding the manufacture and distribution of explosives. The key activities in this subsector include the designing of explosives, the manufacturing of explosive materials and the specialised transportation required to distribute the products. Explosives are manufactured for use in mining and civil construction as well as for military use.

1.2.2.6 Fertilisers

According to the International Fertiliser Industry Association (2015) fertilisers include any solid, liquid or gas substances containing plant nutrients which is applied to the soil, directly to plants or added to fluid mixtures to maintain soil fertility, improve crop development, crop yields and crop quality. The Fertilisers Subsector encompasses both major forms of fertilisers, namely organic and mineral/manufactured fertilisers.

1.2.2.7 Speciality Chemicals

Speciality chemicals are chemicals that serve specific purposes. The Speciality Chemicals Subsector produces more than 50 categories of speciality chemicals, including textile dyes and chemicals, leather dyes and chemicals, pharmaceutical intermediates, intermediates for pesticides and herbicides, pigments, additives, electronic chemicals, adhesives, plastics and water treatment chemicals.

1.2.2.8 Surface Coatings

Surface coatings include any mixture of film-forming materials plus pigments, solvents and other additives, which yield a thin film that is functional and often decorative when applied to a surface and dried. Surface coatings include paints, drying oils and varnishes, synthetic clear coatings and other products with the primary function of protecting the surface of an object from the environment (Encyclopaedia Britannica, 2018).

1.2.2.9 Glass

The Glass Subsector involves the manufacture of raw glass by melting various raw materials (e.g. soda ash, sand), which is converted into products. The Glass Subsector is divided into four main sub-industries (Glass Industry Employer's Association, 2010: 2): Glass manufacturing (mass production); Glass processing and distribution; Fibreglass manufacturing, and industrial mineral and manual glass production. The various types of glass manufactured for use in various other sectors of the economy include container glass, flat glass, domestic glass, glass wool fibre, reinforcement fibres, optic fibre, special glass and glass frits.

1.3 KEY ROLE PLAYERS

Key role players include employer and industry organisations, labour unions, and professional bodies. Role players are engaged and brought together in the five Chambers (Table 1-1) in order to discuss and address skills issues. A variety of government departments also form part of the key role players in the Chemicals Industry.

1.3.1 Employer and industry organisations

The following employer associations are active in the Chemicals Industry and are parties to the National Bargaining Council for the Chemical Industry:

Subsector	Organisation	NSDP
Explosives	Explosives Industry Employers' Association	<ul style="list-style-type: none"> • Outcome 1: Identify and increase production of occupations in high demand • Outcome 2: Linking education and the workplace • Outcome 3: Improving the level of skills in the South African workforce • Outcome 4: Increase access to occupationally directed programmes • Outcome 6: Skills development support for entrepreneurship and cooperative development • Outcome 7: Encourage and support worker initiated training • Outcome 8: Support career development services
Fertilizer	Fertilizer Industry Employers' Association	
Glass	Glass Industry Employers' Association	
Pharmaceutical	Labour Affairs Association of the Pharmaceutical Industry	
FMCG	National Fast Moving Consumer Goods Employers' Association	
Petroleum	National Petroleum Employers' Association	
Speciality Chemicals	National Speciality Chemicals Employers' Association	
Surface Coatings	Surface Coatings Industry Employers' Association	
Base Chemical	National Base Chemical Employers' Association	
Base Chemical	South African Compressed Gas Association (SACGA)	
Base Chemical	South African Gas Association (SAGA)	

In addition to the employer organisations that play a key role in labour relations and in collective bargaining processes, the sector also has various industry organisations whose main functions are to set and promote quality standards, represent the local industries in international forums and to market and promote the specific industries in various ways. While the CHIETA acknowledges that the employer's organisations were set up primarily for industrial relations and collective bargaining, more needs to be done to have skills development elevated as a strategic priority of these organisations in order to deliver on the NSDP outcomes. These organisations, some of which are actively involved in the CHIETA's activities include:

Subsector	Organisation	NSDP
Multiple	The Chemical and Allied Industries' Association (CAIA)	<ul style="list-style-type: none"> • Outcome 1: Identify and increase production of occupations in high demand • Outcome 2: Linking education and the workplace • Outcome 3: Improving the level of skills in the South African workforce • Outcome 4: Increase access to occupationally directed programmes • Outcome 6: Skills development support for entrepreneurship and cooperative development • Outcome 7: Encourage and support worker initiated training • Outcome 8: Support career development services
FMCG	The Cosmetic, Toiletry and Fragrance Association of South Africa (CTFA)	
Fertilizer	The Fertiliser Society of South Africa (FSSA)	
Pharmaceutical	The National Association of Pharmaceutical Manufacturers (NAPM)	
Explosives	The National Institute for Explosives Technology (NIXT)	
Glass	The South African Glass and Glazing Association (SAGGA)	
Base Chemical	The South African Glass Institute (SAGI)	
Petroleum	The South African Oil and Gas Alliance (SAOGA)	
Surface Coatings	The South African Paint Manufacturers Association (SAPMA)	
Petroleum	The South African Petroleum Industry Association (SAPIA)	

1.3.2 Employee organisations

Many of the employees in the sector are professionals and technicians who belong to voluntary professional associations and/or are registered with statutory professional councils such as the Engineering Council of South Africa (ECSA), the Health Professions Council of South Africa (HPCSA) and the Pharmacy Council of South Africa (PCSA). These organisations,

of which are all active in the CHIETA structures, are in various ways involved in skills development and for this reason they are important role players to be considered in skills planning processes:

Organisation	NSDP
Chemical, Energy, Paper, Printing, Wood and Allied Workers Union (CEPPWAWU)	<ul style="list-style-type: none"> • Outcome 1: Identify and increase production of occupations in high demand • Outcome 3: Improving the level of skills in the South African workforce • Outcome 6: Skills development support for entrepreneurship and cooperative development • Outcome 7: Encourage and support worker initiated training • Outcome 8: Support career development services
General Industries Workers Union of South Africa (GIWUSA)	
Solidarity	
South African Chemical Workers Union (SACWU)	
United Association of South Africa (UASA)	

1.3.3 Government departments involved with the sector

As per the CHIETA constitution, the most relevant government departments are:

- The **Department of Trade and Industry (the dti)** which is, among others, the custodian of the Industrial Policy Action Plan (IPAP).
- **Department of Minerals and Energy (DMRE)** is particularly relevant to chemical products used for energy generation, including petroleum and gas products and nuclear energy. The DMRE plays a regulatory role and is involved in initiatives such as introducing cleaner fuels in South Africa and is mandated with delivering an energy mix for the country.
- **Department of Environmental Affairs (DEA)** plays a regulatory role in the Chemicals Industry. This includes the implementation of government policies and oversight of all products and activities that may pose a threat to the environment.
- **Department of Employment and Labour (DEL)** plays a significant role in reducing unemployment, poverty and inequality through a set of policies and programmes developed in consultation with social partners.

1.4 ECONOMIC PERFORMANCE

Figure 1.1 shows a comparison of South African industries' contribution to the GDP by looking at their gross value add (GVA) at basic prices. In 2018 the Manufacturing industry contributed 14% of the South African gross domestic product (GDP). It is the fourth largest contributor followed by trade, catering and accommodation contributing 15%; general government services contributing 17%; and the largest contributor to GDP in 2018 was finance, real estate and business services contributing 22%.

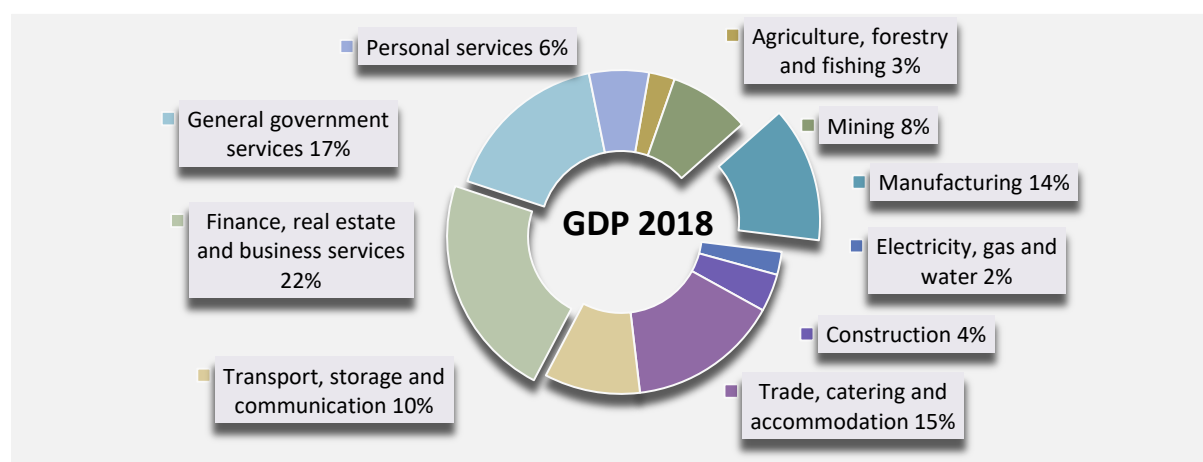


Figure 1-1 Industries' share of GDP 2018
Source: Statistics South Africa, 2018

In 2018 the Chemicals Industry contributed 3% to the total economy and 25% of total manufacturing gross value added (GVA) at basic prices. The subsector Coke and Refined Petroleum Products contributed 1.1% and the subsector Other Chemicals and Man-made Fibres contributed 0.8%. The sector was responsible for 11.8% of the country's imports. The Coke and Refined Petroleum Products subsector was responsible for 0.2% of imports and the Other Chemicals and Man-made Fibres subsector for 6.7%. At the same time the Chemicals Industry contributed 5.5% of the country's exports.

The Chemicals Industry is capital intensive, in 2018 it accounted for 4.4% of the gross fixed capital formation while it contributed only 1.4% of total formal employment and 0.32% of total informal employment in the country, mainly of high level and artisanal related skills.

Table 1-2 The Chemicals Industry's contribution to the South African economy: 2018

Subsector	Gross Value Added	Imports	Exports	Gross Fixed Capital Formation	Employment Formal	Employment Informal
Coke & refined petroleum products	1.1%	0.2%	0.4%	1.6%	0.2%	0.03
Basic chemicals	0.5%	3.9%	2.0%	1.3%	0.2%	0.04
Other chemicals & man-made fibres	0.8%	6.7%	2.7%	0.5%	0.6%	0.10
Non-metallic minerals	0.3%	0.8%	0.3%	0.5%	0.4%	0.14
Glass & glass products	0.1%	0.3%	0.1%	0.6%	0.1%	0.01
Total petroleum, chemicals & glass	2.7%	11.8%	5.5%	4.4%	1.4%	0.32%

Source: Quantec

1.4.1 Imports and exports

South Africa is a net importer of chemical products. Imports have consistently exceeded exports from 2004 to 2018 with Other Chemicals and man-made fibres in comparison to other subsectors importing far more than exporting (Figure 1-2).

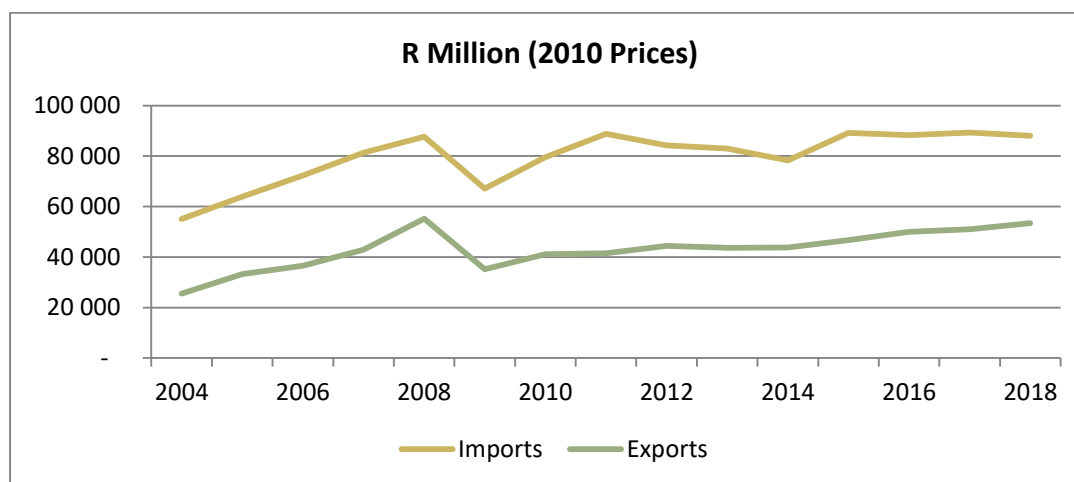


Figure 1-2 Imports and Exports of the Chemicals Industry 2004 – 2018

Source: Quantec

1.4.2 Growth in gross value added

The percentage growth (year on year) of the Chemicals Industry as a whole over the last thirteen years is illustrated in the subsequent graph.

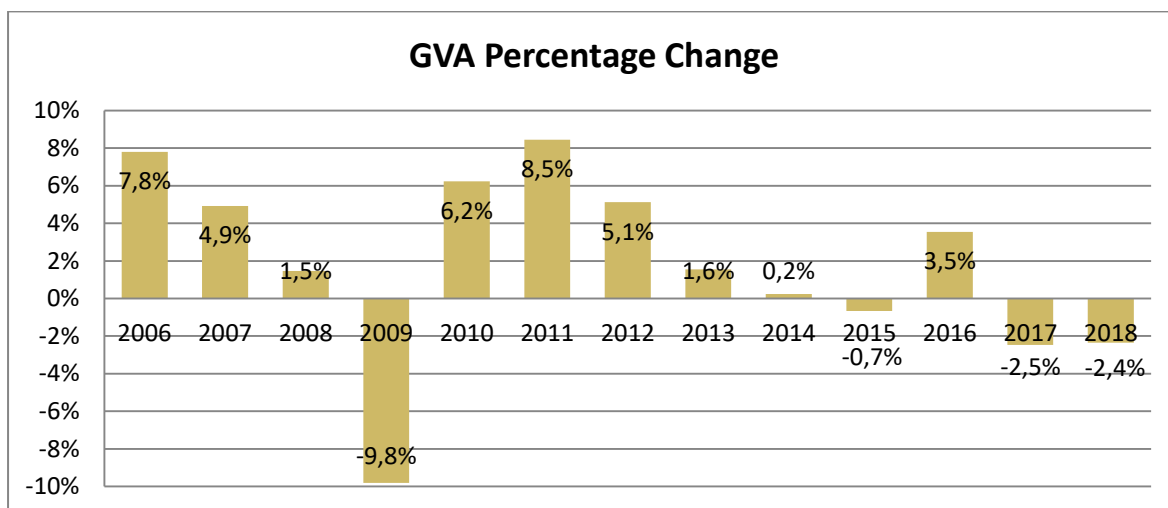


Figure 1-3 Change in Gross Value Added (GVA) in the Chemicals Industry 2006 – 2018
Source: Quantec

The sector has experienced decreasing growth consistently from 2006 to 2009. In 2009 the economy went into a recession, the sector shrunk by -9.8%. It recovered in 2010 and gained positive growth from 2010 to 2011. From 2012 to 2015 the sector's growth dropped from 5.1% to 0.2% in 2014. In 2015 the sector experienced negative growth similar to the 2009 recession at -0.7% however in 2016 it picked up to 3.5%. In 2017 and 2018 the sector experienced negative growth again at 2.5% and 2.4% respectively.

1.4.3 Factors that influence the economic performance of the sector

The economic performance of the Chemicals Industry is influenced by a host of factors. These factors do not necessarily have the same impact on the respective subsectors. Some of the most pertinent factors are discussed below.

1.4.3.1 The regulatory environment

Government plays a very important role in the growth of the industry. A clear and stable regulatory environment is a key prerequisite for foreign as well as local investment. Companies continuously weigh up the risks and benefits of new projects and products while deciding how much capital to invest. Behind such decisions lie a host of regulatory, safety, environmental and political stability considerations. Political interference, uncertainty and delays in passing laws, energy policies and regulations into law stifle growth, development and investment (PwC, 2013).

There has been a reduction in commercial attractiveness of high capital ventures in Africa due to the fluctuating oil prices, particularly from 2014 to 2017 where there was a trend of oil price drops. Oil prices have picked up due to the increase in demand and OPEC's decision taken in 2016 to reduce supply output. The International Energy Administration (IEA) predicts oil price stability in 2018 and 2019 and that world demand for oil will further drive up prices by 2030 (Amadeo, k. 2018). Although oil-prices have gone up, they remain volatile due to demand and geo-politics. Combined with the uncertain regulatory outlook, political instability, and widespread corruption, still makes Africa a high-risk region, despite its substantial resource base (PwC, 2016). These challenges will be ever-present, however there are opportunities to 'reimagine the possible', which is fundamental to operating an oil and gas business in the world of today and in the volatile energy future (PwC, 2017).

1.4.3.2 The availability and cost of raw materials

All the subsectors of the Chemicals Industry are influenced by the availability and cost of feedstock and raw materials used in the production of chemical products. Most of the subsectors are dependent on imported raw materials which are subject to international levies that reduce manufacturer's profit margins (Majozi T, 2015).

Because South Africa has very limited crude oil reserves or resources, oil refineries are mainly dependent on crude oil imports from countries such as Iran, Saudi Arabia, Nigeria, Angola and United Arab Emirates. This makes the country vulnerable to decreases in world oil exports and to rising prices. The availability of crude oil to South Africa could be influenced by several factors, including: the continuing rise in domestic oil consumption in oil exporting countries; depletion of reserves and production in oil exporting countries; wars, conflict and political uncertainty in oil exporting countries; sanctions on oil exports from oil producing countries (for example Iran); and the increase in the demand for oil from large and developing economies such as China (Creamer Media, 2012). Fluctuations in oil prices also have an impact on the industry.

1.4.3.3 International trends in chemical production

For many years the global chemicals industry has been fighting declining margins, product commoditization, rapidly expanding competition in developing countries, and customers demanding more at lower process (Pwc, 2018). However, there has been a shift. Some chemicals companies have begun to rethink their growth strategies because of accelerating technology advances which are shaping customer purchases and needs. These companies are finally moving away from cost-cutting and retrenchment, towards more nimble, coherent and aggressive business models (Pwc, 2018). Timidity and contraction are giving way to new ways of navigating and benefitting from mergers and acquisitions, digital products and services, and even political forces affecting global trade. Although this trend is nascent, it is nonetheless significant and could place the chemicals industry on a path to improved performance in the short-term and offer better prospects for long-term growth.

In the case of the South African chemical sector, stakeholders continue to report that their subsectors are threatened by imports – especially from China (CHIETA Strategic Scenario Planning Workshop, 2017). The extent to which local markets are protected through tariffs also has an effect on the growth of the local Chemicals Industry. Contrary to this, growth in chemical production and consumption in the rest of Africa is potentially positive for the local industry. Many South African companies are expanding their operations to the rest of Africa and/or export intermediate products to the Chemicals Industries in other African countries, as well as to other parts of the world.

1.4.3.4 Global economic growth

The level of global economic growth influences the Chemicals Industry in several ways, for example: economic growth in the rest of the world increases the demand for chemicals and may open up new export markets or increase the demand from existing markets. Subdued global growth may, on the other hand, increase competition from imports. The prices of input commodities are affected by the level of growth in the rest of the world.

1.4.3.5 Exchange rates

The South African Rand is one of the most volatile currencies in the world; it can exhibit moves of greater than 0.20c in a single day of trading versus the US dollar (PSG Online n.d.).

Exchange rate instability generally causes an uncertain environment for investment. Given the overall trade deficit of the Chemicals Industry and its dependence on imported raw materials, the negative effects of a weaker Rand can be expected to outweigh sector benefits accruing from higher export earnings. Although it could be argued that a weaker exchange rate could support import substitution industries, the weakening would probably have to be substantial and sustained for that effect to have a meaningful impact.

1.4.3.6 The linkage and performance with other sectors of the economy

There are strong linkages between the Chemicals Industry and the Manufacturing Industry which uses chemical products in majority of its processes. This implies that the fortunes of the Chemicals Industry are fairly closely correlated with those of manufacturing. Manufacturing is the biggest of the “production” sectors, contributing approximately 12% of total GDP in 2017. The Explosives Subsector is directly affected by the performance of the Mining and Construction Industries. Factors such as labour unrest and volatility in the mining industry may have a knock-on effect on the Chemicals Industry.

1.4.3.7 Consumer markets and consumer spending

Some of the subsectors in the Chemicals Industry are directly affected by consumer markets and spending, for example the FMCG Subsector and the Glass Subsector. Others are more indirectly affected through changes in the demand for manufactured products.

1.4.3.8 Administered, logistics and compliance costs

“Administered costs” refers to the prices that firms pay for non-raw material inputs and services over which they have no bargaining power. Included are items such as port tariffs, electricity, water and municipal rates. While poor service and price increases negatively impact the economic performance of the sector, of most concern is the uncertain electricity supply and the considerable increases in electricity prices in recent years. Interruptions in electricity supply have a profound effect on production processes and have huge cost implications for firms in the sector.

“Logistics costs” refers to those costs arising from the movement of input and output products between suppliers and customers. Most transport fuel in South Africa is produced in the coastal areas and about 68% of it is consumed in the inland Gauteng region (Department of Government Communications and Information System, 2014). Most chemical producers are located inland which means that relatively high transport costs reduce industry competitiveness. Inefficiencies and/or lack of capacity in the transportation sector (such as in bulk rail freight) also increase costs and reduce profitability of operations in the Chemicals Industry. There is also a cost to firms associated with having to use bad roads to transport freight. “Compliance costs” refers to costs associated with compliance with the different forms of legislation and regulations. This includes health and safety, waste management and other environmental legislation.

1.4.4 The current economic outlook

As indicated in the previous section, there are a host of factors that influence the economic performance of the sector. At this stage it seems unlikely that the sector will regain the momentum in the short term that it had in prior years. The projected growth of the Chemicals Industry, its respective subsectors and the total South African economy can be seen in Table 1-3. The projected growth from 2019 to 2023 seems to be at a constant rate of 3.4%.

Table 1-3 Projected growth in gross value added: 2019 – 2023

	2019	2020	2021	2022	2023
Coke & refined petroleum products	1,3%	1,4%	1,4%	1,4%	1,5%
Basic chemicals	0,6%	0,6%	0,6%	0,6%	0,6%
Other chemicals & man-made fibres	0,9%	0,9%	0,9%	0,9%	0,9%
Non-metallic minerals	0,5%	0,4%	0,4%	0,4%	0,4%
Glass & glass products	0,1%	0,1%	0,1%	0,1%	0,1%
Total petroleum, chemicals & glass	3,4%	3,4%	3,4%	3,4%	3,4%

Source: Econquant econometric model

One of the main factors that are hampering the growth of the Petroleum Subsector is regulatory uncertainty. Currently the two main challenges are uncertainty about the licencing for shale gas exploration which the minister vowed in 2018 to fast-track the finalisation of Exploration Rights applications, and the Mineral and Petroleum Resources Development Amendment Bill which remains unsigned by the President. The international oil companies are adamant that they will not spend any more money on exploration in the absence of adequate legislative certainty.

Another factor is the fluctuating crude oil prices. In May 2018 crude oil prices hit an all-time high since November 2014. A significant contributor to the increase was geo-politics following the announcement of the United States to withdraw from the Iran nuclear deal and restore wide-ranging sanctions on Iran. The then increase in demand for crude oil and fears of supply disruptions has exerted upward pressure on oil prices. These upward pressures may also have adverse effects on various subsectors by way of increased cost in production (Mersie, A. 2018). In 2019 the oil market is performing poorly in comparison to last year. The significant deterrent to continuous growth in the oil market is the US trade war with China, and unexpected higher stock volumes (Widdershoven, 2019). However, analysts are predicting that despite the geo-political tension, the current oil climate may result in positive market growth.

The fluctuating oil prices have an adverse effect on the largest part of the sector, namely the Petroleum Subsector. The synfuel producers are the hardest hit, but other companies in this subsector may also feel the effects. Of particular importance for this SSP are the effects of volatility on the demand for skills and on skills development in the sector. In the first instance it is likely that employment growth will level off or even drop slightly in the next few years. This means that the number of new entrants that the sector will absorb will be limited. On the one hand this may relieve some of the occupational shortages experienced but on the other hand it will slow down the transformation of the sector.

The sector continues to experience shedding of jobs. The predominant cause is the economic downturn including the effects of the fluctuating oil prices. Although the oil prices increased in 2018 the adverse effects and economic pressures of the prolonged low prices in previous years may still be felt in the coming years. Consequently, this has led to the sector's restructuring processes in order to increase its efficiency. This includes voluntary retrenchments which releases high-level skills into the sectoral labour market. It is however expected that these skills will be absorbed within a relatively short period of time.

Due to low economic growth, in 2018 Karbochem began the process of extricating itself from the market of rubber products both locally and internationally. Karbochem is the sole manufacturer of synthetic rubber in South Africa. The process included the shutdown of the

manufacturing facilities in Sasolburg and Newcastle. All business value chains were affected thus there were significant job losses and financial implications for both the entity and its affiliates. Some of the key occupations affected were; Formula Weighers, Chemical Plant Machine Operators, Chemical Engineers and Laboratory Technicians, Mixers, Instrument Mechanics, Production Leaders, Production and Process Controllers, and Computer Aided Design (CAD). Due to the sluggish economy it is hard to tell if those retrenched with the above skills related to the Chemicals Industry will be reabsorbed back into the sector.

It is not uncommon for companies to cut back on training and development in times of economic hardship. However, industry experts concur that it is very important for the Chemicals Industry to retain a long-term perspective and to continue to maintain the skills development pipeline. South Africa is best positioned to supply skilled labour to the region. In terms of ship and rig repair in particular, the skills are transversal and crosscutting in relation to other growth industries like manufacturing, renewable energy and nuclear. Other developments should also not be stopped because of the economic downturn. Most of the refineries need to be refurbished to produce cleaner fuels as required by the clean fuels legislation. If the refurbishments are not done timeously South Africa may end up importing refined petroleum, including the bi-products and thousands of jobs may be lost in the process.

1.5 EMPLOYER PROFILE

In the 2018/19 financial year there was a total of 2 719 CHIETA skills development levy paying companies. This figure increased by 127 from the previous financial year. This increase can mainly be attributed to very small companies that started to pay the SDL – possibly due to their payrolls exceeding the levy threshold of R500 000 per year and companies transferring to the CHIETA from other SETAs. The Petroleum Subsector contributed 41% of the levies paid in 2018/2019 although companies in this subsector only comprised 15% of the total number of levy-paying companies in the Chemicals Industry (Figure 1-4). The reason for this is the presence of a few very large companies in this subsector.

The employers/entities in the sector include a few strategic state owned companies, for example: The Nuclear Energy Corporation of South Africa (NECSA) and PetroSA. These companies play key roles in government strategies to stimulate the local economy. The majority (55%) of the companies in the Chemicals Industry are classified as either micro or small. 26% are categorised as medium and 19% as large.² The high prevalence of micro and small companies in the sector has major implications for the nature of the support which the CHIETA is required to provide to workplaces in relation to skills development.

² This categorization is based on a combined methodology of employment size as well as the levy amounts paid by organisations in the sector. Micro organisations paid less than R10 000 or have less than 10 employees, small organisations between R10 000 and R99 999 or 10 to 49 employees, medium organisations between R100 000 and R999 999 or 50 to 149 employees, and large organisations paid R 1 mil and above or 150 and above employees.

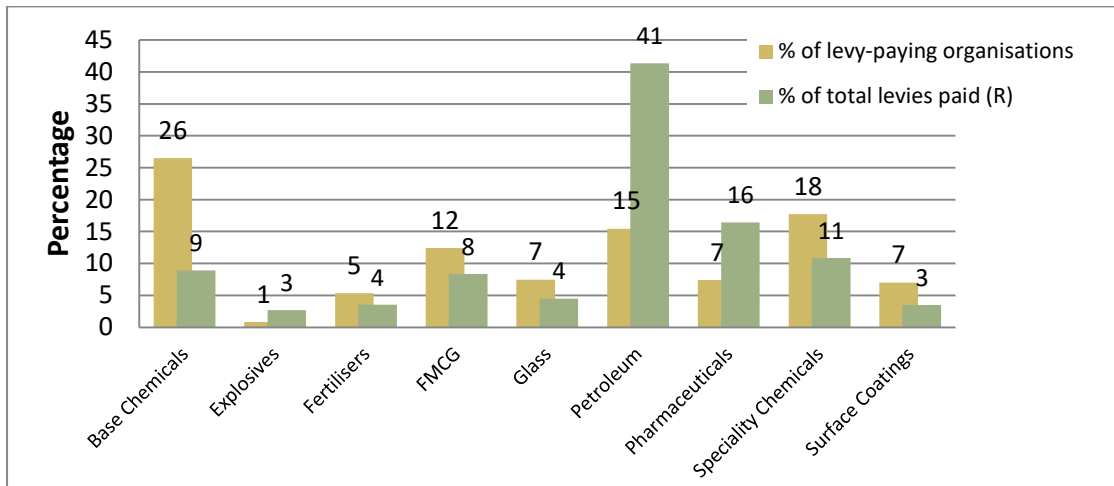


Figure 1-4 Subsectoral distribution of levy-paying organisations and levy-amounts paid: 2018/2019

Note: Due to rounding, percentages do not necessarily add up to 100.

Source: CHIETA's data system, extracted June 2019

Figure 1-5 shows that 50% of companies that paid levies to the CHIETA in 2018/2019 were located in Gauteng, followed by 25% in KwaZulu-Natal, 15% in the Western Cape and 5% in the Eastern Cape. The rest of the provinces had around 1% of companies. The companies in the Chemicals Industry are mostly located in urban areas.

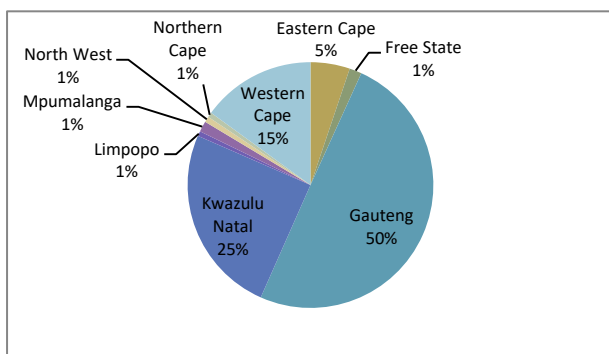


Figure 1-5 Provincial distribution of levy-paying organisations 2018/2019

Note: Due to rounding, percentages do not necessarily add up to 100.

Source: CHIETA data system, extracted June 2019.

employment since 2015 however in 2018 the estimated employment dropped to 160,308. In 2019 employment increased by just over 11,000 to an estimated employment of 171,376. This affected the employment trajectory to a 6.9% growth over the total period.

In 2019 the Petroleum Subsector employed the largest contingent of workers in the Chemicals Industry representing about 40,089 (23% of the total workforce). The Pharmaceuticals Subsector is the second largest with 16% of the workers in the sector. This is followed by Speci-

1.6 LABOUR MARKET PROFILE

1.6.1 Employment in the sector

Estimates of total employment in the Chemicals Industry in 2015 to 2019 are depicted in Figure 1-6. The employment figures include all employees – those with permanent appointments as well as those on term contracts.

There was a year-on-year increase in

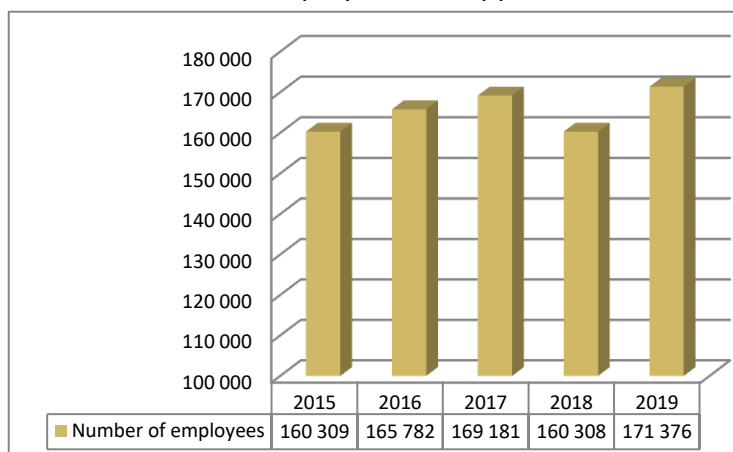


Figure 1-6 Estimate of total employment in the Chemicals Industry: 2015 – 2019

Source: CHIETA source-data system June 2019

ality Chemicals (15%), Base Chemicals (14%), FMCG 12%, and the Glass Subsector with 7% of the workers. The other subsectors employ 5% or fewer of the workers in the sector.

1.6.2 Provincial distribution of employees

The provincial distribution of employees observed over the period 2015 to 2019 is shown in Table 1-4. In all five years, Gauteng was the province with the largest number of employees. This was followed by KwaZulu-Natal, Mpumalanga and the Western Cape.

Table 1-4 Provincial distribution of employees: 2015 – 2019

Province	2015	2016	2017	2018	2019
	%	%	%	%	%
Eastern Cape	7	6	8	7	8
Free State	6	6	5	6	6
Gauteng	41	44	41	42	40
KwaZulu-Natal	19	17	18	18	18
Limpopo	1	1	1	1	1
Mpumalanga	12	11	13	12	12
North West	2	2	3	3	3
Northern Cape	0	0	0	1	1
Western Cape	12	12	11	11	11
Total	100	100	100	100	100

Source: CHIETA source-data system, June 2019

1.6.3 Educational qualifications of employees

The qualifications of employees in the Chemicals Industry are shown in Figure 1-7. In 2019 more than 40% of the employees in the sector had post matric qualifications (NQF levels 5 and above) while 38% held qualifications at NQF Level 4. People with educational levels below NQF level 1 formed only 2% of the workforce in 2015, this figure dropped to almost 0% from 2016 to 2019.

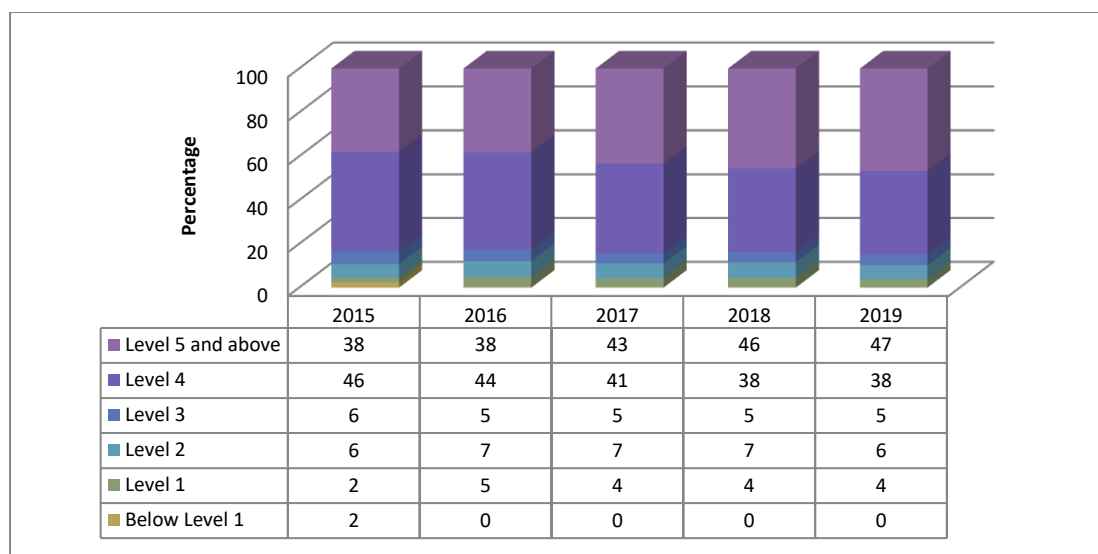


Figure 1-7 Educational qualifications of employees: 2015 – 2019

Source: CHIETA data system, June 2019.

1.6.4 Occupational distribution of employees

Table 1-5 shows that the occupational distribution of employees stayed more or less the same over the five-year period from 2015 to 2019. In 2019 there are more technicians and associate professionals at 20% in comparison to plant and machine operators and assemblers at 19%. The proportion of managers stayed more or less the same; 13% in 2015, 12% in 2016, 11% in 2017, 12% in 2018 and back to 11% in 2019. One per cent of workers were categorised as learners throughout the period of review.

Table 1-5 Occupational composition of the Chemicals Industry: 2015 – 2019

OFO Occupational group	2015		2016		2017		2018		2019	
	N	%	N	%	N	%	N	%	N	%
Managers	20 689	13	20 599	12	19 190	11	18 885	12	18 900	11
Professionals	21 144	13	22 537	14	22 416	13	19 794	12	21 375	12
Technicians and associate professionals	31 421	20	30 697	19	29 633	18	28 017	17	34 668	20
Clerical support workers	15 740	10	16 705	10	19 381	11	16 991	11	17 445	10
Service and sales workers	6 013	4	5 226	3	6 795	4	7 026	4	7 533	4
Skilled and related trades workers	12 626	8	10 893	7	12 243	7	12 505	8	12 498	7
Plant and machine operators and assemblers	25 915	16	33 932	20	33 140	20	30 949	19	32 131	19
Elementary occupations	23 631	15	23 894	14	25 289	15	24 647	15	25 481	15
Learners	891	1	1 174	1	1 089	1	1 346	1	1 341	1
Unknown	2 240	1	126	0	4	0	148	0	4	0
Total	160 309	100	165 782	100	169 181	100	160 308	100	171 376	100

Source: CHIETA source-data system June 2019

Note: Because of rounding percentages may not add up to 100.

1.6.5 Age, population group and gender distribution of employees

Table 1-6 shows the age distribution of workers in the Chemicals Industry. Throughout the period of review, majority of the workforce has been between the ages of 36 to 54, followed by youth from the age of 35 and below, then those approaching retirement between the ages 55 to 59. The age cohorts of the workforce that make the smallest population are those above 60. They are typically specialists in their fields due to a combination of factors such as years of experience and qualification.

Table 1-6 Age distribution of workers in the Chemicals Industry: 2015 – 2019

Age	2015		2016		2017		2018		2019	
	N	%	N	%	N	%	N	%	N	%
< 35	59 917	37	64 298	39	66 521	39	61 648	38	64 805	38
36-54	80 182	50	80 321	48	81 541	48	78 472	49	85 313	50
55-59	12 178	8	12 769	8	12 409	7	11 414	7	12 105	7
60+	8 033	5	8 395	5	8 710	5	8 774	5	9 153	5
Total	160 309	100	165 782	100	169 181	100	160 308	100	171 376	100

Source: CHIETA source-data system June 2019

Note: Because of rounding percentages may not add up to 100.

Monitoring of the population group and gender distribution of employees is important in order to keep track of employment transformation in the sector. The composition of the total population group employment is shown in Figure 1-8. The percentage of whites decreased from 25% in 2015 to 20% in 2019 while Africans' share in employment increased from 56% in 2015 to 62% in 2019. The percentage of Indian and Coloured employees remained more or less the same over the period.

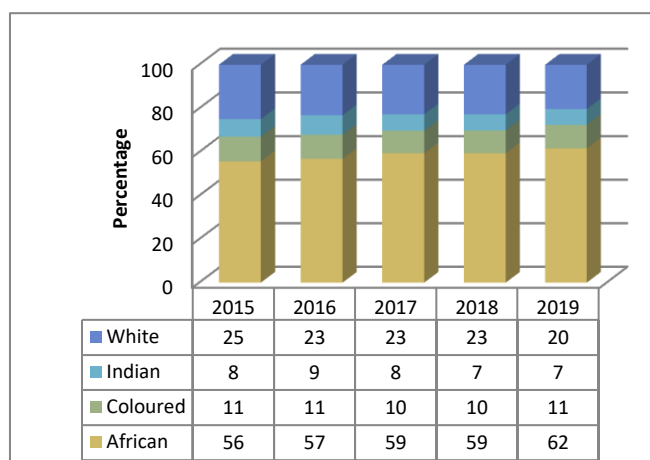


Figure 1-8 Population group composition of employees in the Chemicals Industry: 2015 – 2019

Source: CHIETA source-data system June 2019

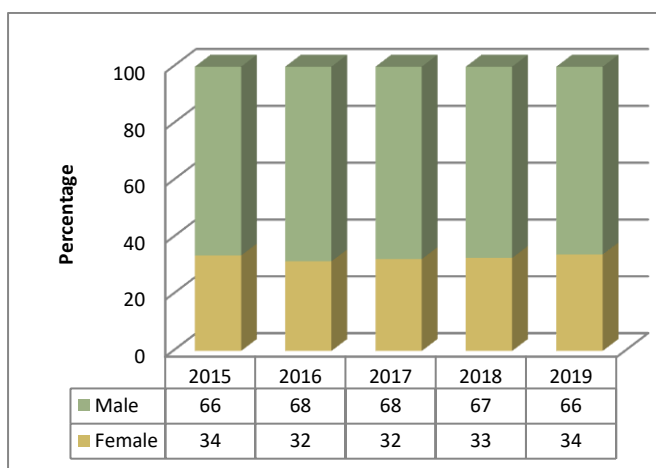


Figure 1-9 Gender composition of employees in the Chemicals Industry: 2015 – 2019

Source: CHIETA source-data system June 2019

There has been minor changes year-on-year and a lack of tangible gender transformation in the sector. In 2015 the sector employed 53 838 (34%) women. In 2016 the sector employed 52 236 (32%) women. In 2017 there were 54 635 women in the sector and they formed 32% of the total workforce, in 2018 there were 52 464 women forming 33%, and 58 169 in 2019 making 34% of the total workforce.

1.6.6 People with disabilities

Table 1-7 contains a profile of workers with disabilities according to population group, gender and age. The total employment percentage of disabled workers year-on-year has been 1% or less. In 2019 there was a 0.1% decrease in disabled workers employed in the sector. Throughout the period of review, male workers with disabilities have exceeded females at a smaller rate in comparison to the general gender population composition in the sector.

Table 1-7 Workers with disabilities according to population group, gender and age: 2015 – 2019

Disabled workers		2015		2016		2017		2018		2019	
		N	%	N	%	N	%	N	%	N	%
Population group	African	448	46	601	48	751	52	875	56	863	56
	Coloured	138	14	172	14	250	17	203	13	223	14
	Indian	83	8	177	14	99	7	113	7	113	7
	White	304	31	306	24	338	24	365	23	343	22
	Total	972	100	1 256	100	1 437	100	1 557	100	1 541	100
		N	%	N	%	N	%	N	%	N	%
Gender	Female	426	44	474	38	613	43	664	43	668	43
	Male	546	56	782	62	824	57	893	57	873	57
	Total	972	100	1 256	100	1 437	100	1 557	100	1 541	100
		N	%	N	%	N	%	N	%	N	%
Age	16-34	305	31	320	25	476	33	552	35	510	33
	35-54	437	45	647	51	638	44	711	46	721	47
	55-59	118	12	178	14	167	12	174	11	193	13
	60+	111	11	112	9	157	11	120	8	117	8
	Total	972	100	1 256	100	1 437	100	1 557	100	1 541	100
Percentage of total employment			0.6		0.8		0.8		1.0		0.9

Source: CHIETA data system June 2019

Note: Percentage figures have been rounded off to get to 100% totals.

1.7 CONCLUSIONS

The South African Chemicals Industry plays a critical role in the South African economy. Not only does it contribute significantly to the GDP, but it also produces inputs that are used in almost all other economic sectors. The industry contracted severely during the 2008/2009 recession and although it recovered in the subsequent two years, growth has again been stifled since 2012. The industry is highly dependent on imports, which makes it vulnerable to changes in world economic growth, competition from fast-growing chemical producers

such as China and exchange rate fluctuations. At this stage the economic outlook for the next few years is dampened mainly because of an uncertain regulatory environment, global trade relations and crude oil prices. Despite this negative situation, it is important for the Chemicals Industry to retain a longer term, holistic perspective on skills development. The growth potential of the sector in South and Southern Africa is undisputed. Skills development needs to continue in order to build the capacity and unlock the potential of the industry.

The majority of the companies in the Chemicals Industry are classified as either micro or small. However, employment is concentrated in a small number of large companies. The Chemicals Industry employs approximately 171 376 people. There has been an increase in employment from 2015 to 2017; however there was a significant decrease of just under 9 000 employees in 2018. This decrease can in part be attributed to the global and local economic conditions that are negatively affecting the industry. In 2019 there was a significant recovery of about 11 000 employees.

An estimated quarter of the workers are employed in the Petroleum Subsector. High concentrations of employees across the different subsectors work in Gauteng, except for the Petroleum Subsector; 44% of the employees in this subsector work in Mpumalanga. The Chemicals Industry is dependent on high-level professional and technical skills. Close to half (47%) of the employees in the sector hold qualifications above NQF Level 5. The dependence of the sector on high-level skills makes it more susceptible to occupational shortages because of the long lead-times in the training of high-level and specialised skills.

In terms of equity, over half (62%) of the employees are African. While African employees' share in employment has gradually increased over the last five years, the percentage of White employees has gradually decreased. However, when compared to the employed population of South Africa it is clear that White and Indian people are still relatively over-represented in the Chemicals Industry. African women are particularly under-represented. That means that transformation remains an important objective for the sector.

2. KEY SKILLS CHANGE DRIVERS

2.1 INTRODUCTION

This chapter identifies factors that are driving change and influencing skills demand and supply in the Chemicals Industry. Much of the information and data is collected from desktop research inclusive of policy papers and legislation, as well as stakeholder engagements in the form of focus groups. The Chemicals Industry is highly regulated and one of the key drivers of skills demand and supply is the regulatory environment. Other factors that contribute to the demand and supply for skills are: the integration of the sector in the international market, technological developments and innovation, health and safety requirements, environmental legislation and requirements, the need for transformation in the sector and the fact that some of the industry activities and developments take place offshore.

Government promotes a range of national plans that are aimed at the stimulation of economic and employment growth. The Industrial Policy Action Plan (IPAP), as well as other initiatives of the departments of Trade and Industry and Energy, is specifically aimed at parts of the Chemicals Industry. The state-owned company Petro-SA's plan to build a new oil refinery may also have a huge impact on the need and supply for skills in the sector.

2.2 CHANGE DRIVERS

2.2.1 Regulatory environment

The Chemicals Industry is, in general, a highly regulated environment – some of the subsectors more so than others. The regulations impacting on the industry span a whole array of areas including control over the country's natural resources and energy supply; the handling of hazardous materials; occupational health and safety; control over medication; protection of patents and intellectual property rights and various others. Many of the regulations have a direct bearing on the types of skills that the sector can and may employ. Certain positions in organisations are, for example, reserved for registered professionals because they require high levels of skills and professional accountability.

The industry is also reliant on highly skilled professionals who can interpret and apply regulatory requirements and who can ensure that the organisations in the industry meet all regulatory requirements. In the case of the Pharmaceutical industry, due to regulatory compliance, there is a need for pharmacists with knowledge and required experience of regulatory affairs. In the same light, those with the required competencies and regulatory knowledge come at a premium, particularly Employment Equity (EE) candidates, consequently driving up compensation costs (CHIETA Strategic Scenario Planning Workshop, 2017; CHIETA Stakeholder Interviews, 2018).

The recently revised B-BBEE has two significant amendments that impacts skills development and the labour market. These two are; the introduction of the Youth Employment Service (YES) Initiative and B-BBEE recognition and the enhanced B-BBEE recognition level for generic enterprises. The president launched the YES initiative on the 27th of March 2018. YES, which is pitched as a partnership between government, business, labour and civil society, aims to see more than one million young South Africans being offered paid work experience over the next three years as part of inclusive economic growth (The Presidency, 2018).

Employers who participate in the initiative will gain additional level(s) on the scorecard and B-BBEE points relative to the target achievements as per the act and guidelines. The skills development element was also amended, with decreasing weights on; Skills Development Expenditure [this category's compliance target has also decreased], number of black learners and unemployed black learners participating in learnerships, apprenticeships and internships. It is envisioned that the new initiative and amendments to the B-BBEE Act will encourage youth employment and training throughout sectors.

2.2.2 Global integration

The South African Chemicals Industry is in various ways integrated in and influenced by international economic trends and markets. Many of the raw materials are imported, many companies export their products and a number of companies in the sector, specifically in the Pharmaceutical and Petroleum Subsectors, are multi-nationals. In many respects the South African Chemicals Industry is bound to international quality, safety and environmental standards. Multi-national companies also have to adhere to accounting and administrative practices that satisfy the local legislative requirements, as well as those of their mother companies and the countries where they are located.

Staffing and human resources development are complex in the international environment. International companies have to ensure that their employees are adequately equipped to implement international business strategies. They also have to overcome shortages of skilled managers and professionals, particularly in emerging markets and they need to train their staff to be sensitive to cultural differences in the workplace and marketplace. South African operations of multi-nationals have to adhere to the training requirements and standards prescribed by their mother companies. In most instances programmes aimed at these requirements are not registered with the South African Qualifications Authority (SAQA) and for this reason the companies cannot apply for discretionary grants for this training. The industry is also dependent on advanced technological training that is not available locally. In 2013 stakeholders pointed out that this training has to be procured at very high cost. This situation still exists in 2018 and is exacerbated by the economic downturn, currency fluctuation, and a lack of quality entrants to the market and staff with experience. Consequently companies have to import foreign skills (CHIETA Stakeholder workshop, 2017; CHIETA Stakeholder Interviews, 2018).

2.2.3 Technological development and innovation

The fourth industrial revolution is ushering a digital revolution characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. Some of the critical breakthroughs will be in various fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing (Schwab, k.2016). Advanced technology is extremely important in the Chemicals Industry and continuous improvement, breakthrough and development in technology is one of the key rudiments of the industry. New technological developments usually require that the skills of current staff have to be upskilled or new people with the relevant skills have to be recruited (these skills may not always be readily available).

The industry's dependence on R&D also means that it is dependent on highly skilled professionals and scientists – some of which are in short supply in South Africa. Although there are

job opportunities linked to technological development, employers argue that the use of technology for continuous improvement is very expensive. At the same time labour unions are concerned about the possible loss of jobs if technological advancement were to bring further mechanisation, particularly artificial intelligence. Furthermore, they have raised concerns regarding the possible resistance from current labour to e-learning opposed to traditional class learning (CHIETA Strategic Scenario Planning Workshop, 2017; CHIETA Stakeholder Interviews, 2018). Research has been conducted, as a starting point, to analyse the impact of the Industry 4.0 in the Chemical Sector. The research also looked at greening as a change driver. The findings, which will be further explored, provide insight to emerging occupations as a result of greening and new technology (Ozone Business Consulting, 2019).

2.2.4 Health and safety

Many of the raw materials used and produced by the Chemicals Industry are potentially hazardous and if the correct preventative measures are not instituted and adhered to, workers may be exposed to diseases or injuries such as chemical burns, asthma, allergies, irritant contact and allergic contact dermatitis, skin infections and injuries and skin and other cancers. Health and safety are therefore key considerations in skills development in the industry.

2.2.5 Environmental legislation and regulations

The Chemicals Industry is inevitably a contributor to different forms of pollution. The containment of pollution and the responsible handling of chemical waste are also key elements of the functioning of the industry that impact on its skills needs and on its skills development interventions. Environmental legislation and regulations and the industry's own efforts to comply with strategies to reduce the environmental impact of chemical production increase the need for skilled specialists across a variety of occupations who can design and implement technologies, processes and practices aimed at reducing pollution and promoting a green economy. The petroleum industry currently faces several significant challenges pertaining to environmental impact. One of these is the implementation of the DMRE's cleaner fuels standards. Oil refineries were to implement the new standards which are Euro 5-specified fuels by the July 2017 deadline set by DMRE. This entails the modification and upgrading of existing facilities and the building of new plants. However many refineries have yet to upgrade due to the high costs. Furthermore, the government reneged on the 2013/2014 budget allocation to assist with the upgrades thus cleaner fuels remains a significant challenge (Creamer Media, 2012; Oirere, S. 2017).

2.2.6 Transformation imperatives

The Chemicals Industry lags behind in the employment of African people in technical, professional and managerial position; as well as gender equity and employing disabled workers (CHIETA Strategic Scenario Planning Workshop, 2017). Although the Petroleum Subsector is the only subsector that is subject to a transformation charter: The Liquid Fuels Industry Charter (LFC), recruitment throughout the Chemicals Industry is very much influenced by employment equity targets and the Broad Based Black Economic Empowerment. The scarcity of skills reported in the industry is often the result of a scarcity of suitably qualified and experienced African people. Transformation efforts also drive up salaries and the quality of in-service training is undermined by the fact that young African recruits are lured away by higher salaries before they can develop a proper grounding in the industry (CHIETA Chamber meeting, 2015; CHIETA Stakeholder Interviews, 2018).

2.2.7 Offshore operations

Some of the activities in the Chemicals Industry entail the exploration and extraction of oil and gas at offshore sites. The offshore operations require skills sets that are unusual and very specific to offshore environments.

2.3 POLICY FRAMEWORKS AFFECTING SKILLS DEMAND AND SUPPLY

Various government policies and plans have been developed over the last five to ten years by different organs of state. Many of them overlap and some have been subsumed within others. The two goals that the policies and plans have in common are the stimulation of the South African economy and job creation. While the National Development Plan (NDP) provides an overall vision and framework for most of the other policies and plans, the Industrial Policy Action Plan (IPAP) and the projects steered by the DTI and some of the infrastructure projects have a direct bearing on the Chemicals Industry. The recently approved and gazetted National Skills Development Plan (NSDP) also has a significant impact to skill prioritization within the Chemicals Industry

2.3.1 Industrial Policy Action Plan (IPAP)

The **Industrial Policy Action Plan (IPAP)** is revised and updated every year with new or revised action programmes and milestones set for each year. While IPAP is mainly aimed at the growth of the industry, the provision of the right skills is a crucial prerequisite for its implementation and therefore CHIETA's skills development initiatives need to tie in and support the Plan. The 2018 IPAP focuses on various industries of which the following belong to the Chemicals Industry.

Chemical sector

The 2018 IPAP provides a brief situational analysis of the chemical sector, highlighting its two distinctive value chains which are upstream (formulation of complex chemical compounds, molecules, of which large firms and capital investments are prevalent), and downstream (display a greater level of chemical product conversion and formulation processes, and of which small and medium-sized firms and smaller capital needs are prevalent) (Ibid, p.157 -152). The IPAP also identifies two key action programmes for the chemical sector: 1) Establishment of a platform to advance chemical sector growth through practical, industry-specific initiatives aimed at high-impact industrialization, and 2) Trade Policy Measures and Interventions (Ibid, p.153 -154).

Green industries

This intervention focuses on enabling chemical producers to transition to greener products and production techniques. The strategy necessitates the development of a policy roadmap for climate-compatible industrial development; systemised resource efficiency data collection and reporting; and the development of a national strategy to utilise appropriate measures and technology to ensure water security and support the development of a local base of technology and service providers (Department of Trade and Industry, 2018, p. 171 - 172).

Special economic zone (SEZ)

The IPAP provides a roadmap to the development of a Chemical SEZ with three key action programmes to assist in the implementation: 1) Designation of Special Economic Zones, 2) Institutional and capacity development, and 3) Marketing Plan for Special Economic Zones.

Pharmaceuticals and medical devices

The 2018 IPAP includes three key action programmes for the pharmaceuticals industry: 1) Trade Measures to protect the local pharmaceutical manufacturing industry, 2) Creation of an enabling environment for development and manufacture of veterinary medicines, and 3) Establishment of a Technology Innovation Cluster Programme to promote collaborative initiatives between industry, government and tertiary institutions to enable high-impact industrialisation in the medical devices sector (Ibid, p.148 - 150). In regards to advancement in medical technology, NTP Radioisotopes which is a subsidiary of Necsa are doing ground breaking work in radioisotopes (medical and industrial) at the world-class Pelindaba nuclear complex in South Africa. The new nuclear research reactor designated the Commercial Production Reactor will assist in the work to among others diagnose cancer by radioisotopic scanning (Creamer Media, 2017)

2.3.2 Operation Phakisa

Operation Phakisa was established to fast track the implementation of specific large scale programmes that have significant potential for economic growth and employment in South Africa. One such programme involves the unlocking of the potential of South Africa's oceans, which led to the launch of the Ocean Economy leg of Operation Phakisa in July 2014. Operation Phakisa: Oceans Economy focuses on six key areas, namely, Aquaculture; Oil and Gas Exploration; Marine Transport and Manufacturing; Marine Protection Services and Ocean Governance, Small Harbours, and Coastal and Marine Tourism. CHIETA is partnering in the Oil and Gas Exploration area under skills development, with the initiative of establishing a research chair.

2.3.3 The National Infrastructure Plan and Strategic Integrated Projects (SIPS)

The CHIETA supports and participates in DHEST Centres of Specialisation programme located within the TVET College sector. The programme aims to promote quality teaching and learning, and facilitate responsiveness. It further aims to provide a model for the implementation of QCTO's trade and occupational qualifications while developing artisanal skills in demand for economic growth, starting with SIPS. The programme aims to meet two objectives, namely: to address the demand for priority trades needed for implementation of government's National Development Plan and its National Infrastructure Plan, and secondly to contribute towards building the capacity of the TVET College system in delivering trade qualifications with employer partners. The CHIETA has been allocated Welding and Rigging trades to coordinate and has commenced with the spadework of mobilising relevant stakeholders inside and outside the chemicals sector including possible collaboration with sister SETAs towards the implementation of the programme.

2.3.4 Strategies aimed at energy provision (Integrated Resource Plan)

The provision of energy is of critical importance for the South African economy and Government has been grappling with this issue over the past decade. Various strategies and plans to improve energy provision and to reduce the country's dependence on fossil fuel

have seen the light. Of particular importance to the Chemicals Industry are the strategies and plans related to the development of biofuels, nuclear energy, cleaner fuels strategy and other renewable energy resources such as the **Biofuels Strategy**.

2.3.5 The White Paper for Post School Education and Training

The White Paper for Post-School Education and Training was approved by Cabinet on 20 November 2013. The White Paper spells out Government's direction with and objectives for the post-school education and training system. Areas that are specifically relevant to the SETAs are the strengthening and development of the TVET Colleges system, the expansion of the partnerships between universities and universities of technology and employers in order to secure work experience opportunities for students, the development of the skills of people in the workplace and the provision of industry-specific labour market information to feed into and to inform the national skills planning system.

2.3.6 The Employment Equity Act (EEA), and Broad Based Black Economic Empowerment Act (BBB-EEA)

The EEA and BBB-EEA are key legislations for transformation. They are aimed at achieving; equity in the workplace by promoting equal opportunity and fair treatment in employment; development and employment aimed at economic inclusivity. To achieve the transformation imperatives in the industry set out in Chapter 1, the 2 acts are central to the socio- economic objectives of skills development.

2.4 IMPLICATIONS FOR SKILLS PLANNING IN THE CHEMICALS INDUSTRY

Based on the analysis presented in the report so far, as well as the analysis of demand, supply and occupational shortages presented in Chapter 3, the CHIETA has identified the following key skills issues that are important for the industry and for the CHIETA itself.

2.4.1 The need for a more robust and refined skills information and planning system

The analysis of the skills situation in the Chemicals Industry clearly shows that the industry is dependent on high-level and specialised skills. These skills are developed over relatively long time periods and through a combination of efforts of the educational sector and employers. It is CHIETA's responsibility to facilitate the long-term planning for skills in the industry.

2.4.2 Skills gap between supply and demand

The Chemicals Industry is heavily reliant on qualified professionals and scientists. In many instances very specific specialisation are needed. These skills are generally in short supply and the Chemicals Industry competes for them not only in the local but also in the international labour market. This drives up the cost of employment for companies in the industry. The need for high-level and specialised skills should also be seen within the context of the transformation needs of the industry. The industry will only be able to address its occupational and skills shortages and transform at the same time if larger numbers of African graduates qualify in the fields of study that are relevant to the industry. However, the skills pipeline is severely constrained by the limited number of learners who have good pass marks in maths and science and the overall poor quality of the basic education system.

Graduates are not only needed at entry level. The industry also has a need for people with professional registration in various fields, but there is a notable shortage in ECSA registered professional engineers and engineers with the Government Certificate of Competence.

2.4.3 Improvement of the quality of the TVET college sector

The Chemicals Industry's involvement with the TVET college sector is not only prompted by the White Paper for Post School Education and Training and the DHEST's focus on this sector. TVET colleges have traditionally been a very important component in the supply of skills to the Chemicals Industry, especially artisan skills. The overall state of these institutions is, however, of great concern to the employers in the industry and to the CHIETA. Thus the CHIETA aims to continuously support and assist TVET colleges in building their capacity holistically so that they can take centre stage in skills development. CHIETA's current contributions to lecture development and various funding interventions of which TVET colleges are beneficiaries of have been critical in stimulating a consistent pipeline of skills into the industry. However, the CHIETA will also need to focus on interventions that will ensure growth and longevity of the TVET college sector, such as:

- Strengthening the management and governance of the TVET college,
- Conducting a needs analysis of the TVET colleges and provide assistance,
- Assist in the aligning the TVET curriculum with industry needs, and
- Assist in improving the TVET college teaching and learning facilities.

2.4.4 Recognition of prior learning (RPL) and articulation between qualifications

An important, but neglected part of the skills pipeline for the Chemicals Industry is the progression of employees who are already employed, not only through the ranks in their organisations, but also in terms of educational qualifications. The industry is, however, still battling with a common understanding of what RPL is and how it can be utilised to promote the career development of employees. The implementation of the National Qualifications Framework (NQF) and the articulation between qualifications awarded by different components of the education and training system are important issues that need to be addressed. RPL should also be seen within the context of the transformation of the industry. The progression of African people with industry experience through the formal educational system is one mechanism through which the transformation of the industry can be supported.

2.5 CONCLUSIONS

In this chapter the most pertinent factors that are expected to impact on the demand for skills in the Chemicals Industry have been identified. Most of these factors tend to increase the demand for high-level and specialised skills. The factors include the strict regulatory environment to which organisations in the industry are subjected, the industry's integration into the global Chemicals Industry and the concomitant regulatory requirements and competition, and the nature of chemical production that forces organisations to attend to health and safety and environmental impact issues. Government's role in the stimulation of the industry through national projects such as IPAP has been highlighted.

This chapter also highlights four issues that are pertinent in the industry and that underpin the skills planning for the period covered by this SSP. This includes the need for a more robust and refined skills information and planning system, the need to help improve capacity of the TVET colleges and the quality and relevance of their educational offerings, the need for RPL and the articulation between qualifications. The transformation of the Chemicals Industry is a transversal theme that cuts across all the issues that the industry is grappling with.

3. OCCUPATIONAL SHORTAGES AND SKILLS GAPS

3.1 INTRODUCTION

This chapter starts with occupational shortages and skills gaps in the Chemicals Industry; it discusses the hard to fill vacancies, lists the hard-to-fill occupations as identified through labour market surveys (WSPs), and identifies skills gaps. An identification of skills gaps shows the extent of scarcities and mismatches experienced in the sectoral labour market. It then explores the extent and nature of supply of skills to the industry and the state of education and training provision. This also highlights the supply-side constraints with which the industry has to deal. The chapter then concludes with the Sectoral Priority Occupations, detailing the various methods applied in identifying the occupations, interventions and ranking.

3.2 SECTORAL OCCUPATIONAL DEMAND

3.2.1 Hard-to-fill vacancies

Employers report, as part of their WSP submissions on occupations for which they have difficulties finding suitable candidates and the number of vacancies that they find hard to fill. In the WSPs submitted in March 2019, 28% of the employers reported that they experienced occupational shortages in the sense that they could not find suitable people to fill positions in their organisations. The total number of vacancies reported was 2 263; this equates to 1.3% of the total number of positions in the industry.

Although employers identified a total of 194 occupations in which they experienced hard to fill vacancies, the overall impression is that the Chemicals Industry is currently not experiencing major occupational shortages. Occupational shortages are, however experienced at the specialisation level within key occupations and in certain cases non-specialised occupations that however require a certain level of experience. In order to prioritise the skills that are in short supply in the industry a shortened list of hard-to-fill vacancies was developed.

The highest weighted vacancy for the managers' occupational category is Quality Manager followed by Engineering Manager; the highest vacancy for professionals is Industrial Products Sales Representative followed by Regulatory Affairs Officer; the highest vacancy for Technicians and associate professionals is Commercial Sales Representative followed by Electronic Engineering Technician; and the vacancies listed for skilled craft and related trades workers were very few and did not meet the criteria³. The full list can be seen in Table 3-1 and includes 17 occupations.

³ Criteria: more than 2 employers identified the occupation as hard-to-fill, more than 5 vacancies existed in the sector, and the vacancies comprised more than 3% of employment in the occupation (refer to Research Methodology section of the SSP)

Table 3-1List of hard-to-fill vacancies in the Chemicals Industry: 2019

OFO Group	Occupation Code	Occupation Name	Number of Organisations (Indicated vacancy amount)	Total Weighted Vacancies	Number of people employed in the occupation across the sector (Weighted)	Total Positions (Vacancies + Employed)	Vacancy Reason
Managers	121201	Human Resource Manager	3	14	373	387	*Equity considerations *Lack of relevant experience and qualifications (desired level of study not attained or inappropriate field of study or inappropriate subject specialisation)
	121206	Health and Safety Manager	5	14	394	408	*Lack of relevant experience *Poor remuneration *Slow recruitment processes *Unsuitable job location
	132104	Engineering Manager	11	29	778	808	*Engineering degree required, not Btech *Female EE candidates required *Lack of relevant experience *Poor remuneration *Slow recruitment processes
	132106	Manufacturing Quality Manager	3	7	168	176	*Lack of relevant experience
	132107	Quality Manager	8	40	363	403	*Lack of relevant qualifications (desired level of study not attained or inappropriate field of study or inappropriate subject specialisation) *EE candidate considerations
Professionals	211302	Manufacturing Research Chemist	4	6	76	82	*Lack of relevant experience and qualifications
	213202	Agricultural Scientist	4	15	128	143	*Equity considerations *Lack of relevant experience and qualifications

						*Unsuitable job location
	214401	Mechanical Engineer	12	27	719	747 *Engineering degree required, not Btech *Lack of relevant experience and qualifications *Slow recruitment processes
	214502	Chemical Engineering Technologist	4	11	187	198 *Lack of relevant experience and qualifications
	215101	Electrical Engineer	5	11	229	240 *Engineering degree required *Lack of relevant experience
	215201	Electronics Engineer	3	10	113	124 *Engineering degree required, not Btech *Lack of relevant experience and qualifications
	242213	Regulatory Affairs Officer	15	36	532	568 *Lack of relevant experience and qualifications *Poor remuneration *Slow recruitment processes *Unsuitable job location
	243301	Industrial Products Sales Representative	19	65	949	1014 *Equity considerations *Lack of relevant experience and qualifications *Poor remuneration
Technicians and associate professionals	311401	Electronic Engineering Technician	6	13	222	235 *Equity considerations *Lack of relevant experience and qualifications
	332201	Commercial Sales Representative	4	24	385	409 *Lack of relevant qualifications
Service and sales workers	522201	Retail Supervisor	4	8	190	199 *Lack of relevant experience *Unsuitable working hours
Plant and machine operators and assemblers	862915	Chemical Mixer	4	14	328	342 *Lack of relevant experience and qualifications *New or emerging job not defined before

Source: WSP submissions, March 2019, CHIETA system DG Funding, SIPS list, DHEST Occupations in High Demand.

Note: The vacancy rates have been rounded off to the nearest whole number. The glaring outliers have not been removed from this table; the CHIETA will be doing further investigations to understand the nuances.

3.2.2 Reasons for hard-to-fill vacancies

The reasons for the existence of hard-to-fill vacancies are complex and it is not possible to provide explanations for all the occupations listed in Table 3-1. However, to better understand all the nuances of occupational shortages, and to get a full understanding of shortages from a Chamber and regional perspective the CHIETA consults stakeholders widely through regional skills forums and Chamber meetings. The June 2017 CHIETA Strategic Scenario Planning workshop with chamber members and the 2018 Stakeholder Interview sessions revealed that the majority of the subsectors are affected by the economic situation and that in some subsectors posts are frozen and people are retrenched. This releases skills to the labour market and reduces the upward pressure on salaries. Despite the reductions in demand, the need for engineers, scientists and artisans remains.

Although there is no statistical information available on migration trends, stakeholders from various subsectors reported that they are losing highly skilled professional and technical skills to the international labour market. They also reported that the international demand for these skills drive up labour costs in the local market and contribute to the scarcity of certain skills. The fact that many engineers do not complete their candidate programmes and do not register as professional engineers, leads to shortages in positions that require professional registration. Similarly there is a shortage of EE candidate engineers with the government certificate of competency. The reporting of hard-to-fill vacancies against OFO codes does not always suffice to signal the type of skills that the educational system needs to produce. Due to the technical nature of certain occupations, qualified engineers, pharmacists or medical doctors are appointed – even though the occupational names do not reflect the fact that qualified professionals are required. For example, in many instances the sales occupations in the Chemicals Industry require high levels of technical knowledge and employers may appoint professionally qualified people in these occupations.

In certain occupations advanced industry skills are required and people who retire are replaced from the ranks of other occupations. In occupations such as the registered trades, artisans who retire have to be replaced by people who have passed the relevant trade tests. That means that the number of people who pass the trade tests each year should at least be equal to the number who are about to retire (that is if the industry wants to provide for its own needs and does not want to rely on other industries to train artisans). However, in most of the registered trades there are already shortages and for this reason the number of new qualifiers have to exceed the number of people who are about to retire.

In many of the hard-to-fill vacancies of the industry, there is a high level of specialist or contextual skills and knowledge required. Occupational shortages cannot be overcome by simply increasing the number of graduates in the relevant fields of study. Specialised knowledge is obtained through workplace experience and through advanced training programmes that are aimed at those areas of specialisation. Each subsector employs a small number of specialists in a given field relevant to that specific subsector. For example Glass Architects are architects who have specialised in the technicalities of glass. Flavourists (employed in the FMCG Subsector) are specialists who are able to discern flavours in food, perfumes etcetera. Engineers specialising in explosives is another example. The number of people needed in these occupations is usually very small but they are key to the businesses within those industries and the Chemicals Industry needs to ensure a sufficient supply of these skills – even if they are not specifically listed as hard-to-fill vacancies.

Despite the current economic situation, it is important to retain a long-term perspective on skills development. In the case of the Petroleum and Base Chemicals Subsector, if shale gas exploration comes off the ground there will be an increased need for drilling engineers and geophysicists, geologists, geochemists, reservoir engineers, petrophysicists, production and completion engineers, economists and SHEQ consultants.

3.2.3 Skills gaps (general and cross-cutting skills needs)

The CHIETA does not only have a responsibility to intervene in the supply of skills to ensure that current occupational shortages are addressed. Skills gaps also need to be addressed. Many of the skills gaps that exist in the industry are of a general and cross-cutting nature and involve large portions of the workforce. Skills gaps are sometimes linked to a critical element of an occupation, for example the Glass Subsector reported that a selected number of glaziers also need to be qualified scaffolders as in the execution of their jobs they work extensively on and with scaffolding and need to take responsibility for their own safety and for that of their co-workers (CHIETA Chamber Meeting, April 2016).

Hard-to-fill vacancies are in some cases a result of a skills gap in an occupation. The nature of the skills gap varies from soft-skills, procedural that may be company specific, experience related and technical or qualification related that may require a combination of several competencies. For instance, Channel and Category Development Manager was identified as a hard-to-fill vacancy by the Pharmaceutical subsector. The subsector pointed out that although there are people with the required qualifications, they are mostly from the FMCG subsector and thus lack pharmaceutical experience (CHIETA Stakeholder Interviews, 2018). The CHIETA conducted focus group interviews with key stakeholders who represent employer and labour constituencies from all 9 CHIETA subsectors. The purpose of the interview was to qualitatively augment the findings from the WSP/ATR analysis. One of the themes tackled, that was key to this section, was Skills Gaps. The question posed was: “What are the 3 most common skills gaps in your organisation for the three identified occupational categories?” The answers were then extrapolated to all 8 OFO major groups and aligned to the DHEST’s WSS’ drop downs of Skills Gaps and reasons for the gaps. The following table lists the responses.

Table 3-2 List of Skills Gaps in the Chemicals Industry: 2019

MAJOR GROUP	SKILLS GAPS	DETAIL	COMMENTS
MANAGERS	Resource Management Skills	<ul style="list-style-type: none"> • Management (Financial Resources, Material Resources, Personnel Resources) • Coordination • Negotiation and Persuasion • Service Orientation and Social Perceptiveness • Time Management • Instructing / Leadership (Coaching and mentoring) 	<ul style="list-style-type: none"> • Performance and Project Management and Disciplinary Skills (Finance Manager, Sales Manager, Director of Marketing) • New Policies and Legislation (Human Resource Manager) • Financial statement interpretation, People Skills, Leadership and development skills, IQ knowledge and skills will improve morale (Corporate General Manager) • Change in ISO requirements (Quality Systems Manager) • Understanding and applying the concept of 20% of key accounts deliver 80% of the business, customer relations and service (Sales and Marketing Manager, Supply and Distribution Manager) • Upskill management to improve their business acumen (Medical Superintendent)

	Complex Problem Solving	<ul style="list-style-type: none"> • Complex Problem Solving 	<ul style="list-style-type: none"> • Strategic thinking skills (Corporate General Manager) • Commercial Acumen (Sales and Marketing Manager) • Managing and coordinating work teams (Manufacturing Operations Manager) • Government Certificate of Competency (GCC) (Engineering Manager)
	Technical Skills	<ul style="list-style-type: none"> • Programming • Quality Control Analysis • Operation and Control • Troubleshooting • Equipment Maintenance 	<ul style="list-style-type: none"> • The position requires biocides speciality and sales, most candidates do not have this combination (Sales and Marketing) • Understanding NERSA Regulations (Sales and Marketing) • Lack of relevant experience (Manufacturing Operations Manager) • Technical Engineering Skills required (Engineering Manager)
	Basic Skills	<ul style="list-style-type: none"> • Writing • Speaking • Active Learning • Learning Strategies • Mathematics • Monitoring • Critical thinking • Science 	<ul style="list-style-type: none"> • Labour Law and Business Score Card (Human Resource Manager) • Sales Manager require training on negotiating and sales strategy planning • Technical knowledge of the paint products and chemistry specific vocational expertise, sales skills, practical management skills (Sales Manager) • Diction, vocabulary and email writing (Sales Manager) • Managers need to understand how adults learn to appreciate the importance of interactive training interventions (Manufacturing Operations Manager) • Lack of experience and need to upskill management to improve their business acumen with the industry (Quality Manager) • Investigating and internal audit training management skills (Laboratory Manager)
PROFESSIONALS	Resource Management Skills	<ul style="list-style-type: none"> • Management (Financial Resources, Material Resources, Personnel Resources) • Negotiation and Persuasion 	<ul style="list-style-type: none"> • Performance management & disciplinary Skills (Regulatory Affairs Officer, Legal Manager, Industrial Engineer, Marketing Practitioner) • General change management and diversity inclusion (Occupational Instructor) • Global multinational requirements and lack of experience (Medical and Pharmaceutical Product Sales Representatives)
	Complex Problem Solving	<ul style="list-style-type: none"> • Complex Problem Solving 	<ul style="list-style-type: none"> • Commercial acumen and lack of experience (Marketing Practitioner)
	Technical Skills	<ul style="list-style-type: none"> • Operation Analysis • Troubleshooting 	<ul style="list-style-type: none"> • Lack of relevant experience (Mechanical Engineer, Skills Development Practitioner) • Knowledge and experience of certified engineers (Chemical Engineer) • Technical ability to trouble shoot (Industrial Products Sales Representative)
TECHNICIANS AND ASSOCIATE PROFESSIONALS	Resource Management Skills	<ul style="list-style-type: none"> • Management of Personnel Resources 	<ul style="list-style-type: none"> • Performance Management & Disciplinary Skills (Credit or Loans Officer) • Lack of experienced candidates (Chemistry Technician) • Workplace Coaching skills - managers/supervisors need to learn to coach young adults and improve on how they develop their team members (Production / Operators Supervisor (Manufacturing)) • Interpersonal skills • Short course: Finance for Non-financial Managers and training on negotiation and sales strategy planning (Chemical Sales Representative)
	Technical Skills	<ul style="list-style-type: none"> • Quality Control Analysis • Equipment Maintenance • Operations (Control, Monitoring, and Analysis) 	<ul style="list-style-type: none"> • Continuous Development • Senior skills transfer due to overseas training (Chemistry Technician) • Technical Engineering Skills required (Mechanical Engineering Technician) • Gender equity considerations as it is difficult to find female candidates (Commodities Trader)

			<ul style="list-style-type: none"> Product training and knowledge of LPG installations (Commercial Sales Representative)
	Systems Skills	<ul style="list-style-type: none"> Considering the relative costs and benefits of potential actions to choose the most appropriate one 	<ul style="list-style-type: none"> Lack of relevant qualifications / systems thinking & analysis / judgement & decision making (Mining Production Supervisor)
	Complex Problem Solving	<ul style="list-style-type: none"> Complex Problem Solving 	<ul style="list-style-type: none"> Research and development due to technological changes (Chemistry Technician)
	Basic Skills	<ul style="list-style-type: none"> Monitoring Active Learning Critical Thinking Speaking Learning Strategies 	<ul style="list-style-type: none"> The production needs and requirements are constantly changing and employees coming into this position need to constantly be trained so as to keep up with the changes (Production / Operations Supervisor (Manufacturing)) Recognition of Prior Learning (Chemical Plant Controller) Lack of relevant experience (Chemical Sales Representative) Emotional Intelligence training (Office Administrator)
CLERICAL SUPPORT WORKERS	Resource Management Skills	<ul style="list-style-type: none"> Time Management Social Perceptiveness Management of Material Resources 	<ul style="list-style-type: none"> Excel skills (General Clerk)
	Basic Skills	<ul style="list-style-type: none"> Active Listening Critical Thinking Learning Strategies Mathematics Speaking and Reading Comprehension 	<ul style="list-style-type: none"> Basic math computing, understanding of chemistry and its application (General Clerk) Customer service training (General Clerk)
	Technical Skills	<ul style="list-style-type: none"> Operation Analysis Operation and Control Quality Control Analysis 	<ul style="list-style-type: none"> Computer literacy, especially on excel (General Clerk) Telephone etiquette (General Clerk) Basic quality control course (Production Coordinator)
SERVICE AND SALES WORKERS	Resource Management Skills	<ul style="list-style-type: none"> Service Orientation Social Perceptiveness 	<ul style="list-style-type: none"> Customer service (Service Station Attendant) Technical and product changes (Sales Assistant (General)) HIV awareness Junior management training (Retail Supervisor)
	Basic Skills	<ul style="list-style-type: none"> Active Listening Speaking Critical Thinking 	<ul style="list-style-type: none"> Sales skills (Sales Assistant) Proportion calculations, estimation (Sales Clerk / Officer) Certification requirements (First Aid Attendant)
	Technical Skills	<ul style="list-style-type: none"> Operations Analysis 	<ul style="list-style-type: none"> Excel and pastel (Sales Clerk / Officer)
	Complex Problem Solving	<ul style="list-style-type: none"> Complex Problem Solving 	<ul style="list-style-type: none"> Mixing fuel (Service Station Attendant)
SKILLED AGRICULTURAL, FORESTRY, FISHERY, CRAFT AND RELATED TRADES WORKERS	Technical Skills	<ul style="list-style-type: none"> Installation Equipment Maintenance and Selection Troubleshooting Operation and Control Repairing Programming 	<ul style="list-style-type: none"> Need legislative refresher courses (Gas Practitioner) Recognition of prior learning (Rigger, Mechanical Fitter, Boiler Maker) Gas Licencing (Boiler Maker) Technical staff often repair or install equipment but are not sure of the input and output of the equipment (Mechanical Fitter) Individual used equipment requires knowledge based training- i.e.- how to strip a pump and assess what requires replacement and changed settings etc. (Mechanical Fitter) Re-doing maintenance activities due to not finding appropriate root cause to problem (Mechanical Fitter) Petroleum Tankers are fitted with specialised equipment to deal with dangerous goods i.e. petroleum products not covered in a general diesel mechanic training (Diesel Mechanic) Operating and determining problems (Screen Printer)

			<ul style="list-style-type: none"> • Technical Engineering Skills required, understanding computer programming and lack of relevant skills (Electrician)
	Complex Problem Solving	<ul style="list-style-type: none"> • Complex Problem Solving 	<ul style="list-style-type: none"> • Lack of relevant qualifications (Boiler Maker) • Integration of technical and pharmaceutical principals to solve maintenance and breakdown challenges (Industrial Machinery Mechanic)
PLANT AND MACHINE OPERATORS AND ASSEMBLERS	Resource Management Skills	<ul style="list-style-type: none"> • Service Orientation • Social Perceptiveness • Time Management 	<ul style="list-style-type: none"> • HIV aids awareness (Truck Driver) • Goods customer service is a good image and time schedules very important (Tanker Driver) • Certification requirements (Forklift Driver)
	Technical Skills	<ul style="list-style-type: none"> • Programming • Operation and Control • Operation Analysis • Quality Control Analysis • Troubleshooting • Operation Monitoring 	<ul style="list-style-type: none"> • Lack of relevant experience, introduction to production management, and lean management – production systems (Mineral Processing Plant Operator) • Preventative problem solving (Chemical Production Machine Operator) • Existing employees need to upskill to use new monitoring tools and technical equipment (Glass Process Operator)
	Basic Skills	<ul style="list-style-type: none"> • Active Learning • Reading Comprehension • Mathematics and Science • Critical Thinking 	<ul style="list-style-type: none"> • Need to bridge the gap between inadequate schooling and tertiary education (Mineral Processing Plant Operator) • Production and manufacturing skills sets and attention to detail, specifically in a manufacturing setting (Chemical Production Machine Operator) • Specialised skill set needed as this is a dangerous occupation. Drivers need to be able to think and react quickly to avoid casualties or environmental pollution in case of emergency (Tanker Driver)
ELEMENTARY OCCUPATIONS	Resource Management Skills	<ul style="list-style-type: none"> • Time Management 	<ul style="list-style-type: none"> • Factory workers were only truly competent on one aspect of production, crimping, or pressure testing, not all. So if more than one staff member was off sick, it would negatively impact production (Plastics, Composites and Rubber Factory Worker)
	Basic Skills	<ul style="list-style-type: none"> • Critical Thinking • Learning Strategies • Speaking • Science and Mathematics • Reading Comprehension 	<ul style="list-style-type: none"> • Need for more training (Packers (Non Perishable Products)) • Need proactive attitude to training and thinking (Chemical Plant Worker) • Older workers still struggle to communicate in English (Chemical Plant Worker) • Grade 12 level inadequate (Store Person)

a) Management and leadership skills

The Chemicals Industry employs a range of managers in specialised technical fields. The managers in the industry are generally the oldest occupational category and their replacement demand is higher than that of other occupational groups. Managers are mostly sourced from the ranks of experienced professionals in the industry. Technically skilled people therefore need to develop additional managerial skills and management development should provide for a steady flow of new management talent available to the industry. Management development is also needed to improve the race and gender equity profile of managers in the industry.

b) Environmental skills

Apart from general attitudes and an environmental orientation that needs to be cultivated in the industry, specific skills also need to be developed to assist the industry in its quest for environmentally responsible operations. Specific skills are needed to manage access to and consumption of non-renewable resources. Strategic planning skills are needed to optimise the utilisation of extracted resources. Diminishing fresh water supplies have led to increasing pressure on large-scale water users in the chemicals, plastics and pharmaceutical indus-

tries. More stringent regulatory limits on the discharge of organic compounds make compliance more difficult and costly to achieve with conventional treatment processes. Skills related to water treatment and conservation is therefore very important to this industry.

Another area of specialisation relevant to several of the professions employed in the Chemicals Industry is the development of cleaner production processes, including the reduction of air pollution. Recycling also forms part of the improvement of the industry's performance in terms of environmental impact. The Glass Subsector is engaged in the recycling of cullet (recycled glass). The skills needs in this area pertain specifically to micro and informal businesses. Glass collectors need to be trained to prepare the cullet in the right format and size before offering it for sale. Various other areas still need to be explored, for example the recycling or use of left-over paint.

c) Health and safety

Occupational health and safety remains a key priority for the industry. This includes health and safety as a cross cutting skills need in all occupations as well as in relation to specialist occupations and roles. A relatively large proportion of environmental and occupational health inspectors are likely to retire in the next five years and as this is a critical occupation in the Chemicals Industry, specific attention needs to be given to the training of a large enough group of people to feed into this occupation. Another major need for the Chemicals Industry is hazardous materials handling, for example the handling of ammonia in the Fertilisers and Explosives Subsector and transportation of hazardous materials by truck drivers.

d) Recognition of Prior Learning (RPL)

RPL forms an important part of artisan training and for this reason it remains a need in the industry. During RPL people who have performed work in the trades are evaluated and their skills gaps (the skills that they still need in order to pass the trade test) are identified and addressed through targeted training programmes. The CHIETA is implementing DHEST ARPL policy in this regard and will continue to effect the necessary improvements.

e) Foundational learning

Employees who do not yet have qualifications at NQF Level 1 or who have qualifications at Levels 1 to 3 - need to have access to programmes which will enable them to complete foundational learning. This includes the National Senior Certificate for Adults (NASCA), also known as the 'second chance matric', Adult Basic Education and Training (ABET), Foundational Learning Competence (FLC) and relevant bridging programmes.

3.2.4 Occupational employment trends

The demand side of the sectoral labour market is represented by the positions in the industry that are filled as well as those that are vacant. The total number of positions in the industry and the occupations in which those positions are available provide insight into the type of skills that the education and training sector needs to produce in order to maintain the skills base of the industry and to support growth of the industry. Vacancies that remain unfilled despite employers' efforts to recruit people for those positions are indicative of occupational shortages.

The skills requirements of the Chemicals Industry have changed gradually over the last few decades. While the demand for low-skilled workers declined, the need for skilled workers increased (see Figure 3-1). The skills levels referred to in this graph cannot be directly

equated to occupational categories or to educational levels as referred to in the rest of this SSP. The graph reflects a time series that has been built up over more than two decades using different classification systems (as they have changed over time) and different data sources. The graph only illustrates a general trend.

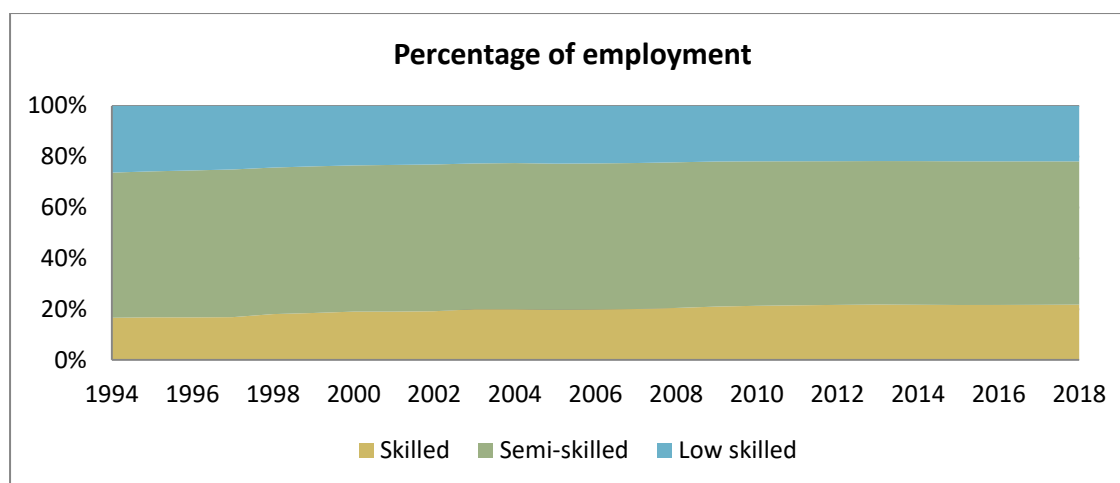


Figure 3-1 Skills composition of the Chemicals Industry: 1994 – 2018

Source: Quantec

The broad occupational composition of the industry has been discussed in Chapter 1. At the occupational group level of the OFO the composition has not changed significantly over the last five years. If the occupational composition is considered at the detailed occupation level, the Chemicals Industry employs people in 797 different occupations. The top five occupations with the largest numbers of employees in each occupational group are listed in Table 3-3 below. The percentages indicate the percentage of people in the occupational group employed in the specific occupation.

Table 3-3 Main occupations in each occupational group: 2019

Occupation Group	Occupations
Managers	Director (Enterprise / Organisation) (9%); Sales Manager (9%); Sales and Marketing Manager (9%); Finance Manager (7%); Manufacturing Operations Manager (7%)
Professionals	Medical and Pharmaceutical Products Sales Representative (12%); Chemical Engineer (7%); Marketing Practitioner (6%); Safety, Health, Environment and Quality (SHE&Q) Practitioner (6%); Industrial Products Sales Representative (4%)
Technicians and Associate Professionals	Chemistry Technician (11%); Production / Operations Supervisor (Manufacturing) (11%); Chemical Plant Controller (11%); Visual Merchandiser (11%); Gas or Petroleum Controller (5%)
Clerical Support Workers	General Clerk (19%); Production Coordinator (17%); Program or Project Administrators (12%); Accounts Clerk (11%); Stock Clerk / Officer (9%)
Service and Sales Workers	Service Station Attendant (24%); Sales Assistant (General) (17%); Sales Clerk / Officer (9%); Office Cashier (9%); Commercial Housekeeper (8%)
Skilled Craft and Related Trades Workers	Mechanical Fitter (15%); Quality Controller (Manufacturing) (9%); Industrial Machinery Mechanic (9%); Millwright (8%); Electrician (8%)
Plant and Machine Operators and Assemblers	Chemical Production Machine Operator (35%); Mining Operator (8%); Delivery Driver (6%); Filling Line Operator (5%); Truck Driver (General) (5%)
Elementary Occupations	Handyperson (21%); Chemical Plant Worker (16%); Packer (Non Perishable Products) (11%); Commercial Cleaner (8%); Store Person (8%)

Percentages refer to the percentage workers in the specific occupation group.

Source: CHIETA data system, June 2019

At the end of March 2019 the Chemicals Industry employed 12 498 people in 124 designated trades. The largest group of artisans was mechanical fitters (1 828), followed by Quality

Controller (Manufacturing) (1 171), Industrial Machinery Mechanic (1 134), and millwrights (1 053). At the same time there were about 14 054 employees in the Chemicals Industry working in occupations identified on the OFO 2017 as ‘green’ occupations. The largest occupational group are Chemical Production Machine Operator (11 378), Handyperson (5 253), Chemical Plant Worker (4 198), Visual Merchandiser (3 949), and Chemistry Technician (3 876).

In 2015 and 2016 the CHIETA embarked on projects to identify and analyse “green” occupations in the Surface Coatings Subsector and the Petroleum and Base Chemicals Subsector respectively. The Surface Coatings study identified three “occupational families” in which green skills are crucial. They are safety, health, environment and quality related occupations, technical, and laboratory related occupations (research & development and technicians) and painters (Jenkin, 2016). This study clearly demonstrated that green skills are crucial elements of the demand side of the sectoral labour market.

3.2.5 Wage trends

Figure 3-2 illustrates the level of, and increase in real remuneration of employees in the Chemicals Industry compared to that of employees in the total economy over the period 2006 to 2018. This information provides further evidence of the industry’s dependence on high-level skills and the overall increase in the level of skills required in the industry. The sharp increase in remuneration levels could be the result of a combination of factors including: the need for high-level and specialised skills that are worldwide in short supply and for which the industry has to compete in the international market; a premium that the industry has to pay for scarce African managerial, professional and technical skills in order to meet employment equity targets and the successful bargaining power of the labour unions.

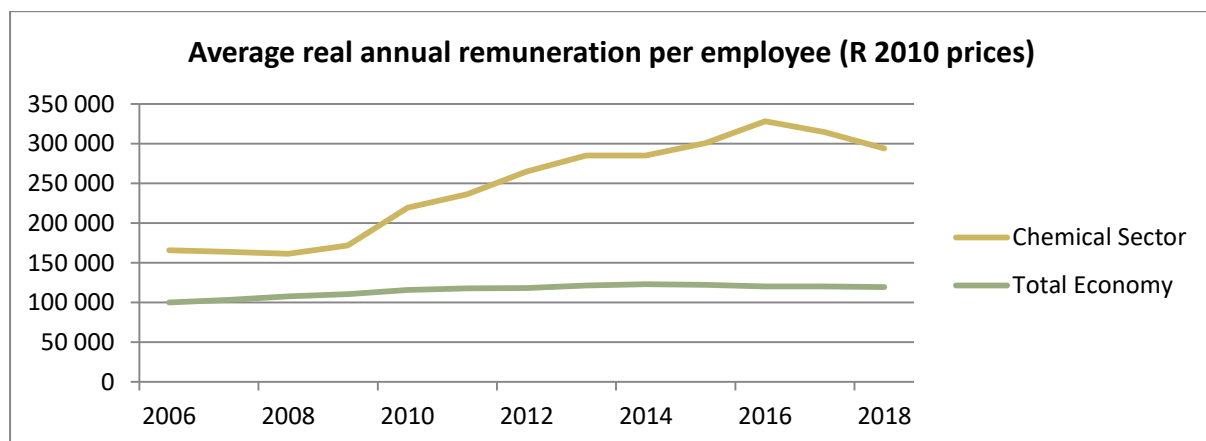


Figure 3-2 Average real remuneration per employee in the Chemicals Industry and in the South African Economy: 2006 – 2018
Source: Quantec

3.3 EXTENT AND NATURE OF SUPPLY

3.3.1 Current employees

Chapter 1 of this SSP provided information on educational levels of the people currently employed within the industry. As a result of the occupational composition of the Chemicals Industry, almost half of the employees hold HET qualifications (NQF Levels 5 to 10), while just more than a third have qualifications at NQF Level 4. However, approximately 15% of the employees in the industry have not attained the NSC and as a result they may be constrained in their career development.

Maintaining the skills levels of the employees in the industry in the face of technological and other developments and changes and the provision of career development opportunities are mainly the responsibility of employers or workplaces. Companies in the Chemicals Industry are involved in a range of training and development initiatives that focus on developing the skills of their employees. Such initiatives supplement, but also build on, the training that supplies new skills to the industry. In the ATRs submitted to the CHIETA in respect of 2019, employers reported that approximately half of the employees in the Chemicals Industry had received training in that year.

3.3.2 Skills formation in the Chemicals Industry

Skills formation for the Chemicals Industry takes many forms and takes place in the formal education system as well as in the workplace. The various components of the skills development system is illustrated in Figure 3-3. In the General Education and Training (GET) band the most important component is the General Education and Training Certificate (GETC) at NQF level 1 which signifies the first formal qualification that can be attained. In the TVET band potential entrants to the industry qualify with the National Senior Certificate (NSC), the National Certificate Vocational (NCV) and the N1 to N6 courses that lead to National Certificates (also known as the NATED courses).

In the Higher Education and Training (HET) band people qualify with first degrees in a variety of study fields relevant to this industry. Post graduate qualifications are also an important factor in the supply of skills because of the industry’s dependence on research and development capabilities. The industry does not only rely on the formal education system for the supply of skills. A large amount of training takes place in the workplace through in-service training and through learnerships, apprenticeships, internships and work experience programmes that provide the practical experience needed for certain qualifications and for professional registration. The following sections analyse the output from and identifies the most pertinent constraints experienced in each component of the system.

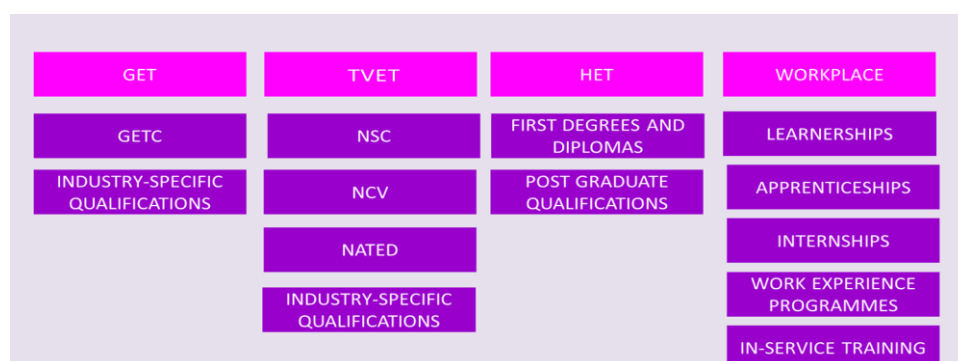


Figure 3-3 Components of the skills development system

3.3.3 General education and training

Less than 1% of the current workforce of the Chemicals Industry exited the education system without completing the general education and training phase and another 4% have only attained an NQF Level 1 qualification – which is the General Education and Training Certificate (GETC) or an equivalent qualification (CHIETA data system, 2018). The CHIETA is the quality assurer of several industry-specific qualifications at NQF Level 1 that provide people without formal qualifications the opportunity to obtain a formal qualification. Most of these qualifications are offered as learnerships.

a) NATED

About 40% of the employees in the Chemicals Industry work as Technicians and Associate Professionals, and Plant and Machine Operators. Some of the training and development for these occupations is available at public TVET colleges. TVET colleges usually offer programmes that are more closely aligned to the work environment, and these programmes generally include workplace placements. The table below shows the examination results in Engineering studies from N1 to N6 in 2013 to 2017. There was a marked increase from 2013 to 2016 in the number of students who enrolled and passed the N1 to N3 courses as well as in the pass rates. However, the number of students enrolled and who passed at N4 to N6 levels decreased substantially. At these levels the pass rates also increased.

Table 3-4 Examination results in Engineering at TVET colleges: 2013 – 2017

Course			2013	2014	2015	2016	2017
N1	Enrolled	N	31 692	50 692	46 446	55 680	55 677
	Wrote exam	N	30 160	45 851	41 862	50 925	53 507
	Passed	N	14 643	30 473	33 604	41 071	43 970
		%	48.6	66.5	80.4	80.6	82.2
N2	Enrolled	N	56 333	61 313	63 490	80 923	79 995
	Wrote exam	N	55 486	58 562	60 577	77 789	75 974
	Passed	N	25 850	33 444	41 278	53 703	54 981
		%	46.6	57.1	68.1	69.0	72.4
N3	Enrolled	N	42 028	44 082	50 589	62 391	63 835
	Wrote exam	N	41 201	42 244	47 811	59 409	60 711
	Passed	N	18 383	23 411	31 023	39 102	46 641
		%	44.6	55.4	64.9	65.8	76.8
N4	Enrolled	N	34 226	30 703	33 568	39 971	50 542
	Wrote exam	N	33 493	29 186	31 423	37 701	49 216
	Passed	N	18 165	19 018	24 157	29 316	46 807
		%	54.2	65.2	76.9	77.8	95.1
N5	Enrolled	N	26 531	22 648	25 609	32 002	45 733
	Wrote exam	N	26 030	21 493	24 106	30 084	44 580
	Passed	N	13 574	13 850	16 809	21 580	42 377
		%	52.1	64.4	69.7	71.7	95.1
N6	Enrolled	N	18 990	16 769	18 387	22 471	36 798
	Wrote exam	N	18 642	15 928	17 086	21 069	35 941
	Passed	N	8 611	7 925	10 277	12 848	33 388
		%	46.2	49.8	60.1	61	92.9

Source: Department of Higher Education, Science and Technology, TVETMIS.

b) NCV

The National Certificate (Vocational) (NC (V)) was introduced to replace the traditional National Certificates, and provides an alternative to the NSC. Although the NC(V) qualifications are to a large extent occupationally directed, they include more fundamental educational components such as languages and life orientation. The NC (V) also provides access to some higher education programmes. The table below shows the examination results of selected NC (V) courses at public TVET colleges in 2017. The overall pass rates are low.

Table 3-5 Examination results of selected National Certificate (Vocational) courses at TVET colleges: 2017

NCV Level	Course	Enrolled	Wrote exam	Passed	
		N	N	N	%
Level 2	Civil Engineering and Building Construction	6 117	2 994	1 721	57.5
	Electrical Infrastructure Construction	10 900	5 553	2 898	52.2
	Engineering and Related Design	10 491	5 242	2 968	56.6
	Mechatronics	574	283	156	55.1
Level 3	Civil Engineering and Building Construction	1 998	1 571	875	55.7
	Electrical Infrastructure Construction	3 775	3 163	1 438	45.5
	Engineering and Related Design	4 170	3 044	1 608	52.8
	Mechatronics	282	244	84	34.4
Level 4	Civil Engineering and Building Construction	1 866	1 652	608	36.8
	Electrical Infrastructure Construction	3 064	2 823	777	27.5
	Engineering and Related Design	3 567	3 177	1 104	34.7
	Mechatronics	234	214	102	47.7

Source: Department of Higher Education, Science and Technology, TVETMIS.

3.3.4 Higher education and training

The analysis of the supply of skills at HET level focuses only on the fields of study that are most relevant to the Chemicals Industry. It also focuses on the growth in output over the five-year period from 2013 to 2017.

Table 3-6 Number of national diplomas awarded in selected engineering fields: 2013 – 2017

CESM Category	2013	2014	2015	2016	2017	AAG (%)
Chemical engineering	580	671	604	556	619	2,3%
Electrical, Electronics & Communications engineering	1 536	1 775	1592	1702	1 631	2,0%
Engineering mechanics	180	184	152	186	106	-9,0%
Materials engineering	16	27	37	27	41	32,7%
Mechanical & Mechatronic engineering	883	1 004	1033	908	1 079	5,8%
Systems engineering	16	15	14	13	14	-3,1%
Polymer/Plastics engineering	2	1	0	0	0	-37,0%
Industrial engineering	336	404	413	427	435	6,9%
Manufacturing engineering	33	24	21	5	26	76,0%

Source: Department of Higher Education, Science and Technology, HEMIS

Table 3-6 reports the number of national diplomas awarded in selected engineering fields between 2013 and 2017. The field with the largest numbers of national diplomas awarded was electrical, electronics and communications engineering. Output in this field showed consistent growth at an average rate of 2% per year. The national diplomas awarded in chemical engineering increased on average by 2.3% while the output in mechanical and mechatronic engineering and industrial engineering increased by 5.8% and 6.9% per year respectively.

Table 3-7 First degrees awarded in selected engineering fields: 2013 – 2017

CESM Category	2013	2014	2015	2016	2017	AAG (%)
Chemical engineering	670	703	807	761	751	3,2
Electrical, Electronics & Communications engineering	1 092	1 174	1 332	1 309	1 321	5,0
Engineering mechanics	36	47	45	38	48	9,3
Materials engineering	39	33	40	41	37	-0,4
Mechanical & Mechatronic engineering	1 124	1 160	1 282	1 419	1 553	8,5
Systems engineering	88	105	47	50	56	-4,4

Polymer/Plastics engineering	14	11	17	15	8	-6,3
Industrial engineering	510	569	711	751	757	10,7
Manufacturing engineering	27	38	41	39	47	16,1

Source: Department of Higher Education, Science and Technology, HEMIS

Table 3-7 shows the number of first degrees awarded in specific engineering fields between 2013 and 2017. The fields with the largest number of graduates were electrical, electronics and communications engineering and mechanical and mechatronic engineering. Chemical engineering and industrial engineering follow. These fields showed substantial growth over the five-year period except for Polymer/Plastics engineering, systems engineering, and materials engineering.

The number of national diplomas and first degrees awarded in the field of chemistry and pharmaceutical sciences are listed in Table 3-8. The national diplomas awarded in chemistry has gradually increased since 2013 while the first degrees in chemistry and in pharmaceutical science increased significantly over the period.

Table 3-8 Number of diplomas and first degrees awarded in Chemistry and Pharmaceutical Science: 2013 – 2017

Qualification	2013	2014	2015	2016	2017	AAG (%)
Chemistry: National diploma	421	446	499	551	582	8.5
Chemistry: First 3-year degree	435	514	565	605	594	8.3
Pharmaceutical science: First 4-year degree	689	726	916	798	811	5.1

Source: Department of Higher Education, Science and Technology, HEMIS

Output in the fields botany/plant biology, microbiological sciences and immunology, pharmacology and toxicology and biotechnology is shown in Table 3-9. The output figures in these fields are relatively small and vary from year to year.

Table 3-9 Number of national diplomas and first degrees awarded in selected fields in Life Sciences: 2013 – 2017

Category	Qualification	2013	2014	2015	2016	2017	AAG (%)
Botany/Plant Biology	National diploma	9	9	5	10	3	-3,6
	Three-year degree	140	150	131	193	177	8,4
Microbiological Sciences & Immunology	National diploma	50	23	32	13	19	-7,0
	Three-year degree	237	301	370	376	447	17,6
Pharmacology & Toxicology	National diploma	26	21	22	22	19	-7,0
	Three-year degree	60	54	57	77	97	14,2
Biotechnology	National diploma	182	204	191	198	179	-0,1
	Three-year degree	77	106	131	141	122	13,9
	Four-year degree	64	50	1	0	0	-55,0

Source: Department of Higher Education, Science and Technology, HEMIS.

Because of the industry's heavy reliance on research and development, the postgraduate output from universities and universities of technology is also very important in the analysis of supply. The HEMIS data shows that in the period 2013 to 2017 a total of 3 836 master's degrees were awarded in the engineering fields listed in Tables 3-7. From 2013 to 2017 the number of master's degrees awarded every year has grown on average by 4.2%. Over the same period a total of 652 doctoral degrees were awarded in these fields of study with the total number of doctoral degrees increasing by 16.7% per year.

3.3.5 Workplace learning

Learning programmes that have workplace components are a very important part of the supply of skills to the Chemicals Industry. These programmes are also seen as a critical component of skills formation in the NSDP – to the extent that the funding regulations have been drastically changed in favour of Sectoral Priority Occupation programmes.

a) Learnerships

The number of learners enrolled in the Chemicals Industry in the financial years 2013/14 to 2017/18 can be seen in Figure 3-4. The enrolment figures fluctuated with a marked increase in 2015/16. However the figures decreased in 2016/17 and increased again in 2017/18. The number of learners who were certificated increased gradually over the period 2013/14 to 2014/15; however the figure dropped in 2015/16 and increased in 2016/17. In 2017/18, the figure dropped slightly. Although many of the learnerships are multi-year learnerships and the enrolment and achievement figures cannot be compared directly, the overall picture suggests that the completion rate on learnerships can be improved.

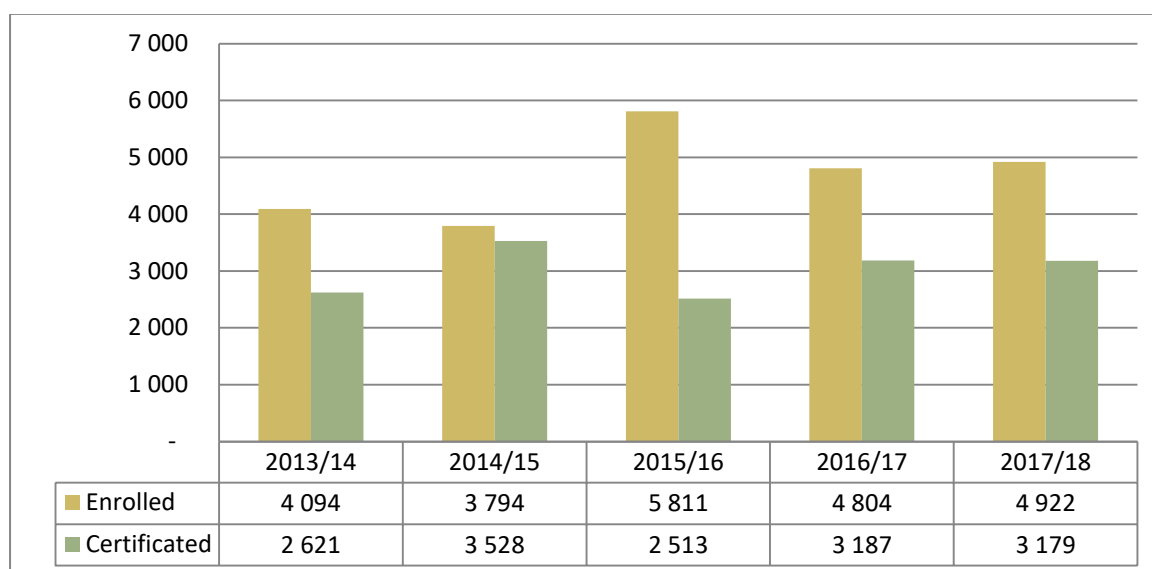


Figure 3-4 Learnership enrolments and achievements: 2013/14 to 2017/18

Source: CHIETA Annual reports 2013/14 to 2017/18

b) Apprenticeships and trade tests

There are currently different routes available for learners who want to become artisans:

- An apprenticeship under the mentorship of a qualified artisan.
- A learnership or a series of learnerships.
- A learning programme that includes prescribed work experience, such as an internship, after completion of the knowledge and practical components.
- The accumulation of knowledge and experience over a minimum period of time while doing the work of an artisan that allows the learners to apply for recognition of prior learning (RPL).

All these routes end in a trade test which the learner must pass in order to qualify as an artisan.

Table 3-10 Number of learners enrolled on and completed apprenticeships: 2013/14 – 2017/18

	Enrolled	Certificated
2013/14	1 885	751
2014/15	1 742	553
2015/16	1 864	792
2016/17	1 824	905
2017/18	1 865	563
Total	9 180	3 564

Source: CHIETA annual reports 2013/14 to 2017/18.

Over the five-year period from 2013/14 to 2017/18 a total of 9 180 apprentices were enrolled in the industry and 3 564 successfully completed their trade tests. Although many of the apprentices are still in the system (as apprenticeships are multi-year learning programmes) the figures suggest that the apprenticeship completion rates also need to improve.

c) Internships

The term “internship” is often used loosely to refer to workplace training that differs in format and duration.

In most instances internships don’t lead to formal qualifications and they are not always formally reported. For this reason there is not reliable information available on the number of interns that receive training in and for the industry.

d) Workplace experience programmes

Workplace experience programmes are programmes that provide students enrolled for the National Certificates offered by the public TVET colleges and students enrolled at universities of technology with the necessary work experience to complete their qualifications. The term also includes the workplace experience required for professional registration in certain professions, for example the candidate programmes for engineers, technologists and technicians.

At this stage there is no time series data available on the number of students who graduate on the National Diploma (i.e. after completion of the workplace component of their studies). Engineers who want to register as professional engineers with the Engineering Council of South Africa (ECSA) have to complete a candidate programme of at least three years. During this period they have to be registered as candidate engineers with ECSA and they have to acquire a set of competencies through work experience as specified by ECSA.

e) In-service training

The vast majority of training interventions sponsored by employers are short courses – some of which are accredited because they lead to unit standards that are registered on the NQF, but the majority are non-accredited. In general, employers in the Chemicals Industry spend significant amounts on non-accredited occupational directed programmes, accredited skills programmes and other short courses.

3.3.6 Supply problems experienced in the industry

a) Career guidance

Career guidance is of critical importance to ensure a steady flow of learners into the Chemicals Industry and specifically into the occupations where there are current or potential future shortages. South Africa faces many challenges in relation to the delivery of career guidance. An aspect of career guidance that poses particular challenges is guiding learners towards learnerships. Learnerships can only be entered once the learner has gained access to a workplace. At this stage there is no central source of information on learnership positions available to potential learners and learners generally struggle to find work placements.

b) The quality of education at school level

The quality of school education in South Africa, and in particular the low standard of Maths and Science teaching is one of the most important and persistent supply-side constraints facing the Chemicals Industry. At the root of the supply of skills to the Chemicals Industry lies the quality of mathematics and science education at school level and the number of learners who pass the NSC with the required marks in these two subjects and with the ability to master post-school studies in chemical-related fields.

The CHIETA conducted a study on the correlation between performance in maths and science and other school subjects in post school education and training (Vulindlela Human Performance Technology cc, 2018). There has been somewhat an improvement in the performance of maths and physical science over the last few years. Over the period 2016 to 2018 the number of learners who passed grade 12 with at least 40% of maths reflects a slight improvement of almost four percent and those who passed grade 12 with at least 40% of physical science reflects a slight improvement of almost seven percent (NSC Diagnostic Report, 2018).

The Department of Basic Education also introduced twelve new subjects in the past with the aim of broadening employment for learners upon finishing school. These included Technical mathematics, Technical Sciences, Electrical Technology (Electronics), Mechanical Technology (Fitting and Machining), Welding and Metal work as well as Civil Technology related subjects.

c) The TVET college sector

The public TVET colleges play a crucial role in the training of artisans and some of the other technical personnel for the Chemicals Industry. At present, the range of NC (V) qualifications relevant to the Chemicals Industry is limited, and for this reason the industry relies to a large extent on the old National Certificates (also referred to as the NATED courses). However, according to a report made to Parliament's Higher Education and Training Portfolio Committee by the Department of Higher Education, Science and Technology, 100% of all bursary funding is allocated to NC(V) studies. This severely constrains the options available to learners who are dependent on financial aid, should they wish to pursue studies in fields relevant to the Chemicals Industry.

The low throughput rates on the NATED courses cited earlier in this chapter is another reason for concern. These courses provide in many instances the theoretical components of artisan training programmes and the high failure rates inhibit the production of sufficient numbers of artisans. Private TVET colleges are marked by uneven quality among providers, which poses many challenges to the organisations responsible for quality assurance. Many colleges suffer from similar problems as those experienced in the public colleges.

The DHET (2011) explains that the college sector is viewed as small and weak and unable to absorb significantly large numbers of students or to attain acceptable levels of throughput. The college sector is hampered by insufficient and unequally distributed resources, inadequate infrastructure, insufficient student financial aid, inadequate caliber of staff and poor governance, administration and intra-institutional relations.

d) The Higher Education Sector

The output from the higher education sector has increased substantially in the last number of years. The growth in engineering graduates is particularly encouraging. However, it is important that the higher education sector should remain in touch with the needs of industry. CHIETA stakeholders voiced the opinion that there is not enough interaction between the higher education institutions and industry and that curricula is not sufficiently aligned to industry needs and requirements.

e) Infrastructure development

A need for infrastructure development in learning institutions has been recognized by the CHIETA. Infrastructure development has been disproportionate favoring urban areas and those institutions that generate enough income to reinvest over and above their running cost. Poor infrastructure has a negative impact on the quality of education and on learners' learning experiences. The NDP has noted the need for infrastructure development in schools as well as addressing the disadvantaged rural institutions. The CHIETA, in partnership with the National Skills Fund, will be looking more closely at infrastructure development for the TVET colleges, UoTs and Universities.

f) Work integrated learning (WIL)

Work integrated learning, in the context of this SSP refers to formal learning programmes with work experience components. This includes qualifications that contain periods of workplace experience in the curriculum (for example the NATED courses and most of the qualifications offered by universities of technology); internships and workplace experience required before graduates can register as professionals; learnerships and apprenticeships. The most pressing challenge with regard to work integrated learning is obtaining access to workplaces.

The DHET (2012) estimated that approximately 65% of students at TVET colleges are unable to find workplace experience which is required to complete their National diplomas. The lack of workplace placements is a complex issue that will only be resolved through a multi-pronged approach whereby employers are educated about the need for, advantages of and the requirements of work placements; whereby they are incentivized to take on learners and learner placements become institutionalized in workplaces; and whereby strong linkages are built between educational institutions and workplaces.

g) Transition between education and the labour market

The majority of new entrants to the labour market find it difficult to obtain first entry. One of the reasons is that more often than not employers prefer people who have some work experience to those without prior exposure to the work environment. WIL is one of the mechanisms designed to facilitate the transition from school or post school education into the labour market. However, as mentioned above, South Africa faces many challenges in this regard. In addition to WIL new entrants also need assistance to obtain a first job.

Stakeholders pointed out that the transition between education and further learning opportunities and the labour market is an even more serious challenge for learners from special schools who complete their schooling with a practical grade 12 certificate. For them there is no clear route into the industry or into training programmes that are relevant to the industry.

h) Lack of articulation

The vertical, lateral and diagonal movement of learners through the formal education and training system remains a challenge. A lack of articulation between qualifications limits learners' access to training programmes, their progression through learning pathways and, ultimately their mobility in the labour market. The largest stumbling blocks seem to be the lack of articulation between the old SGB (Standard Generating Bodies) qualifications (which are in the process of being replaced by QCTO qualifications) and the higher education qualifications; the NCV and NATED courses and higher education qualifications; and between the qualifications conferred by the universities of technology and those conferred by the universities.

i) Professional registration and Government Certificates of Competency (GCC)

The professional registration of engineers is currently not compulsory. However, for many engineering positions in the Chemicals Industry professional registration is a prerequisite because of health and safety or other legislative requirements. The supply of professionally registered engineers is hampered by the fact that a large percentage of engineering graduates enter the labour market and continue working without entering or completing the candidate phase of the learning pathway towards professional registration.

There are multiple reasons for this situation including a lack of suitable work placements and mentorship. In some instances engineers are also required to obtain the Government Certificate of Competency (GCC). However, the pass rates of the exams that lead to this certificate are notoriously low. One of the factors contributing to the low pass rates is a shortage of training providers who can prepare candidates for the exams.

j) The cost of public and private training

There are more registered learners in public post school education institutions compared to private. This can be attributed to the socio-economic state of the country where private training is costly in comparison to public of which are subsidized by the state. There are also implicit differences in quality of training between public and private institutions. Although in certain cases the differences are tangible regarding infrastructure and lecture quality, in another the perception precedes reality where you find pockets of public training excellence.

The abovementioned predicament can be noticed in learner preferences for university post-schooling in comparison to TVET College. However, due to the cost of training and significant state subsidies towards public institutions, many learners from low income households end in public institutions. The CHIETA has commissioned a study on the cost of private education and training. The findings of the research will be explored and factored in the subsequent SSP once the research has been concluded.

3.4 SECTORAL PRIORITY OCCUPATIONS AND INTERVENTIONS

The hard-to-fill vacancy list does not represent the entire industry's skills needs or priorities; neither does it reflect all the nuances of scarcity or shortages. Thus the CHIETA does not utilise the hard-to-fill vacancies identified in a particular year as the only basis for priority funding. To prioritise occupations for funding, the CHIETA compiles a Priority Skills Funding Matrix.⁴ The CHIETA's primary understanding of Sectoral Priority Occupations is "programmes

⁴ Refer to Annexure B containing the CHIETA PRIORITY Skills Funding Matrix

which lead to either a full or part qualification needed within the Chemicals Industry” (NDS III). Given the vast array of occupations and specialisations found in the industry part-qualifications had to be included in the conceptualisation of the term. Some of the occupations in the industry require only part-qualifications for entry while in many instances part-qualifications provide the specialisations needed in the industry.

This matrix is compiled through a combination of quantitative and qualitative inputs. The process starts with the entire weighted hard-to-fill vacancies from WSP submissions. The list is then further augmented with information derived from employers’ discretionary funding applications. It is argued that employers base their applications on a thorough assessment of the skills needs of their organisations and that the people that they train are either employed or likely to become employed in the organisations. The list is further augmented with skills needs related to national development plans and initiatives.

A second step in the development of the matrix is stakeholder engagements. The platforms to gain qualitative insight into skills needs are the Chamber meetings as well as the broad regional skills forums. The Chambers consist of employers, trade unions, government departments (dti and Department of Mineral Resources and Energy) and critical interest groups. The Chambers meet regularly, at least quarterly, to carry out their mandate and to guide and advise CHIETA. Furthermore the CHIETA factors in guidance obtained from industry players and other stakeholders in its governance structures. They provide a bird’s eye perspective as well as monitoring of trends within the industry and provide inputs in this regard.

The interventions indicated on the matrix are in the first instance determined by the funding windows made available by the CHIETA Governing Authority. Funding windows include bursaries, internships, learnerships (non-artisan), learnerships or apprenticeships (artisan related), work integrated learning, and work-based informal programmes. Employers, when applying for funding choose the most appropriate funding windows and by implication also the most appropriate education and training programmes that suit their specific needs.

The quantities indicated on the matrix list are determined by a combination of hard-to-fill vacancy numbers reported in the WSPs and the numbers indicated on the funding applications. The occupations that appear on the matrix list are ranked according to a weighting system. The ranking system takes into consideration whether the occupation was requested for funding in prior years (2014/15 – 2018/19) with a heavier weight given for the 2018/19 funding application cycle, whether the occupation was identified as a hard-to-fill vacancy in 2015, 2016, 2017, 2018, and 2019 WSP reporting years with a heavier weight given for the latter, the number of people that need to be trained from the 2018/19 funding applications, and whether it is a national priority or not. The top ten identified occupations based on the ranking system makes the Sectoral Priority Occupations list.⁵

Once the list has been completed it is taken through a consultative process. The Chambers extensively debate and make input into the list. The Research and Skills Planning Committee comprising of the chairpersons of the five Chambers, then engage with the drafts and also have the opportunity to make inputs and comments. They then endorse the drafts to the

⁵ Refer to Annexure A containing the CHIETA TOP 10 Sectoral Priority Occupations List

Governance and Strategy Committee which is a board standing committee with the delegated responsibility for research and skills planning. The Governance and Strategy Committee then tables the SSP document including the Sectoral Priority Occupations list to the Board for ratification and approval.

3.5 CONCLUSIONS

The analysis presented in this chapter and in previous chapters highlights the fact that although employment in the Chemicals Industry was not growing very rapidly in the first three years of the five-year period of review with the fourth year (2018) experiencing a significant drop, there has been various Government initiated projects and plans in place geared towards stimulating the growth of the industry and increase the demand for skills. Among other factors the 2019 increase of employment may be part due to these interventions. There is, however, still some uncertainty about the real effect that these initiatives will have on the skills demand in the industry going forwards. Overall the skills levels of the industry are rising and the skills demands tend to shift towards higher level skills.

The CHIETA takes a holistic view of the skills development pipeline and in this chapter the key elements of the pipeline have been identified and analysed. At the GET level the supply of skills to the pipeline is constrained by the poor quality of school education and the relatively low numbers of learners who exit the system with maths and science.

These deficiencies in the system have a ripple effect on the throughput rates in the post school education system. They also put an additional strain on the post school education and training system because of the bridging and other extra inputs required to help students through their courses. The TVET college system is very important to the Chemicals Industry. However, throughput rates in this system are notoriously low and industry view the system as weak and not properly aligned to industry needs and requirements.

Over the last few years the output of the higher education sector has been growing strongly in fields of study that are most relevant to this sector. It is especially in the engineering field that the growth figures are high. However, various factors still lead to a disjuncture between the demand for engineering skills and the supply thereof. One is a lack of alignment between industry requirements and the curricula of the higher education institutions. Another is the fact that engineers qualify and start working without completing their candidacy training and registration with ECSA.

Employers in the industry identify and report occupational shortages to the CHIETA on a regular basis. Most of the shortages experienced in the industry are for professional engineers and scientists, as well as artisans, whose training takes several years. It is therefore necessary that the CHIETA takes a long-term view in terms of its skills development initiatives and interventions.

4. SETA PARTNERSHIPS

4.1 INTRODUCTION

A partnership can be defined as an arrangement where parties, agree to cooperate to advance their mutual interests. DHEST (Department of Higher Education, Science and Technology, DHEST, 2019) contextually defines partnerships as “a collaborative agreement between two or more parties intended to achieve specified outcomes directed towards addressing mutually inclusive skills priorities or objectives within a specified timeframe”. The purpose of this chapter is to identify successes and challenges in creating and maintaining partnerships and propose measures for deepening TVET college partnerships. The chapter will also outline research conducted in the 2018/19 year to build on TVET college support and collaboration.

The National Skills Development Plan (NSDP) 2030 affirms the role of SETAs as facilitation of both the supply and demand side of skills development. Outcome 2 maintains that SETAs should link education and workplaces. Core to the achievement of this objective is a collaborative or partnership approach that improves the linkages of universities, colleges and employers. Outcomes 5 of the plan sees supporting the growth of the public college institutional type as a key provider of skills required for socio-economic development. The promotion of training to meet employers’ needs at public institutions is therefore a priority. A key finding of this SSP in Chapter 2, which also translates into a key change driver articulated by industry, is the need to improve the quality of the TVET Sector. The chemical sector has significant reliance and utilisation of artisanal and technical skills. The TVET and University of Technology (UoT) sector therefore remains a very important component of skills supplied to the sector.

The CHIETA fully embraces the partnership approach and has seen the value in the implementation of skills development projects and interventions utilising this approach. The success of the CHIETA can be largely contributed to functioning and successful partnerships across the skills development value chain. Traditionally, partnerships have been viewed mainly as comprising of funding from the SETAs; however, in recent years the CHIETA has adopted a far more collaborative approach and has engages stakeholders in various ways.

4.2 THE CHIETA PARTNERSHIP MODEL

The CHIETA utilises a structured approach that provides a way to leverage the unique skills and expertise of each stakeholder. Stakeholders with shared interests and mutual benefits are brought together to achieve alignment. The CHIETA acts as the coordinator, funder, and facilitator in the process. This collaborative and consultative approach is evidenced by the establishment of task or steering committees for strategic projects. The advantage of the model is that it leads to correct identification of supply-side and demand-side needs and fit-for-purpose projects and project outcomes. The role played by the CHIETA’s constitutional structures and stakeholders in the skills planning process and hard-to-fill vacancies identification forms part of the successful partnership model for skills planning. CHIETA’ s governance structures, inclusive of stakeholder constituencies, are central to skills planning, including the development and finalisation of the SSP, Strategic Plans and Annual Performance Plans.

4.3 ANALYSIS OF EXISTING PARTNERSHIPS

4.3.1 The state of existing partnerships in the CHIETA

The CHIETA has partnerships with stakeholders across the skills development value chain. A few successful projects implemented utilising this approach is singled out for purposes of this chapter. Strategic partnership to implement national priorities, partnerships with government departments, including provincial and local governments, partnerships that depict linkages with other SETAs, programme delivery partnerships, and industry – institution partnerships are reported on.

Table 4-1 Existing Partnerships

Name of institution/ partner organisation	Nature of partnership (start & end dates)	Objectives of partnership	Value of partnership
1. TVET College Sector Partnerships	For the 2018 and 2019 skills development years the SETA entered 28 partnerships with TVET colleges across all 9 provinces. The areas of partnerships or interventions are wide ranging and have been identified through research and stakeholder engagements, they include but not limited to; work integrated learning, apprenticeships, skills programmes, Lecturer development, bursaries and occupational trainer development. Support at university and University of Technology level is mainly in research, graduate and post graduate funding.	The partnerships in line with the mandate of the SETA have the objective of capacitating the TVET college sector. The Chemical sector has a heavy reliance on technical and artisan skills. The TVET sector therefore plays a critical role in the supply of skills for the sector.	The value of the partnership is seen to be improving the quality of learning delivery and supply from TVET colleges.
The challenge with implementation so far has been administration and project management at the colleges. Because TVET colleges by their nature are learning institutions, that takes priority. The CHIETA over the years have strengthened its support to TVET projects through its regional skills advisors and offices.			
2. Centres of Specialization	The CHIETA is supporting the two (2) trades allocated by DHEST, namely Riggers and Welders. These trades will be supported through Umfolozi, False Bay, Boland and East Cape Midlands TVET Colleges. The total number of 120 apprenticeships made up of 60 Welders and 60 Riggers are being supported. Contracting and the recruitment of learners by employers have been concluded.	The initiative is designed to meet two objectives simultaneously: firstly to address the demand for priority trades needed for the implementation of government's National Development Plan in general and its National Infrastructure Plan more particularly; and secondly to contribute towards the building of the capacity of its public Technical and Vocational Education and Training (TVET) College system to deliver trade qualifications with employer partners.	The value for the programme lays in its partnership approach that links TVET colleges and workplaces. The Programme aims to develop thirteen priority trades that have been identified as being in strong demand for the infrastructure programmes as well as for other strategic programmes such as the War on Leaks and the new ocean economy programme, Operation Phakisa. If government decides to on nuclear energy, then many of the same trades will be needed for that investment too which can be delivered through the CoS model.

Challenges: The main challenges with the project are finding approved workplaces and fast-tracking workplace approvals. The CHIETA has been looking at efficient approaches to workplace approval which includes collaboration with other SETAs and looking at endorsements.			
3. Gandhi Mandela Centre of Specialisation for artisan skills in South Africa	Partnership project between the Government of the Republic of India (GOI) and the Government of the Republic of South Africa (GOSA). The CHIETA through strategic engagements with the Deputy High Commissioner of India collaborated on the project in (4) trades with the Tshwane West TVET College. In addition to CHIETA is supporting the GANDHI MANDELA Centre of Specialisation with a further 20 apprenticeships through the Tshwane South TVET College: 1.Mechanical Fitter 2.Electrician(Industrial & Domestic) 3.Millwright 4.Boilermaker	The collaborative partnership aims to expand and strengthen bilateral co-operation in the area of skills development and promote quality vocational education and training.	The value of the partnership is in meeting the training requirements of young people and the artisan skill requirements of the country, through a linking institutions with industry
Challenges: The main challenges with the project are finding approved workplaces and fast-tracking workplace approvals. The CHIETA has been looking at efficient approaches to workplace approval which includes collaboration with other SETAs and looking at endorsements.			
4. Operation Phakisa	The CHIETA has been participating in Operation Phakisa Ocean’s Economy leg since 2015. The CHIETA is actively involved in the Oil and Gas Exploration and the Manufacturing Skills Initiative Working Group(s). The working groups were tasked with developing the skills strategy roadmaps for industry and governance based activities related to the project life cycle. The skills strategy roadmaps include the mechanism for knowledge generation and human capacity building, which is achieved through the establishment of university research chairs among other things. The Oil and Gas Exploration working group identified the need for the establishment of such a Research Chair to drive knowledge generation, human capacity building and transformation within the Oil and Gas industry.	Support to Operation Phakisa focuses on undersea explorations, providing artisanal skills for the maintenance of equipment, the training of engineers and on occupation health and safety related interventions. The CHIETA in collaboration with SAIMI, the Energy and Water Sector Education and Training Authority (EWSETA) and the Transport Education and Training Authority (TETA) are co-funding and supporting the establishment of the Oil and Gas Research chair in line with South African Research Chairs Initiatives (SARChI) protocols. Among others, the key objectives of the Research Chair will include promotion of an integrated system of research, research training, information and documentation in the Oil and Gas field and facilitation of the localisation and transfer of new technology.	The value of the partnership is the accelerated development of South Africa’s Ocean Economy.

Partnerships outputs and gaps

As partnerships are established and enhanced, they are often characterised by challenges. Some of these include inadequate project management, some leadership not taking skills development as an imperative, general administrative inefficiencies and delays in delivery of projects often resulting from inadequate capacity especially from TVET colleges. On the other hand, partnerships with other institutions including industry and universities are characterised by challenges such as change of management affecting specific projects, change requests from initial planned skills development interventions, requests for extensions on projects timeframes, and inadequate evidence submitted to process grants payments. The CHIETA continues to engage its stakeholders and explore various ways to address these challenges. Some of the interventions put in place include the capacity building of new skills development facilitators, developing of relevant skills planning and implementation tools, continuous improvements on the credible system for skills planning and quality assurance, sharing best practices during regional skills forums.

4.3.2 Industry Institution Partnerships

Industry - Institution model is the most prominent within the CHIETA. Industry-Institution can happen at various levels, and at the conceptual phase should exhibit mutual benefit for stakeholders involved. The partnership can be for curriculum design and development, training and skills development, research, technology development and transfer. The Chemicals Industry, through research and stakeholder engagement, highlighted their skills development needs and challenges limiting skills development. Some of the supply-side challenges identified are the quality of education at school level, the capacity of TVET colleges to deliver technical courses, and the shortage of learners with good maths and science grades to undertake Chemicals Industry qualification at tertiary institutions.

Within the CHIETA the industry institution model found prominence largely due to the commitment and participation of role players to find solutions to problems and challenges in skills development. There industry –institution partnerships are focussed on forging strategic partnerships with industry and HET Institutions to contribute to the technical and statistical content of the SSP and closing the skills development gaps identified. The purpose of the projects include , but are limited to, the provision on current research trends and empirical evidence for the Chemical Industry and positioning the CHIETA with HET Institutions and other Industry associations supporting the National agenda of the Chemical related skills development demands. The model has been extended to other projects and is the main delivery model on projects for CHIETA. In 2018/19 the CHIETA had the following 3 new industry and institution partnerships:-

Table 4-2 Industry Institution Partnerships

Industry Institution Partnerships	Partnership Focus (Please provide an explanation of the Partnership)	Areas of support/Interventions
University of the Witwatersrand	CHIETA funded Wits University and Industry to establish the Africa Energy Leadership Centre (AELC) to develop leadership and management skills to tap into Africa's vast, untapped energy potential and fastest growing regions for energy demand.	Postgraduate and Executive Education Research & Thought Leadership Networking and Professional Development
Unilever SA	CHIETA funded Unilever to offer practical exposure and Bursaries for tuition fees	UN Engineering Bursary

	which include but not limited to accommodation, textbooks and meals for University of the Witwatersrand students studying towards a BSC degree at University of the Witwatersrand	
Group Technology (Sasol)	CHIETA funded Sasol to offer work integrated learning opportunities to 16 Matriculants (10 African Females 6 African Males) from the local communities surrounding the Sasolburg site. The project aims to increase participants' employment opportunities by 60%, Communicate effectively using corporate communication tools (i.e. e-mails) and business language skills in the modes of oral and / or written presentation and demonstration of basic numeracy skills and use systems and technology effectively and professionally showing responsibility and ownership towards their work environment, team members and other stakeholders in the organisation.	Sasol WIIL & Youth Development Programme
Tshwane University of Technology	CHIETA funded Tshwane University of Technology to support 26 students by exposing them to the industry to gain industrial experience in the Technology station in Chemicals working on industrial projects and problem solving for future employment.	TUT Wil & Industry Exposure
South African Petroleum Industry Association (SAPIA)	The CHIETA funded SAPIA for the Women in Leadership to understand and appreciate their personal and professional journey in relation to leadership and understand Emotional Intelligence as an enabler for their work and leadership environment. The CHIETA funded SAPIA for the Advance Certificate in the Management of Oil and Gas to understand strategic imperatives of the Oil and Gas Sector, understanding key governance principles relevant to the sector, Key Performance Indicators on how to manage people, talent management process and succession planning and operational excellence from theory to practice in the oil and gas industry.	Women in Leadership and Advanced Certificate in Management of Oil and Gas
Unilever SA	CHIETA funded Unilever to provide practical workplace exposure to disadvantaged candidates from rural areas studying towards a BSC Engineering degree at University of the Witwatersrand. This programme enables students to master the theoretical subject better when they go back to the institution to complete their 3 rd and 4 th years of study, the practical workplace exposure will give them competitive advantage when applying for employment.	Wits WIL Program

4.3.3 Linkages with other SETAs

To address some of the identified weaknesses with the Ghandi Mandela CoS project, the British Council has approved funding for a project called the "A21 Digital Guideline". The project objectives include the design, development and publication of digital online guidelines to allow stakeholders looking to implement a quality apprenticeship system to understand and enhance their roles and responsibilities. The CHIETA hosted the British Council and relevant SETAs on the 27th June 2019 at the CHIETA Offices to implement a detailed project planning process during the period May to November 2019. This project is seen as an enhancement of the CoS project and a collaborative SETA project to be facilitated by CHIETA. The CHIETA continues to extend its workings with various SETAs. This includes working and collaborating with other SETAs and relevant stakeholders for the design and development of qualifications.

4.4 PLANNED PARTNERSHIPS

In 2011 CHIETA had set as one of its main strategic objectives as the strengthening and expanding of partnerships, this was in response to the goals of NSDP. The National Skills Development Plan (NSDP) sees the core role of SETAs as linking the workplace and industry through collaborations and partnerships. Over the last few years, CHIETA has enjoyed great success in this regard. New partnerships that innovatively advance the skills development mandate, takes forward the objectives of the national skills development strategy and now the plan, and enrich the post school education and training sector were and continue to be prioritised. Of great importance are industry-institutional partnerships. The below are planned strategic partnerships believed able to take CHIETA's strategic objectives forward.

Table 4-3 Planned Partnerships (new partnerships)

Name of institution/ partner organisation	Gaps that the partnership will be addressing	Objectives of partnership
Post learnership absorption strategy	To address the challenges of a slow growing economy, changes in jobs and business processes brought about by the 4th Industrial Revolution and unemployment. The CHIETA has identified the need to improve the impact of skills development in the short term for beneficiaries	<p>The Post Learnerships Absorption Strategy is aimed at improving post education and training of placements in employment or entrepreneurship opportunities, utilising below re-envisioned programmes:-</p> <p>Work readiness and Job preparedness programmes</p> <ul style="list-style-type: none"> • Work integrated learning programs • Entrepreneurship development programmes (New Venture Creation Learnerships) • Mentorship (work place mentorship and business development mentorship) <p>The objectives are to use entrepreneurship as a driver of small business development for job creation. This is to be achieved by unpacking the CHIETA industries value chains and identify opportunities for creating simple business models that can be taken to scale, invest environments that enables the industry to take up emerging entrepreneurs and provision of mentorship and small business subcontracting opportunities for the learners, formulating partnerships with TVETs and Higher Education and Training Institutions to ensure sustained capacity for our SETA in the areas of training and research to test new models and design programmes with scale as a desired end.</p>
World Skills Competition	The SETA, Tvet College and private provider partnership, which focuses on the implementation of the World Skills Competition standard as a vehicle for impact in skills development and capacity building of the TVET Colleges, focusing in the Electrical Trade for a start. Once developed, the pilot will be documented and presented as a scalable model to various TVET colleges and other programmes including welding.	<ul style="list-style-type: none"> ▪ Evaluation of the college workshops to identify gaps in tools, equipment, layout and a plan to close these to enhance the quality and flow of practical teaching and learning ▪ Development and capacity building of selected lecturers on full Electrical curriculum and international standards used at the World Skills International competition (WSI, standardised training methodologies and learning materials leading to improved quality of teaching and learning in the college ▪ Establishment of partnerships with industries and schools in the proximity of the college in order to present colleges as higher institutions of choice as well as to facilitate placement of learners for workplace learning ▪ Development and testing of the learner selection guide/tool prior to their enrolments and career advise ▪ A tested case study ready to be duplicated across the country targeting learners between 14-21 years as pipeline candidates for future skills completions alongside their career development
Partnerships with new Universities and TVET colleges	The CHIETA endeavours to expand its partnership model between the universities and TVET colleges through the development of college management and lecturers. CHIETA has supported and partnered with the Northern Cape Rural TVET in work integrated learning but aims to strengthen its support in areas of relevance. Partnerships are also planned with the Sefako Makgatho and Mpumalanga Universities in areas of common interest for the sector	Infrastructure support remain a critical success factor for TVET colleges, particularly rural TVETs, a collaborative stakeholder approach will be explored that sees other stakeholders involved in bringing support that CHIETA cannot offer in TVET colleges.

4.5 CONCLUSIONS

The partnership approach in the CHIETA has been in use for a number of years, and has led to successful implementation of a number of innovative and pragmatic skills development programmes. Over the years the CHIETA partnership model and approach has continuously been improved on and expanded.

Sector partnerships are key and vital to skills development, and fundamental for effective implementation and maximum impact based on experience. Going forward the CHIETA is planning to continue to forge meaningful partnerships with relevant stakeholders across the skills development value chain but with a focus on short term efficacy. Monitoring and Evaluation plays a critical role in planning and will be used to strengthen partnership and establish high impact projects. Existing successful partnerships are to be expanded and deepened, while continuous engagements and various mechanisms are to be explored to address challenges associated with them as outlined in the partnership section.

5. SETA MONITORING AND EVALUATION

5.1 INTRODUCTION

This section of the SSP addresses Monitoring and Evaluation (M&E). M&E is a critical function of organisations. State owned enterprises are mandated to provide services by allocating its scarce resources to achieve national and sectoral priorities. In the case of SETAs, the allocation of levy contributions to skills interventions are limited by the levy pool, thus it is important to continuously monitor the expenditure and reflect on project outcomes and the extent of impact. It is also critical that CHIETA conducts introspective analysis at an organisational level with the intention to strengthen and streamline processes.

5.2 CHIETA'S MONITORING AND EVALUATION APPROACH

CHIETA has a monitoring and evaluation policy which aims to sustain and increase the effectiveness of CHIETA as a value adding business partner to all its stakeholders. It takes cognizant of the need to continuously evaluate the organisations' performance, impact and service delivery outcomes. Thus M&E in the regards to CHIETA predominantly focuses on programme implementation. It further states that this is done through the reporting of accurate, valid and complete organisational performance information to the CHIETA Governance structures and stakeholders. It concludes by tying the importance of a functional monitoring and evaluation framework with the delivery of CHIETA's mandate and strategic objectives. The table below provides CHIETA's approach to M&E which is program specific.

Table 5-1 CHIETA's Monitoring and Evaluation Approach

	Definition	CHIETA's Approach
Monitoring	<p>The regular systematic collection and analysis of information to track the progress of programme implementation against pre-set targets and objectives.</p> <p>Question: Did we deliver?</p>	<p>CHIETA establishes its indicators based on DHEST's Service Level Agreement (SLA). The SLA thus significantly informs the Strategic Plan and Annual Performance Plan. The programme objectives are subsequently aligned with indicators and honour the SLA.</p> <p>The indicators inform the kinds of data needed for collection. In order to enable this process, the CHIETA developed a stakeholder and management driven Management Information System that that processes data and aligns data input requirements with indicators. Through the MIS we are able to execute the SLA obligations which are to provide skills development funding to our stakeholders.</p>
Evaluation	<p>The objective assessment of an on-going project or programme or policy, its design, implementation and results.</p> <p>Question: What has happened as a result?</p>	<p>The term <i>performance</i> is generally used to describe and measure the SETAs outputs in terms of a set of targets that is agreed upon by the CHIETA Board, Management and the Department of Higher Education, Science and Technology. Performance is measured and evaluated on an annual basis (annual and quarterly reports) and performance indicators are formulated for each programme and/or intervention.</p>
Impact	<p>Assesses what has happened as a result of the intervention and what may have happened without it.</p> <p>Question: Have we made a difference and achieved our goal?</p>	<p>CHIETA's performance indicators focus on programme outputs and not on the outcomes for beneficiaries and stakeholders as an impact assessment would do. Therefore CHIETA may begin structuring the organisation's impact assessments according to programmes and broader organisational objectives going forward.</p>

CHIETA's monitoring and evaluation framework can be best described as an integrated set of organisational structures with decentralised reporting and evaluations against set targets as per its SLA with DHEST. These decentralised reporting as per each organisational structure's monitoring mechanisms are then consolidated into a DHEST reporting template (SETA Quarterly Monitoring Report and Annual Performance Plan).

5.3 USE OF INFORMATION TO INFORM RESEARCH AND PLANNING

The diagram below shows an ideal information process cycle that informs planning of which CHIETA strives for. The colour coding of the arrows indicates whether CHIETA performs that specific process well (green), can do much more (yellow), and is not doing well (red).

The figure begins with CHIETA Research and Strategic Planning: at this stage, objectives, targets and outcomes are established. These are informed by national priorities, adherence to the DHEST SLA, and sectoral research and reports (tracer studies, impact reports, Annual Reports and SSP). The CHIETA conducts these various reports inclusive of labour market analyses in order to determine and assess need and quantity as well as set priorities.

The next stage is the development of indicators: these indicators are developed based on programmes and are significantly driven by the DHEST SLA. The CHIETA notes that M&E and impact based on programmes and associated indicators makes more sense given the direct relationship and reporting line of these items to DHEST of which DHEST subsequently evaluates CHIETA on. However, CHIETA has not lost sight of broader organizational M&E to influence organisational productivity, such as the much needed cohesion and synchronised work of the Strategic Plan (SP) and Annual Performance Plan (APP) with that of the research work that goes in the development of the SSP.

The next process is the Data collection: of applicants and those who have been awarded for various programmes including however not limited to learnerships, apprenticeships, bursaries, skills programs, WIL, lecture development, and SMME support among others. The data is collected at unit record level. The criticality of this process cannot be overstated, as the information collected forms the basis of information for the development of strategic priority. The data collection also consists of WSP-ATRs which is used in the development of the SSP, and informs priority funding based on identified occupational needs and training. The data also consists of discretionary grant funding which also provides industry need. This is then expressed in the SSP and forms part of the methodological approach in identifying priorities for skills planning.

Dedicated impact surveys: are meant to be part and parcel of the planning process. These analyse the various projects and programmes against their indicators, and determine whether there is return on investment for the various funding vehicles. At this stage the CHIETA does not have dedicated impact surveys within this process, instead conducts adhoc impact research. Evaluation of impact per programme: is conducted through the collation of data against indicators and presented in various formats inclusive of the Seta Quarterly Monitoring Reports (SQMR). The SQMR data is subsequently stored in CHIETA's MIS.

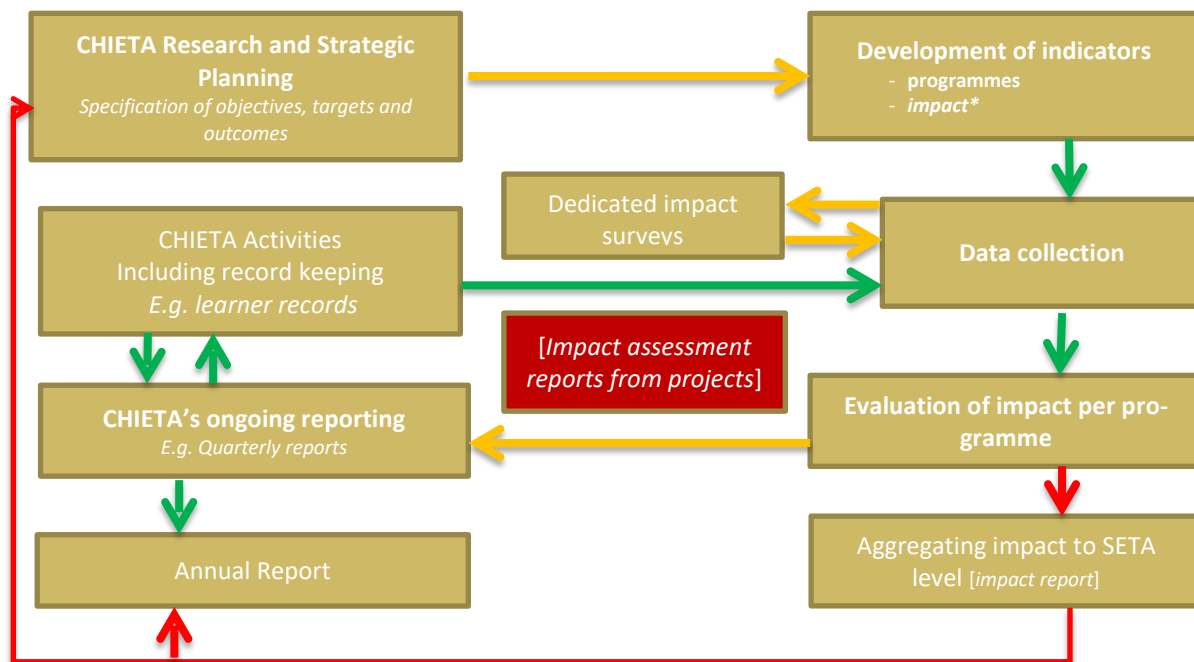


Figure 5-1 CHIETA M&E Process

Aggregating impact to SETA: necessitates a process of collating the various dedicated impact surveys with the purpose to reflect on project and program impact and provide guidance in the development of strategic objectives. Thus the aggregated impact feed into the Annual Report and back again to the CHIETA Research and Strategic Planning. Currently research in the form of the SSP and various impact research reports do inform strategic objectives however the organisation is yet to establish a dedicated impact processes.

Impact tends to be conducted intermittently. Although successful impact studies have been conducted through SSP identification and needs expressed by industry and stakeholders at large, impact is not conducted systematically and continuously, thus CHIETA is not always able to reflect on return on investment and measure its impact against sectoral and national priorities.

The above figure displaying the information process flow has attempted to answer the broader question regarding how the CHIETA uses information from previous year's Annual Report and reports from tracer studies to inform research and planning. It is important to note the critical stage of data collection. Without the necessary investment in this process, CHIETA would not be able to monitor and neither evaluate skills interventions as effectively. The data analyses process and aggregation of dedicated impact surveys based on the data collection needs to be developed going forward as a plan of action. This will solidify the information process flow and ensure that skills' planning is all encompassing.

5.4 STRATEGIC PRIORITIES

CHIETA considers national priorities in determining its strategic objectives. These priorities provide an important compass in setting the organisation's sectoral goals and objectives while reflecting on priorities emanating from research. The table below provides a high-level map of national outcomes against sectoral priorities, goals and objectives, and critically the alignment of the 2019/2020 SSP priorities with that of the Strategic Plan (SP) and Annual Performance Plan (APP).

Table 5-2 Strategic Priorities

NDP National Priorities	NSDP National Skills Outcome	SSP (2019 /2020) Sector Priorities	CHIETA Strategic Goals SETA Goals (APP &Strat Plan)	CHIETA Strategic Objectives SETA Objectives (APP &Strat Plan)
Economy and Employment <i>Creation of decent work and sustainable livelihoods</i>	Outcome 1: Identify and increase production of occupations in high demand	Priority 3: Responding to changing sectoral needs and priorities	Provide the Chemical Industry and its nine economic sectors with accurately identified skills needs	Manage and sustain a continuously improving credible research and skills planning framework
	Outcome 2: Linking education and the workplace			Optimal access and delivery on occupationally directed programmes Strategic public and private partnerships to support TVET graduates for work integrated learning
Build a capable and developmental state	Outcome 3: Improving the level of skills in the South African workforce	Priority 1: Enhancing the skills of the existing workforce of the Chemicals Industry	Reducing the scarce and critical skills needs of the Chemical Industry	Supporting co-ops, SMMEs, worker initiated NGOs and community training initiatives Impact studies on the effectiveness of CHIETA and industry skills development interventions
			Sustained and improved culture of good governance within CHIETA	CHIETA aligned to the key principles of King IV
Improve and expand education, training and innovation Expansion of infrastructure Transformation and Unity Transforming urban and rural spaces Environmental sustainability and resilience Ensure quality health care for all	Outcome 4: Increase access to occupationally directed programmes	Priority 2: Supporting skills development of new entrants to the Chemicals Industry	Producing a highly competent cohort of learners through quality learning programmes	Optimal access and delivery on occupationally directed programmes
	Outcome 5: Support the growth of the public college system	Priority 4: Strengthening and expanding strategic partnerships to maximise sustainability and impact of skills development interventions		Addressing low level language and numeracy skills to provide access to additional training and pathways
	Outcome 6: Skills development support for entrepreneurship and cooperative development			Accreditation and management of CHIETA training providers, moderators and assessors
	Outcome 7: Encourage and support worker initiated training	Priority 5: Support national imperatives in relation to skills development, with emphasis on the Chemicals Industry		Supporting co-ops, SMMEs, worker initiated NGOs and community training initiatives
	Outcome 8: Support career development services			Supporting co-ops, SMMEs, worker initiated NGOs and community training initiatives
				Building career and vocational guidance Addressing medium term strategic priorities of Government

Table 5-3 Plan of action addressing skills strategic priorities

Priorities	Achievements	Measures <i>to ensure continuity</i>	Plan of action <i>in relation to impact</i>
<p>Research and Skills Planning</p> <p>Priority 3: Responding to changing sectoral needs and priorities</p>	<p>There has been a yearly increase in the submissions of WSP-ATRs however it was noted that this may not necessarily mean that there have been new entrants to the sector. Subsequently much of the skills needs identified have remained the same however the level of prioritization per occupation have changed and that consequently required that CHIETA re-ranks the priority list.</p> <p>The various data sources and research reports that informed a well-researched Sector Skills Plan allowed for the accurate identification of skills needs in the sector and the prioritization of the above for allocation of funding for skills intervention purposes.</p> <p>Due to the level of consultation that occurs in the development of the SSP, there has been an increase in the interest and participation of stakeholders, inclusive of labour, employers and training providers. More than ever, labour has become more expressive, particularly regarding matters that will assist them in their companies and their roles, such as the request to understand legislation, developmental training, and refocusing on the need to assist People With Disabilities.</p> <p>Employers continue engaging on various matters including the need for qualification development and the accreditation processes. Although the CHIETA has endeavoured in increasing internal capacity and streamlining processes for qualification development, much of the challenges regarding delays in qualification registrations are due to QCTO's processes and backlogs.</p> <p>Tracking and tracing learners has become a critical component within skills development. It is seen as closing the gap for SETAs. Although CHIETA has an online system that facilitates placements of learners and tracks them, the workplace uptake has been low.</p> <p>Companies tend to express budgetary constraints in absorbing learners. The candidates coming out from learning institutions as well have been found to lack commitment, soft skills, and the ability to manage their expectations of real life work.</p>	<p>The CHIETA delivered on all of its indicators under this programme.</p> <p>There was a re-alignment of research outputs from 10 to 5, with a vetting project that would necessitate all research conducted to be vetted for publishing. The vetting project is underway, the last 5 completed research reports in the 2018/19 financial year will be the first to be vetted.</p> <p>This programme reports on performance indicators relating to research and skills planning interventions in support of the CHIETA SSP. The purpose of this programme is to ensure that the CHIETA among other important imperatives, addresses the NSDP outcomes and continues to be an authoritative voice on skills in the Chemicals Industry.</p> <p>MEASURES</p> <p>Measures to be initiated to ensure that currently set strategic skills priorities are achieved:</p> <p>In order for Priority 3 to be achieved, there is a need to maintain and where possible increase the quality and standards of the:</p> <ul style="list-style-type: none"> - WSP-ATR submissions - Stakeholder engagements - Research Agenda 	<p>The CHIETA has achieved priority 3 regarding “responding to changing sectoral needs and priorities”, as well as achieving its strategic goals and objectives as outlined above. One of the indicators associated with the priority is - to increase WSP-ATR submissions and determine sector priority occupations. The achieved goals have resulted in the reinforcement of skills planning.</p> <p>However, the impact has not been articulated or reflected on well-enough to determine the difference made despite having the data to do so (Funding Matrix Annexure B).</p> <p>CHIETA needs to conduct research that will look at industry needs, inclusive of future skills, against historic funding. The study will also need to ascertain whether or not industry has been better off with CHIETA’s prioritized skills.</p> <p>The CHIETA has implemented projects and tools to assist stakeholders. Some of the tools implemented were the Skills Development Committee and People With Disabilities Toolkit. At this stage the impact is unknown. The CHIETA will begin this year leading to the next in conducting surveys and questionnaires to determine the level of impact that the various tools and projects have had.</p> <p>Employers in Chamber meetings have communicated their appreciation regarding the high increase in qualification development. The impact in this regard is the increase of learner enrolments into newly developed qualifications as per industry need.</p> <p>Although the goal has been achieved based on the indicator - to develop a tracking and tracing system (Skills Supply and Demand Database), the impact however cannot be determined as yet. There needs to be an impact assessment for this particular indicator among others.</p> <p>CHIETA however has conducted a tracking and tracing study that looked at artisan and bursary beneficiaries. It tracked a cohort of learners post-graduation to determine whether the learners found placement (EE Research Focus Pty Ltd, 2019).</p>

<p>Occupationally Directed Programme</p> <p>Priority 1: Enhancing the skills of the existing workforce of the Chemicals Industry</p> <p>Priority 2: Supporting skills development of new entrants to the Chemicals Industry</p> <p>Priority 4: Strengthening and expanding strategic partnerships to maximise sustainability and impact of skills development interventions</p>	<p>CHIETA companies have responded favourably to the funding programmes accessed through the discretionary grants funding model. Beneficiaries of programmes have increased throughout the years. It is assumed thus far that the funding programmes have generally enhanced productivity and performance within the Chemical Sector workplaces.</p> <p>There has been a greater uptake on employed bursaries entered. Companies have shown preference towards bursaries and skills programmes for their workforce over learnerships and apprenticeships. They have expressed that they no longer have budget for replacing a worker in the plant when they go on training. Bursaries, contact sessions and exams are done through study leaves whereas learnerships and apprenticeships are conducted during company time.</p> <p>The issuance of certification of learnerships has always been a problematic operational function due to the varying parties involved and the need to coordinate the process efficiently. Although the CHIETA achieved this target, it takes cognizant of the work done by learning providers and staff members who tirelessly endeavoured to increase accreditation and the issuing of certificates. Without said parties' commitments, CHIETA would have certainly not achieved this target.</p> <p>Due to the fees must fall campaign and Government's Free Higher Education Plan, the CHIETA was able to exhaust the entire allocated bursary's budget. CHIETA also had success with the NSFAS, CHIETA Bursary scheme and Free state top achiever projects, all with similar and complementing objectives.</p> <p>CHIETA has been driving placement of unemployed interns for job creation. This was also due to the co-funding partnership model between the CHIETA and TVET Colleges.</p> <p>White paper requires SETAs to support TVET Lecturer development; CHIETA sees this intervention as critical in developing and bettering the TVET system.</p>	<p>The CHIETA delivered on all of its indicators under this programme.</p> <p>This programme is the core of the skills development programmes in the CHIETA. It provides learners with learning opportunities. At the core of these programmes is the creation of more opportunities for skills development in the chemical industry that enhances the efficiencies, performance and productivity of the sector as a whole.</p> <p>MEASURES Measures to be initiated to ensure that currently set strategic skills priorities are achieved: In order for Priorities 1, 2 and 4 to be achieved, there is a need to increase, as per priority 3's identification of skills needs:</p> <ul style="list-style-type: none"> - Public Private Partnerships - Work-Integrated learning - Lecture development - Learnerships - Bursaries - RPL - AET - CET 	<p>The CHIETA has achieved priorities 1, 2 and 4 as well as achieving its strategic goals and objectives as outlined.</p> <p>The CHIETA is currently studying the awarding of beneficiaries from the past three financial years. This is to determine the demographic make-up of the beneficiaries and whether the awarding of training has taken cognizant of sectoral and national priorities.</p> <p>The next level of research and analysis will require an in-depth impact analysis on beneficiaries against national strategic targets and most importantly determine how beneficiaries and society as a whole has benefited post CHIETA's intervention.</p> <p>Impact analysis has not been conducted as yet. A needs analysis in respect to which kind of training is beneficial for industry and whether CHIETA can assist in the process over and above providing funding needs to be conducted. The research should consider priority skills related to funding program, and whether or not CHIETA should begin prioritizing certain funding windows over others.</p> <p>Impact analysis has not been conducted as yet. Stakeholders have advised that the delays in the issuance of certificates have been detrimental to the employability of learners. The lag regarding accreditation as well has delayed training significantly. However, the extent of the issue is unknown at present and needs to be investigated so that CHIETA can understand the depth of this matter and how it impacts the industry as a whole.</p> <p>Impact analysis has not been conducted as yet.</p> <p>Impact analysis has not been conducted as yet.</p> <p>Although CHIETA has continuously supported lecture development, no study has been conducted as yet to determine impact. CHIETA will need to prioritize ongoing impact assessments for all its interventions.</p>
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	Strategic focus of the CHIETA Board to grow the sector is to support more SMMEs to impact the development of entrepreneurs which can make a significant contribution to job creation.		The CHIETA once had a voucher scheme which was aimed at developing SMMEs through various training interventions. An assessment of the project was conducted by EE Research Focus Pty (2019) , detailing the impact that the project had to the various beneficiaries. Although CHIETA still supports SMMEs, the voucher project is no longer in existence and thus a new impact assessment model needs to be implemented for the current SMME beneficiaries.
	Prioritised Rural funding model that encouraged cooperatives to participate through the CHIETA Strategic Projects.		Impact analysis has not been conducted as yet.
ETQA Priority 2: Supporting skills development of new entrants to the Chemicals Industry	Workplace approvals have come under scrutiny with directives from the Minister of DHEST to have more companies opening up workplaces. CHIETA has worked tirelessly to increase workplace approvals however there have been persistent challenges related to the rigid guidelines, lack of mentors, and managing perceptions around mentors and mentees.	The CHIETA delivered on all of its indicators under programme 4. The purpose of this programme is to ensure the sustainability of accreditation of service providers, workplace approvals and the acceleration of certification.	Although the CHIETA has achieved its target impact analysis has not been conducted as yet. This is a critical area in skills development which requires in-depth understanding and impact to the sector as a whole.

5.5 CONCLUSIONS

CHIETA has been able to successfully align its strategic outcomes with national strategic objectives and priorities. It has also been able to align priorities derived from research with its Strategic Plan and Annual Performance Plan. However, there is still much work needed to expand and nuance evaluation reporting. CHIETA needs to also begin conducting systematic and continuous impact assessments going forward. Much of its good story to tell is lost due to CHIETA solely relying on performance target measures consequently lacking contextual expression that impact assessments would otherwise provide.

6. SETA STRATEGIC SKILLS PRIORITY ACTIONS

6.1 INTRODUCTION

The strategic skills priority actions chapter is the final chapter of this SSP. It consolidates and presents the key findings, and reflects on the priority actions for the industry. The priority actions are presented below as recommended actions to address identified needs and priorities. Based on the analysis presented in this SSP, the CHIETA has identified five strategic priorities that will guide its interventions over the next five years. The strategic objectives are guided by changing sectoral needs and relevant national strategies and plans.

As a key industry contributing to the South African economy, the priorities set for the industry are also guided by the National Development Plan (NDP), the government's medium term strategic framework (MTSF) serving as the foremost frame of reference outlining the government's policy posture and programme to improve the conditions and daily lives of South Africans, as well as other relevant strategies and plans of relevance to the industry.

6.2 FINDINGS FROM PREVIOUS CHAPTERS

The profile of the Chemicals Industry, as described in Chapter 1 of this SSP, clearly highlights the industry's dependence on highly skilled human resources in the main. Furthermore, the industry's growth is closely linked to the availability of the skills as well as its R&D capability. Many of the skills that are in short supply in the industry as indicated in Chapter 2 require people with advanced higher education qualifications as well as specialised, industry-specific training and work experience. It is therefore very important for the SETA to develop a clear understanding of the areas of specialisation necessary in each of the subsectors, to fund these areas of specialisation, to monitor skills demand in these areas and to work with industry and education institutions to ensure a sufficient supply of people in areas of specialisation. This must be done while simultaneously focusing on the transformational needs of the industry.

The Chemicals Industry uses sophisticated and expensive equipment and works with hazardous substances. The operation and maintenance of plants and equipment is critically important and as a consequence the industry depends on technical skills – especially those of artisans and engineers. These occupations are highlighted in Chapter 3 as well as listed in the Top 10 Sectoral Priority Occupations List and CHIETA Priority Skills Funding Matrix as annexures to the SSP. The development of many of the occupations in the industry (especially artisans and certain categories of technicians and professionals) require workplace experience.

The provision of opportunities to gain workplace experience remains a key imperative for the industry. CHIETA has over the NSDS III period increasingly invested more grants funding to incentivise work integrated learning and will continue to do so. The need for specialised skills has led to employers and industry organisations taking greater responsibility for skills development. The CHIETA and stakeholders have found that skills development interventions in the Chemicals Industry can only be relevant and sustainable if they are planned and executed in a collaborative manner and through partnerships as detailed in Chapter 4.

Currently there are a number of Government strategies and interventions that exert influence in the skills development environment, the CHIETA focusses on those with a direct im-

pact on skills needs in the industry. The analysis presented in earlier chapters, highlight Government as a key role player in the industry and that the growth of the industry depends to a large extent on the success with which Government strategies such as IPAP and Operation Phakisa among others will be implemented.

The successful implementation of these strategies are however dependent on the provision of the necessary skills. While there are already examples of new developments as a result of collaborations with Government (and especially the dti) and other stakeholders in the industry, support for Government strategies that aim to stimulate the growth of the Chemicals Industry remains a strategic imperative for the country. The CHIETA measures to support national strategies and plans have a skills focus, and directs funding towards the development skills and research capacity aimed as economic growth.

6.3 KEY STRATEGIC PRIORITIES FOR THE SECTOR AND PLANNED RESPONSE TO CHANGE DRIVERS

Based on the analysis presented in this SSP, the CHIETA has identified five strategic priorities that will guide its interventions over the next five years to respond to sectoral change drivers. The actions under each strategic and skills priority area are outlined below.

Priority 1: Enhancing the skills of the existing workforce of the Chemicals Industry

The development of the current workforce is the first priority area on which the CHIETA will focus. Intervention in this area is, however, dependent on a thorough understanding of the sectoral labour market, the skills required by industry and the current skills levels of the labour force. The further development and maintenance of a labour market intelligence system (including an integrated data management system and relevant research and analyses) will continue with more alignment to the common language of skills planning – OFO framework.

The *Proposal for the New National Skills Development Plan (NSDP) and Sector Education and Training Authorities* proposes determining the skills needs of employers by occupation using the OFO for the industry to be key. The CHIETA has been doing this through an integrated information management and skills planning system that involves capacitation of the industry on the OFO and skills planning with great success. To deepen this function and understanding of industries, the CHIETA has coordinated the piloting of Competency Profiling to define the specific skill sets required across various subsectors. The participating organisations are expected to share their experiences and benefits to ensure the capability can be rolled out in the entire sector.

CHIETA and its stakeholders recognize that upskilling of the existing workforce requires better utilisation of workplace based skills development and increased access to occupational learning programmes at the entry, intermediate and high level. The CHIETA's focus will be on the continuous improvement of the quality of learning and to enhance learners' prospects of gainful and sustained employment, also by way of incentivising interventions such as relevant skills programmes that offer top-up skills where needed. Programmes include ABET, bridging programmes or foundational learning for workers requiring it, apprenticeships, trade-related and non-trade related learnerships, skills programmes, and various professional programmes. Strong emphasis is placed on the recognition of prior learning (RPL) to accelerate the career advancement of the existing workforce, and offering gap training

programmes for RPL learners where this need is identified. In both artisan and non-artisan learning programmes, health and safety is key.

The CHIETA will continue to strengthen the role of skills development committees (SDCs) in skills planning and reporting and continue to ensure that organised labour participation in these processes is enhanced. Other efforts made by CHIETA to support SDCs and organised labour include the funding of the Trade Union Support, the development and advocacy of the toolkits for People with Disabilities and the SDCs. The 40 learner beneficiaries are registered on the Ditsela Trade Union Support Project. The programme is a 150 credit programme with a theoretical and workplace component with a portfolio of evidence required to complete the programme.

The Further Education Certificate in Trade Union: Level 4 formalises the recognition of competencies and will contribute towards developing expertise in both theory and practice in the trade union environment, particularly empowering the shop stewards who carry significant responsibilities at this level in the sector. The Qualification covers how trade unions work; Political Economy and Labour Law, Organising and mobilizing workers, Collective Bargaining, Effective union organisations and Media and Communications as its core subjects. Logistical and accommodation challenges have been identified as limitations for full completion. The CHIETA is assessing those challenges for an improved quality learning experience going forward.

Priority 2: Supporting skills development of new entrants to the Chemicals Industry

Like many other industries, the Chemicals Industry has access to a limited number of school leavers who meet the requirements for further or higher education and training in engineering and other technical disciplines. As a result CHIETA supports programmes to increase the pool of school leavers with the required maths and science competencies. The programmes also include educator development for maths and science as CHIETA disciplines require maths and science. There is recognition and acknowledgement that there is a need to reform Science, Technology, Engineering and Mathematics (STEM) to prepare students for their future careers (Jang,H 2015). In the advent of the 4th Industrial Revolution the need and relevance of this priority has become paramount.

The CHIETA makes bursaries available for learners to study in relevant chemical disciplines at tertiary institutions. The CHIETA increases bursary funding annually because of a recognised need identified through research and stakeholder engagements. To continue to service this important skills development intervention, the CHIETA offers bursaries to deserving learners at higher and further institutions of learning as well as offering bursaries through companies in the industry. The benefit of the latter option is that companies then commit to taking such learners through all the way, including offering them workplace training opportunities, and creating opportunities for employment for many such learners.

Deepening and expanding career development and support opportunities through partnering with government and other professional or industry associations is important to CHIETA to ensure a steady flow of learners into the Chemicals Industry and specifically into occupations where there are current or anticipated occupational shortages. To enhance the flow of new skills into the industry, to address youth unemployment and to expand the opportunities for greater employment and empowerment of youth in the economy, CHIETA will con-

tinue supporting placement of learners and graduates in workplaces, either as part of their in-service training requirements or for post qualification work experience.

The Department of Higher Education, Science and Technology has issued a directive to SETA's regarding collaboration with NSFAS on bursaries. To this end, the CHIETA Board has approved the CHIETA-NSFAS collaboration in relation to the administration of CHIETA bursary fund commencing to support about 95 students in the 2018/2019 financial year, in alignment with the applicable CHIETA policies. The CHIETA has entered into an agreement with NSFAS regulating the management and administration of the fund and disbursing of monies on the agreed terms and condition. This support will continue to assist CHIETA to attract top achieving learners from poor backgrounds in hard to fill vacancies within the Chemicals Sector. The CHIETA will also continue to support WIL, Focused partnerships with TVET colleges that promote industry collaboration, and that support WIL will be forged. Through these partnerships the CHIETA will endeavour to develop skills relevant to the SIPS and to promote rural and youth development.

Priority 3: Responding to changing sectoral needs and priorities

Through credible research and skills planning processes, CHIETA has been identifying changing sectoral needs and priorities; the ever-changing work environment requires adaptation and responsiveness. These adaptations often entail changes in the skills sets required in specific occupations or even the creation of new occupations. The growing concern over the impact of businesses on the natural environment is, for example, leading to changes in the skills sets required in occupations as well as the establishment of new occupations. Technological changes also lead to changing skills needs.

Advanced technology is extremely important in the Chemicals Industry and innovations and development in technology are some of the key essentials of the industry. With the advent of technological developments and the required mind shift in application and new processes associated with the 4th Industrial Revolution, the CHIETA will need to facilitate and steer the Chemicals Sector in taking stock of the current workforce skills in order to design and develop new, top-up and relevant skills sets that would enable the sector to be proactive and responsive to these industrial changes. The development of responsive qualifications and recognition of international qualifications by the QCTO and SAQA is a critical area of collaboration for the 4th Industrial Revolution.

The Chemicals Industry is crucial to the economic vitality of modern economies and in many instances are responsible for economic growth, wealth creation and well-being more so than any of the other industries. It is largely for this reason that the various chemical and related industries feature prominently in the annual iterations of the Industrial Policy Action Plan (IPAP) compiled by the Department of Trade and Industries. The annual revisions of IPAP are seen as an important indicator of opportunities and challenges facing the various industrial sectors from a South African perspective in relation to Government policies, particularly the National Development Plan (NDP) and the Medium Term Strategic Framework (MTSF). The CHIETA has started engagements with the dti's chemical desk on a partnership on the implementation of the Chemical Sector Strategy which has the objectives of growing chemicals manufacturing at CAGR 6% to 2035, employment growth of 50%, increase in local content, develop industry competitiveness to levels of leading international competitors, transformation of the chemicals value chain, R&D in support of competitiveness to levels of leading

international competitors, transformation of the chemicals value chain, R&D in support of sustainable competitive advancement.

The CHIETA commissions research annually, investigating the growth and development opportunities of the Chemicals Industry and how the CHIETA could position itself as a strategic asset for skills development. The themes research informs strategy and planning and key decision. The reports have recently been subjected to a peer review and vetting process to allow for wider dissemination and value creation. In 2017, the CHIETA started strategic sessions for scenario planning through its constituent stakeholder groupings, the board and chambers. The scenario planning led to the development of four possible future scenarios based on socio-political and economic outcomes. The top and bottom quadrants reflected Expanding and Declining Chemical and related sectors respectively, and the right and left quadrants reflected Collaborative and Prescriptive Skills Development Environment. Converging the scenario planning and commissioned reports that speak particularly to the realisation of growth prospect for industry will effectively reassess and reposition CHIETA's strategic objectives. The CHIETA continues to do this assessment and align for its annual skills and strategic planning processes.

Priority 4: Strengthening and expanding strategic partnerships to maximise sustainability and impact of skills development interventions

Partnerships with public and private institutions in support of building a sustainable post-school sector are important. As indicated in previous chapters of this SSP, the CHIETA has a range of relationships with public TVET colleges, and universities and companies. The SETA will continue to play a central role in facilitating conversations and bringing relevant stakeholders together to forge stronger cooperation around skills development priorities through a structured well-coordinated skills development and partnership framework. During 2018/2019 the CHIETA held 3 Regional Skills Forums where various stakeholder groupings are invited to obtain and be engaged on national updates, skills planning, grants, strategic projects, quality assurance matters, regional events and best practice shared by other stakeholders in the Chemicals Industry. The CHIETA worked with the Department of Higher Education (DHEST) and various schools to hold several career exhibitions.

Through these events, Career Guidance booklets and DVDs were produced for circulation to schools in order to inform and create an understanding by linking opportunities to career choices. Industry-institutions partnerships and partnering with the government on relevant strategies and plans will continually be enhanced to engender and foster impactful and meaningful skills development interventions. The CHIETA, through its regional offices, also participates in all active Provincial Skills Development Forums (PSDFs) held by the NSA. The PSDFs were established to be stakeholders' platform to address specific provincial needs. CHIETA is constantly in the process of engaging with provincial offices in relation to skills development.

Priority 5: Support national imperatives in relation to skills development, with emphasis on the Chemicals Industry

The CHIETA, within the ambit of its skills development mandate, is responsive to the medium term priorities of government with dedicated projects, specifically in support of rural development and the strengthening of the human resources and skills base of South Africa.

Additional interventions are aimed at supporting the strengthening of a developmental state and job creation. The government is recognised as a key stakeholder in the implementation of the CHIETA's mandate; this includes local as well as provincial governments. Core to supporting national imperatives is establishing and deepening partnerships with rural communities that aim at development.

This SSP in chapter 2 mainly and through other chapters identifies the following strategic projects relevant to the Chemicals Industry that support the national imperatives

- Industrial Policy Action Plan including the Oil and Gas, Pharmaceuticals and medical devices, and cosmetics.
- Operation Phakisa mainly in the Oil and Gas lab
- The national Infrastructure plan and the Strategic Integrated Projects (SIPs)
- Strategies aimed at energy provision like the Biofuels Strategy and the Integrated Resource Plan
- Participation in World Skills South Africa Competition leading to world skills competition through support Welder and Electrical Installation skills areas
- SMME and Entrepreneurship development
- Transformation and High impact projects

6.4 MEASURES TO SUPPORT SMMES AND ENTREPRENEURSHIP

Entrepreneurship is seen as a driver of small business development for job creation. This is to be achieved by unpacking the CHIETA industries value chains and identify opportunities for creating simple business models that can be taken to scale, investing in environments that enables the industry to take up emerging entrepreneurs and providing of mentorship and small business subcontracting opportunities for beneficiaries, formulating partnerships with TVETs and Higher Education and Training Institutions to ensure sustained capacity for our SETA in the areas of training and research to test new models and design programmes with scale as a desired end.

6.5 MEASURES TO SUPPORT NATIONAL STRATEGIES AND PLANS

The CHIETA set as a priority, measures to support National Strategies and Plans, the details of the interventions are covered mainly in Chapter 2 and Chapter 4 of this SSP. The CHIETA will continue to engage further on these national strategies and participate in their implementation through various appropriate means of which some of these include:

- Contributing towards the SiPs through supporting a national project on the Centres of Specialisation (CoS), specifically skills development in welding and rigging with potential partners such as sister SETAs, TVET colleges and industry
- Further engagements with NECSA and its subsidiaries for possible support towards the relevant skills development interventions on the recently added scope of nuclear application.
- The CHIETA plans to deepen its support towards the research chairs by identifying possible areas of research and interventions in the oil and gas once the establishment on the research chair for Operation Phakisa is concluded.
- In the area of White Paper for Post School Education and Training, among other things, the CHIETA plans to develop and implement various strategies including fur-

thering the improvement of the quality of provisioning at TVET colleges and facilitating strong sustainable partnerships and linkages of education and workplaces.

- The need to explore, engage and develop plans to address the implications of the 4th Industrial Revolution and the Youth Employment Service (YES) initiative for the chemicals sector has been identified for further actions in the next financial year.

6.6 CONCLUSIONS

This chapter illustrates the key findings of this SSP and at a conceptual level explains 5 CHIETA skills priorities that will guide skills planning interventions for the SSP time frame.

Based on the analysis across the 5 SSP Chapters, there is already a lot that the CHIETA has put in place not only to meet its skills and strategic priority needs but to support national strategies and plans relevant to the Chemicals Industry. What has enabled successful skills development implementation has been collaboration and partnership with our employers and other stakeholders. Industry leading the way and identifying not only needs but critical areas of support has shown commitment and integration.

Both industry and government are key role players in the sector and the growth of this economic sector depends largely on the success with which Government strategies are conceptualized and implemented. Organized business is also an important partner for success.

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ANNEXURE A. CHIETA TOP 10 SECTORAL PRIORITY OCCUPATIONS LIST

CHIETA TOP 10 SECTORAL PRIORITY OCCUPATIONS LIST									
SETA NAME	Period	Occupation Code	Occupation	Intervention(s) Planned	NQF Level ⁶	NQF Aligned (Y/N)	Total Number required	Quantity to be supported	
CHIETA	2020/21	2017-671101	Electrician	Apprenticeships, Learnerships, RPL, Work Integrated Learning, TVET College Lecturer Development	4	Y	2815	511	
CHIETA	2020/21	2017-651302	Boiler Maker	Apprenticeships, Learnerships, RPL, TVET College Lecturer Development	4	Y	1101	277	
CHIETA	2020/21	2017-214401	Mechanical Engineer	Bursaries, Work Integrated Learning	6	Y	1054	91	
CHIETA	2020/21	2017-226302	Safety, Health, Environment and Quality (SHE&Q) Practitioner	Bursaries, Learnerships, Skills Programmes, Work Integrated Learning	5	Y	1812	318	
CHIETA	2020/21	2017-121905	Programme or Project Manager	Learnerships, Bursaries, Skills Programmes, TVET College Lecturer Development, Work Integrated Learning	6	Y	2621	111	
CHIETA	2020/21	2017-214501	Chemical Engineer	Bursaries, Learnerships, Work Integrated Learning	6	Y	1063	184	
CHIETA	2020/21	2017-653303	Mechanical Fitter	Apprenticeships, Learnerships, RPL, Skills Programmes, WIL	4	Y	3724	653	
CHIETA	2020/21	2017-215101	Electrical Engineer	Bursaries, Learnerships, RPL, Skills Programmes, WIL	6	Y	6422	801	
CHIETA	2020/21	2017-226203	Retail Pharmacist	Bursaries, Learnerships, Skills Programmes, Work Integrated Learning	6	Y	1910	137	
CHIETA	2020/21	2017-211301	Chemist	Bursaries, Learnerships, Skills Programmes, Work Integrated Learning	6	Y	1162	180	

Source: WSP submissions, March 2019, CHIETA system DG Funding, SIPS list, DHET Occupations in High Demand.

⁶ NQF Levels: All the trades herein are at an NQF Level 4 however CHIETA also funds NQF Levels 2-3 interventions which are at various stages of learning. CHIETA also funds interventions at varying NQF levels for diploma and degree related occupations such as SHE&Q, Programme or Project Manager, Electrical and Mechanical Engineer, and Chemistry Engineer. They typically vary from NQF Level 5-9. However, as per DHET's request the CHIETA has indicated only 1 NQF Level per occupation.



CHIETA PIVOTAL/PRIORITY SKILLS FUNDING MATRIX 2020/21

Rank	Occupation Code	OFO Occupation Name	Sector Demand Assessment 2014-15	Sector Demand Assessment 2015-16	Sector Demand Assessment 2016-17	Sector Demand Assessment 2017-18	Sector Demand Assessment 2018-19	Scarce Skills List 2015	Scarce Skills List 2016	Scarce Skills List 2017	Scarce Skills List 2018	Scarce Skills List 2019	OIHD	SIPS
1	2017-671101	Electrician	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	2017-651302	Boiler Maker	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	2017-214401	Mechanical Engineer	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	2017-226302	Safety, Health, Environment and Quality (SHE&Q) Practitioner	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	2017-121905	Programme or Project Manager	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
6	2017-214501	Chemical Engineer	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
7	2017-653303	Mechanical Fitter	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
8	2017-215101	Electrical Engineer	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
9	2017-226203	Retail Pharmacist	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
10	2017-211301	Chemist	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
11	2017-313301	Chemical Plant Controller	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
12	2017-311101	Chemistry Technician	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
13	2017-671202	Millwright	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
14	2017-132102	Manufacturing Operations Manager	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
15	2017-214502	Chemical Engineering Technologist	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
16	2017-121908	Quality Systems Manager	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
17	2017-333905	Supply Chain Practitioner	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES

18	2017-214101	Industrial Engineer	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
19	2017-213202	Agricultural Scientist	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
20	2017-651202	Welder	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES
21	2017-672105	Instrument Mechanician	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
22	2017-226202	Industrial Pharmacist	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
23	2017-652302	Fitter and Turner	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES
24	2017-311601	Chemical Engineering Technician	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
25	2017-243302	Medical and Pharmaceutical Products Sales Representative	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
26	2017-243103	Marketing Practitioner	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
27	2017-214601	Mining Engineer	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
28	2017-213108	Microbiologist	YES	YES	YES	YES	YES		YES	YES	YES	YES	NO	NO
29	2017-332302	Purchasing Officer	YES	YES	YES	YES	YES	YES		YES	YES	YES	NO	YES
30	2017-213110	Medical Scientist	YES	YES	YES	YES	YES	YES		YES	YES	YES	YES	NO
31	2017-211403	Materials Scientist	YES	YES	YES	YES	YES		YES	YES	YES	YES	NO	NO
32	2017-263101	Economist	YES	YES	YES	YES	YES	YES		YES	YES	YES	NO	NO
33	2017-214201	Civil Engineer	YES	YES	YES	YES	YES	YES	YES		YES		YES	YES
34	2017-734402	Forklift Driver	YES	YES	YES		YES	YES	YES	YES	YES	YES	NO	NO
35	2017-214102	Industrial Engineering Technologist	YES	YES	YES		YES		YES	YES	YES	YES	NO	YES
36	2017-242303	Human Resource Advisor	YES	YES	YES	YES	YES				YES	YES	NO	NO
37	2017-684305	Quality Controller (Manufacturing)	YES	YES	YES	YES	YES			YES	YES	YES	NO	NO
38	2017-718102	Glass Production Machine Operator			YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
39	2017-242101	Management Consultant	YES	YES	YES		YES	YES	YES	YES	YES	YES	NO	NO
40	2017-733201	Truck Driver (General)	YES	YES	YES	YES		YES	YES	YES	YES	YES	NO	YES
41	2017-653306	Diesel Mechanic	YES	YES	YES	YES	YES	YES	YES	YES	YES		NO	NO
42	2017-432101	Stock Clerk / Officer	YES	YES	YES	YES	YES	YES	YES	YES	YES		NO	NO
43	2017-642607	Pipe Fitter		YES		YES	YES	YES		YES		YES	NO	YES
44	2017-241101	General Accountant	YES	YES	YES	YES	YES		YES	YES	YES		YES	YES
45	2017-213205	Food and Beverage Scientist		YES	YES	YES	YES	YES	YES	YES	YES		NO	NO

46	2017-541101	Fire Fighter	YES	YES	YES		YES	YES		YES	YES		NO	YES
47	2017-311401	Electronic Engineering Technician	YES		YES		YES		YES	YES	YES	YES	NO	YES
48	2017-541102	Hazardous Materials Removal Workers	YES	YES	YES		YES			YES	YES	YES	NO	NO
49	2017-652301	Metal Machinist	YES	YES	YES	YES	YES		YES			YES	NO	NO
50	2017-243301	Industrial Products Sales Representative	YES	YES	YES	YES		YES	YES	YES	YES	YES	NO	NO
51	2017-411101	General Clerk	YES	YES	YES	YES		YES		YES	YES	YES	NO	YES
52	2017-651501	Rigger	YES	YES	YES	YES	YES				YES		YES	YES
53	2017-132401	Supply and Distribution Manager			YES		YES	YES	YES	YES	YES	YES	YES	NO
54	2017-122102	Sales Manager			YES		YES	YES	YES	YES	YES	YES	NO	NO
55	2017-121101	Finance Manager					YES	YES	YES	YES	YES	YES	YES	YES
56	2017-311301	Electrical Engineering Technician	YES	YES	YES	YES		YES	YES		YES	YES	NO	YES
57	2017-242402	Occupational Instructor	YES	YES	YES	YES			YES	YES	YES	YES	YES	NO
58	2017-213302	Environmental Scientist	YES	YES	YES	YES	YES			YES	YES		NO	NO
59	2017-215201	Electronics Engineer		YES			YES	YES	YES	YES	YES	YES	YES	YES
60	2017-432104	Warehouse Administrator / Clerk	YES	YES	YES	YES	YES			YES		YES	NO	NO
61	2017-331301	Bookkeeper	YES	YES	YES	YES	YES			YES		YES	NO	NO
62	2017-651203	Fitter-welder	YES	YES	YES		YES	YES	YES	YES		YES	NO	NO
63	2017-242208	Organisational Risk Manager	YES	YES	YES	YES	YES			YES	YES		NO	NO
64	2017-243201	Communication Coordinator	YES	YES	YES	YES	YES			YES	YES		NO	NO
65	2017-242213	Regulatory Affairs Officer		YES	YES	YES			YES	YES	YES	YES	NO	NO
66	2017-132106	Manufacturing Quality Manager		YES			YES		YES	YES	YES	YES	NO	NO
67	2017-261901	Adjudicator	YES				YES			YES	YES	YES	NO	NO
68	2017-134902	Laboratory Manager		YES		YES		YES	YES	YES	YES	YES	NO	NO
69	2017-331201	Credit or Loans Officer	YES		YES	YES			YES	YES	YES	YES	NO	NO
70	2017-241107	Financial Accountant	YES	YES	YES	YES				YES	YES	YES	NO	NO
71	2017-653101	Automotive Motor Mechanic	YES	YES	YES	YES	YES					YES	YES	YES
72	2017-532901	First Aid Attendant	YES	YES	YES		YES			YES	YES		NO	NO
73	2017-132403	Road Transport Manager	YES			YES	YES	YES			YES	YES	NO	NO
74	2017-122101	Sales and Marketing Manager					YES	YES	YES	YES	YES	YES	YES	NO

75	2017-652201	Toolmaker	YES	YES	YES	YES		YES	YES	YES		YES	YES	NO
76	2017-325705	Safety Inspector	YES	YES	YES			YES		YES	YES	YES	NO	YES
77	2017-261101	Attorney	YES	YES	YES	YES	YES				YES		NO	NO
78	2017-251201	Software Developer	YES	YES	YES				YES	YES	YES	YES	NO	NO
79	2017-642501	Glazier				YES	YES	YES	YES	YES		YES	NO	NO
80	2017-243102	Market Research Analyst					YES	YES	YES	YES	YES	YES	NO	NO
81	2017-332203	Sales Representative (Personal and Household Goods)					YES	YES	YES	YES	YES	YES	NO	NO
82	2017-241102	Management Accountant	YES	YES	YES		YES				YES	YES	NO	NO
83	2017-642603	Gas Practitioner	YES			YES			YES	YES	YES	YES	NO	NO
84	2017-215202	Electronics Engineering Technologist	YES	YES	YES	YES	YES				YES		YES	NO
85	2017-311501	Mechanical Engineering Technician	YES	YES				YES	YES	YES	YES	YES	NO	YES
86	2017-213104	Biochemist	YES	YES	YES	YES	YES	YES	YES				NO	NO
87	2017-213105	Biotechnologist	YES	YES	YES	YES	YES	YES	YES				NO	NO
88	2017-211401	Geologist		YES	YES	YES	YES	YES			YES		YES	NO
89	2017-334102	Office Administrator	YES	YES	YES	YES	YES				YES		NO	NO
90	2017-713101	Chemical Production Machine Operator		YES	YES			YES	YES	YES	YES	YES	NO	NO
91	2017-242403	Assessment Practitioner	YES	YES	YES		YES			YES		YES	NO	NO
92	2017-642701	Air-conditioning and Refrigeration Mechanic	YES	YES	YES		YES			YES		YES	YES	NO
93	2017-242210	Business Administrator	YES	YES	YES	YES	YES						NO	NO
94	2017-214605	Metallurgist	YES	YES	YES	YES	YES			YES			NO	NO
95	2017-862202	Handyperson	YES		YES				YES	YES	YES	YES	NO	YES
96	2017-734301	Crane or Hoist Operator	YES	YES	YES		YES	YES			YES		NO	YES
97	2017-132404	Warehouse Manager		YES	YES		YES			YES	YES		NO	NO
98	2017-643101	Painter		YES	YES		YES			YES	YES		NO	YES
99	2017-132402	Logistics Manager					YES			YES	YES	YES	YES	NO
100	2017-214104	Production Engineering Technologist	YES	YES	YES	YES		YES	YES		YES		NO	NO
101	2017-241301	Financial Investment Advisor	YES	YES	YES	YES				YES	YES		YES	NO
102	2017-121901	Corporate General Manager	YES			YES				YES	YES	YES	YES	NO

103	2017-314101	Life Science Technician	YES	YES					YES	YES	YES	YES	NO	NO
104	2017-241103	Tax Professional	YES	YES	YES					YES	YES	YES	NO	NO
105	2017-432201	Production Coordinator		YES	YES			YES		YES	YES	YES	NO	NO
106	2017-832907	Chemical Plant Worker			YES			YES	YES	YES	YES	YES	NO	NO
107	2017-251202	Programmer Analyst	YES	YES	YES				YES		YES	YES	NO	NO
108	2017-332201	Commercial Sales Representative					YES			YES	YES	YES	NO	NO
109	2017-235101	Education or Training Advisor	YES	YES	YES	YES				YES	YES		NO	NO
110	2017-311801	Draughtsperson		YES	YES			YES	YES	YES	YES		YES	YES
111	2017-226301	Environmental Health Officer	YES	YES			YES	YES	YES		YES		NO	NO
112	2017-313916	Manufacturing Production Technicians		YES				YES	YES	YES	YES	YES	NO	NO
113	2017-121206	Health and Safety Manager						YES	YES	YES	YES	YES	YES	YES
114	2017-313203	Water Process Controller	YES	YES	YES			YES			YES	YES	NO	NO
115	2017-132104	Engineering Manager						YES	YES	YES	YES	YES	NO	YES
116	2017-642601	Plumber	YES		YES	YES	YES						YES	YES
117	2017-711201	Mineral Processing Plant Operator	YES				YES				YES	YES	NO	YES
118	2017-431301	Payroll Clerk	YES	YES	YES	YES					YES		NO	YES
119	2017-142102	Wholesaler	YES	YES	YES	YES	YES						NO	NO
120	2017-214103	Production Engineer						YES	YES	YES	YES	YES	NO	NO
121	2017-432301	Transport Clerk	YES	YES	YES	YES						YES	NO	NO
122	2017-225101	Veterinarian			YES					YES	YES	YES	YES	NO
123	2017-121202	Business Training Manager		YES				YES		YES	YES	YES	NO	NO
124	2017-311904	Manufacturing Technician			YES					YES	YES	YES	NO	NO
125	2017-641201	Bricklayer		YES	YES	YES	YES						NO	YES
126	2017-522301	Sales Assistant (General)					YES	YES			YES	YES	NO	NO
127	2017-132107	Quality Manager	YES				YES				YES	YES	NO	NO
128	2017-313202	Waste Materials Plant Operator					YES				YES	YES	NO	NO
129	2017-312202	Maintenance Planner				YES		YES	YES	YES	YES		NO	YES
130	2017-732101	Delivery Driver	YES	YES						YES	YES	YES	NO	NO
131	2017-718905	Engineering Production Systems Worker	YES	YES						YES	YES	YES	NO	NO

132	2017-242202	Policy Analyst	YES	YES						YES	YES	YES	NO	NO
133	2017-122301	Research and Development Manager						YES	YES	YES	YES	YES	YES	NO
134	2017-642702	Refrigeration Mechanic		YES		YES	YES			YES			NO	NO
135	2017-332207	Chemical Sales Representative						YES	YES	YES	YES	YES	NO	NO
136	2017-312201	Production / Operations Supervisor (Manufacturing)						YES	YES	YES	YES	YES	NO	NO
137	2017-733204	Tanker Driver						YES	YES	YES	YES	YES	NO	NO
138	2017-862915	Chemical Mixer						YES	YES	YES	YES	YES	NO	NO
139	2017-214902	Explosive Ordnance Engineer	YES						YES	YES	YES	YES	NO	NO
140	2017-142103	Retail General Manager							YES	YES	YES	YES	YES	NO
141	2017-226201	Hospital Pharmacist							YES	YES	YES	YES	YES	NO
142	2017-314201	Agricultural Technician							YES	YES	YES	YES	NO	NO
143	2017-332401	Commodities Trader							YES	YES	YES	YES	NO	NO
144	2017-833301	Freight Handler (Rail or Road)		YES	YES	YES	YES						NO	NO
145	2017-643202	Vehicle Painter					YES		YES	YES	YES		NO	NO
146	2017-661501	Glass Maker				YES	YES				YES		NO	NO
147	2017-422501	Enquiry Clerk					YES				YES	YES	NO	NO
148	2017-718304	Packaging Manufacturing Machine Minder	YES	YES	YES	YES					YES		NO	NO
149	2017-134901	Environmental Manager			YES	YES			YES	YES			YES	YES
150	2017-214603	Metallurgical Engineer							YES	YES	YES	YES	YES	NO
151	2017-211302	Manufacturing Research Chemist							YES	YES	YES	YES	NO	NO
152	2017-213111	Pharmaceutical Physician							YES	YES	YES	YES	NO	NO
153	2017-311103	Fragrance Evaluators/ flavourists							YES	YES	YES	YES	NO	NO
154	2017-312101	Mining Production Supervisor						YES		YES	YES	YES	NO	YES
155	2017-311102	Physical Science Technician			YES			YES	YES	YES		YES	NO	NO
156	2017-132301	Construction Project Manager								YES	YES	YES	YES	YES
157	2017-134915	Non Manufacturing Operations Manager								YES	YES	YES	YES	YES
158	2017-252201	Systems Administrator	YES	YES	YES					YES		YES	NO	NO
159	2017-653301	Industrial Machinery Mechanic			YES						YES	YES	YES	YES

160	2017-313901	Integrated Manufacturing Line Process Control Technician		YES	YES						YES	YES	NO	NO
161	2017-641902	Scaffolder	YES	YES	YES		YES						NO	YES
162	2017-833402	Store Person			YES		YES						NO	YES
163	2017-514201	Skin Care Therapist			YES		YES					YES	NO	NO
164	2017-122201	Advertising and Public Relations Manager				YES			YES	YES	YES		NO	NO
165	2017-211101	Physicist				YES		YES		YES	YES		NO	YES
166	2017-313401	Gas or Petroleum Controller			YES			YES	YES	YES	YES		NO	NO
167	2017-252101	Database Designer and Administrator		YES	YES					YES	YES		NO	NO
168	2017-242207	Compliance Officer	YES							YES	YES	YES	NO	NO
169	2017-441903	Program or Project Administrators								YES	YES	YES	NO	YES
170	2017-312102	Miner						YES		YES	YES	YES	NO	NO
171	2017-132201	Mining Operations Manager						YES		YES	YES	YES	NO	NO
172	2017-711301	Driller						YES		YES	YES	YES	NO	NO
173	2017-431101	Accounts Clerk								YES	YES	YES	NO	YES
174	2017-242102	Organisation and Methods Analyst								YES	YES	YES	NO	YES
175	2017-431102	Cost Clerk								YES	YES	YES	NO	YES
176	2017-441601	Human Resources Clerk								YES	YES	YES	NO	YES
177	2017-862918	Electrical or Telecommunications Trades Assistant								YES	YES	YES	NO	YES
178	2017-122103	Director of Marketing								YES	YES	YES	NO	NO
179	2017-132101	Manufacturer								YES	YES	YES	NO	NO
180	2017-133104	Application Development Manager								YES	YES	YES	NO	NO
181	2017-251401	Applications Programmer								YES	YES	YES	NO	NO
182	2017-311502	Pressure Equipment Inspector								YES	YES	YES	NO	NO
183	2017-216101	Architect			YES					YES		YES	YES	YES
184	2017-734204	Excavator Operator	YES	YES	YES		YES						NO	YES
185	2017-684202	Blaster	YES	YES	YES	YES		YES					NO	NO
186	2017-133105	Information Technology Manager						YES	YES	YES	YES		NO	YES

187	2017-422206	Call or Contact Centre Agent		YES	YES	YES				YES			NO	NO
188	2017-134201	Medical Superintendent								YES	YES	YES	YES	NO
189	2017-241104	External Auditor								YES	YES	YES	YES	NO
190	2017-132202	Mineral Resources Manager								YES	YES	YES	NO	NO
191	2017-524903	Sales Clerk / Officer								YES	YES	YES	NO	NO
192	2017-714208	Plastics Manufacturing Machine Minder	YES	YES							YES	YES	NO	NO
193	2017-714204	Plastics Production Machine Operator (General)	YES	YES							YES	YES	NO	NO
194	2017-134903	Small Business Manager	YES	YES	YES							YES	NO	NO
195	2017-251203	Developer Programmer							YES		YES	YES	NO	NO
196	2017-242211	Internal Auditor	YES	YES	YES		YES						NO	NO
197	2017-263501	Social Counselling Worker	YES	YES	YES		YES						NO	NO
198	2017-121201	Human Resource Manager		YES							YES	YES	YES	NO
199	2017-514101	Hairdresser	YES				YES				YES		NO	NO
200	2017-331302	Accounting Technician		YES			YES			YES			NO	YES
201	2017-641403	Civil Engineering Constructor	YES	YES			YES						NO	YES
202	2017-243202	Communication Strategist	YES	YES	YES	YES		YES					NO	NO
203	2017-311201	Civil Engineering Technician	YES	YES	YES					YES			NO	YES
204	2017-432102	Dispatching and Receiving Clerk / Officer			YES			YES	YES	YES			NO	YES
205	2017-734209	Mobile Explosives Manufacturing Unit (MEMU) Operator	YES			YES	YES						NO	NO
206	2017-112101	Director (Enterprise / Organisation)						YES			YES	YES	NO	YES
207	2017-133101	Chief Information Officer						YES			YES	YES	YES	NO
208	2017-214402	Mechanical Engineering Technologist									YES	YES	YES	YES
209	2017-718302	Packing Machine Operator						YES	YES	YES	YES		NO	NO
210	2017-263403	Organisational Psychologist	YES	YES	YES	YES							NO	NO
211	2017-121301	Policy and Planning Manager							YES	YES	YES		NO	YES
212	2017-671203	Mechatronics Technician		YES	YES	YES							YES	NO
213	2017-214406	Marine Engineering Technologist							YES	YES		YES	NO	NO

214	2017-242401	Training and Development Professional							YES	YES		YES	NO	NO
215	2017-413201	Data Entry Operator				YES						YES	NO	NO
216	2017-221101	General Medical Practitioner									YES	YES	YES	NO
217	2017-252301	Computer Network and Systems Engineer									YES	YES	YES	NO
218	2017-122105	Customer Service Manager									YES	YES	NO	NO
219	2017-252901	ICT Security Specialist									YES	YES	NO	NO
220	2017-343401	Chef									YES	YES	NO	NO
221	2017-213306	Water Quality Analyst					YES				YES		YES	NO
222	2017-833401	Shelf Filler		YES			YES		YES				NO	NO
223	2017-321301	Pharmacy Technician	YES	YES				YES	YES	YES			NO	NO
224	2017-216502	Surveyor						YES		YES	YES		YES	YES
225	2017-214607	Petroleum Engineer							YES	YES	YES		NO	NO
226	2017-341110	Associate Legal Professional							YES	YES	YES		NO	NO
227	2017-214907	Materials Engineer								YES	YES		YES	YES
228	2017-242304	Industrial Relations Advisor	YES	YES	YES					YES			NO	NO
229	2017-143901	Facilities Manager		YES	YES					YES			NO	NO
230	2017-142101	Importer or Exporter		YES	YES					YES			NO	NO
231	2017-235102	Education or Training Reviewer	YES	YES			YES						NO	NO
232	2017-718303	Filling Line Operator									YES	YES	NO	NO
233	2017-132203	Rock Engineering Manager									YES	YES	NO	NO
234	2017-262201	Librarian									YES	YES	NO	NO
235	2017-441602	Skills Development Administrator									YES	YES	NO	NO
236	2017-522201	Retail Supervisor									YES	YES	NO	NO
237	2017-711101	Mining Operator									YES	YES	NO	NO
238	2017-718914	Sand Blaster									YES	YES	NO	NO
239	2017-311903	Food and Beverage Technician								YES		YES	NO	NO
240	2017-421401	Debt Collector		YES			YES						NO	YES
241	2017-422202	Outbound Contact Centre Consultant	YES				YES						NO	NO
242	2017-684904	Panelbeater			YES		YES						NO	NO

243	2017-524501	Service Station Attendant	YES			YES				YES			NO	NO
244	2017-335402	Import-export Administrator	YES	YES	YES				YES				NO	NO
245	2017-831301	Builder's Worker								YES	YES		NO	YES
246	2017-251101	ICT Systems Analyst								YES	YES		YES	NO
247	2017-213201	Agriculture Consultant								YES	YES		NO	NO
248	2017-351302	Geographic Information Systems Technicians								YES	YES		NO	NO
249	2017-653302	Mechanical Equipment Repairer								YES	YES		NO	NO
250	2017-734303	Dredge Operator								YES	YES		NO	NO
251	2017-313201	Water Plant Operator	YES		YES					YES			NO	NO
252	2017-718906	Bulk Materials Handling Plant Operator		YES	YES					YES			NO	NO
253	2017-216601	Digital Artist			YES						YES		NO	NO
254	2017-134603	Financial Markets Business Manager								YES		YES	NO	NO
255	2017-242209	Accounting Officer								YES		YES	NO	NO
256	2017-523102	Office Cashier								YES		YES	NO	NO
257	2017-214503	Explosives and Dangerous Goods Inspector		YES			YES						NO	NO
258	2017-312301	Building Associate					YES						NO	YES
259	2017-262202	Information Services Manager								YES	YES		NO	NO
260	2017-314102	Environmental Science Technician	YES	YES						YES			NO	NO
261	2017-243403	ICT Sales Representative								YES	YES		NO	NO
262	2017-718201	Boiler or Engine Operator								YES	YES		NO	NO
263	2017-212101	Actuary	YES	YES	YES								YES	NO
264	2017-333903	Sales Representative (Business Services)							YES		YES		NO	NO
265	2017-313104	Nuclear Power Plant Process Controller		YES							YES		NO	NO
266	2017-226501	Dietitian			YES						YES		NO	NO
267	2017-662201	Printing Machinist			YES						YES		NO	NO
268	2017-242302	Skills Development Practitioner	YES	YES	YES								NO	NO
269	2017-332202	Sales Representative (Building and Plumbing Supplies)							YES			YES	NO	NO
270	2017-333908	Marketing Coordinator					YES						NO	NO

271	2017-643201	Industrial Spraypainter					YES	YES					NO	NO
272	2017-121103	Credit Manager					YES						NO	NO
273	2017-532202	Aged or Disabled Carer					YES						NO	NO
274	2017-653309	Forklift Mechanic					YES						NO	NO
275	2017-651401	Metal Fabricator				YES			YES				YES	NO
276	2017-313913	Chemical Waste Controller						YES	YES	YES			NO	NO
277	2017-832910	Component Fitter						YES	YES	YES			NO	NO
278	2017-341103	Paralegal	YES	YES	YES								NO	NO
279	2017-214301	Environmental Engineer						YES		YES			NO	YES
280	2017-641502	Carpenter				YES							NO	YES
281	2017-351301	Computer Network Technician									YES		YES	YES
282	2017-134916	Non Manufacturing Operations Foreman									YES		NO	YES
283	2017-811201	Commercial Cleaner	YES	YES	YES								NO	NO
284	2017-734206	Loader Operator	YES	YES	YES								NO	NO
285	2017-651101	Moulder										YES	NO	YES
286	2017-133102	ICT Project Manager										YES	YES	NO
287	2017-121204	Recruitment Manager										YES	NO	NO
288	2017-351201	ICT Communications Assistant										YES	NO	NO
289	2017-134203	Primary Health Care Manager					YES						NO	NO
290	2017-214407	Defence Industry Armament Engineer					YES						NO	NO
291	2017-221211	Surgeon					YES						NO	NO
292	2017-313907	Food and Beverage Manufacturing Process Controller					YES						NO	NO
293	2017-334101	Office Supervisor					YES						NO	NO
294	2017-335201	Taxation Inspector					YES						NO	NO
295	2017-441905	Account Clerk (Public Relations / Communication)					YES						NO	NO
296	2017-683101	Tailor					YES						NO	NO
297	2017-325301	Health Promotion Practitioner	YES								YES		NO	NO

298	2017-214202	Civil Engineering Technologist	YES	YES									YES	YES
299	2017-311905	Industrial Engineering Technician	YES	YES									NO	YES
300	2017-432103	Order Clerk / Officer							YES	YES			NO	NO
301	2017-422601	Receptionist (General)	YES	YES				YES					NO	YES
302	2017-641101	House Builder				YES							NO	YES
303	2017-213106	Botanist						YES		YES			NO	NO
304	2017-216302	Industrial Designer		YES						YES			YES	NO
305	2017-311701	Mining Technician									YES		NO	YES
306	2017-541201	Traffic Officer									YES		NO	YES
307	2017-862919	Mechanic Trade Assistant									YES		NO	YES
308	2017-332301	Retail Buyer									YES		YES	NO
309	2017-121902	Corporate Services Manager									YES		NO	NO
310	2017-143904	Security Services Manager									YES		NO	NO
311	2017-121102	Payroll Manager									YES		NO	NO
312	2017-131101	Agricultural Farm Manager									YES		NO	NO
313	2017-131102	Forestry Operations Manager									YES		NO	NO
314	2017-133106	Information Systems Director									YES		NO	NO
315	2017-241202	Investment Manager									YES		NO	NO
316	2017-251302	Web Developer									YES		NO	NO
317	2017-251901	Computers Quality Assurance Analyst									YES		NO	NO
318	2017-331401	Statistical and Mathematical Assistant									YES		NO	NO
319	2017-671208	Transportation Electrician									YES		NO	NO
320	2017-683201	Clothing, Home Textiles and General Goods Cutter									YES		NO	NO
321	2017-671204	Lift Mechanic	YES		YES								NO	NO
322	2017-214604	Metallurgical Engineering Technologist		YES	YES								YES	NO
323	2017-214904	Quantity Surveyor			YES								YES	YES
324	2017-141201	Café (Licensed) or Restaurant Manager		YES	YES								NO	NO
325	2017-221103	Public Health Physician										YES	YES	NO

326	2017-221102	Resident Medical Officer										YES	NO	NO
327	2017-222101	Clinical Nurse Practitioner										YES	NO	NO
328	2017-264202	Editor										YES	NO	NO
329	2017-311704	Geophysical Technician										YES	NO	NO
330	2017-333303	Labour Recruitment Consultant: Temporary Employment Services (TES)										YES	NO	NO
331	2017-333402	Real Estate Agent										YES	NO	NO
332	2017-335501	Detective										YES	NO	NO
333	2017-662203	Screen Printer										YES	NO	NO
334	2017-672107	Special Class Electrician										YES	NO	NO
335	2017-712201	Electroplater										YES	NO	NO
336	2017-214105	Energy Efficiency Manager										YES	NO	NO
337	2017-211402	Geophysicist								YES			NO	NO
338	2017-325706	Ammunition Technician						YES		YES			NO	NO
339	2017-641303	Refractory Mason	YES							YES			NO	NO
340	2017-221210	General Medicine Specialist Physician				YES							NO	NO
341	2017-321117	Radiation Laboratory Technician				YES							NO	NO
342	2017-333101	Clearing and Forwarding Agent				YES							NO	NO
343	2017-441902	Contract Administrator								YES			NO	YES
344	2017-831310	Surveyor's Assistant								YES			NO	YES
345	2017-243203	Corporate Communication Manager									YES		NO	NO
346	2017-216402	Transport Analyst									YES		NO	NO
347	2017-141204	Reservations Manager									YES		NO	NO
348	2017-143101	Betting Agency Manager									YES		NO	NO
349	2017-226904	Diversional Therapist									YES		NO	NO
350	2017-243104	Market Campaign Analyst									YES		NO	NO
351	2017-252902	Technical ICT Support Services Manager									YES		NO	NO
352	2017-321114	Health Technical Support Officer									YES		NO	NO
353	2017-333301	Recruitment Consultant / Officer									YES		NO	NO

354	2017-333910	Business Support Coordinator									YES		NO	NO
355	2017-335911	Quarantine Officer									YES		NO	NO
356	2017-341107	Law Clerk									YES		NO	NO
357	2017-524901	Materials Recycler									YES		NO	NO
358	2017-542305	Engineer Soldier									YES		NO	NO
359	2017-662315	Coating Machine Operator									YES		NO	NO
360	2017-714202	Plastic Compounding and Reclamation Machine Operator									YES		NO	NO
361	2017-714301	Paper Products Machine Operator									YES		NO	NO
362	2017-311303	Energy Efficiency Technician			YES								NO	NO
363	2017-325201	Health Information Manager								YES			NO	NO
364	2017-721901	Product Assembler								YES			NO	NO
365	2017-734101	Agricultural Mobile Plant (Equipment) Operator								YES			NO	NO
366	2017-332208	Pharmacy Sales Assistant	YES		YES								NO	NO
367	2017-641501	Carpenter and Joiner		YES									YES	YES
368	2017-265903	Public Speaker	YES		YES								NO	NO
369	2017-241201	Investment Analyst			YES								NO	NO
370	2017-651204	Gas Cutter			YES								NO	NO
371	2017-212103	Statistician			YES								NO	NO
372	2017-214901	Biomedical Engineer	YES	YES									NO	NO
373	2017-132109	Quality Systems Auditor	YES	YES									NO	NO
374	2017-143905	Call or Contact Centre Manager						YES	YES				NO	NO
375	2017-733208	Mobile Mining Equipment Operator	YES						YES				NO	NO
376	2017-714203	Plastics Fabricator or Welder								YES			NO	NO
377	2017-331503	Insurance Loss Adjuster								YES			NO	NO
378	2017-514102	Hair or Beauty Salon Assistant								YES			NO	NO
379	2017-515301	Caretaker								YES			NO	NO
380	2017-812904	Sterilisation Technician								YES			NO	NO

381	2017-821101	Crop Production Farm Worker / Assistant								YES			NO	NO
382	2017-832901	Metal Engineering Process Worker								YES			NO	NO
383	2017-335904	Pest Management Officer								YES			NO	NO
384	2017-734401	Lift Operator	YES	YES									NO	NO
385	2017-522304	ICT Sales Assistant	YES	YES									NO	NO
386	2017-313910	Juice Extraction Process Controller	YES	YES									NO	NO
387	2017-342302	Outdoor Adventure Guide	YES	YES									NO	NO
388	2017-541401	Security Officer	YES										NO	YES
389	2017-651201	Pressure Welder			YES								YES	NO
390	2017-341201	Auxiliary Community Development Practitioner			YES								NO	NO
391	2017-111401	Elected Official		YES									NO	NO
392	2017-134906	Practice Manager							YES				NO	NO
393	2017-524201	Sales Demonstrator							YES				NO	NO
394	2017-734201	Earthmoving Plant Operator (General)						YES					NO	YES
395	2017-111207	Senior Government Manager						YES					NO	NO
396	2017-213102	General Biologist						YES					NO	NO
397	2017-231101	University Lecturer	YES										NO	NO
398	2017-263401	Clinical Psychologist	YES										NO	NO
399	2017-263507	Adoption Social Worker	YES										NO	NO
400	2017-642301	Fibrous Plasterer		YES									NO	NO
401	2017-335907	Weights and Measures Inspector		YES									NO	NO
402	2017-541203	Military Police Official		YES									NO	NO
403	2017-214602	Mining Engineering Technologist											YES	YES
404	2017-214908	Materials Engineering Technologist											YES	YES
405	2017-671102	Electrical Installation Inspector											YES	YES
406	2017-111402	Trade Union Representative		YES									NO	NO
407	2017-342301	Fitness Instructor		YES									NO	NO
408	2017-333907	Property Portfolio and Asset Manager		YES									NO	NO

409	2017-441604	Labour Relations Case Administrator		YES									NO	NO
410	2017-334302	Personal Assistant		YES									NO	NO
411	2017-325701	Environmental and Occupational Health Inspector											NO	YES
412	2017-121904	Contract Manager											NO	YES
413	2017-132302	Project Builder											NO	YES
414	2017-133103	Data Management Manager											NO	YES
415	2017-214403	Aeronautical Engineer											NO	YES
416	2017-311202	Surveying or Cartographic Technician											NO	YES
417	2017-412101	Secretary (General)											NO	YES
418	2017-651301	Sheet Metal Worker											NO	YES
419	2017-711405	Concrete Batching Plant Operator											NO	YES
420	2017-313917	Pulp and Paper Manufacturing Process Control Technician	YES										NO	NO
421	2017-671205	Weapon Systems Mechanic											NO	NO
422	2017-215103	Energy Engineer						YES					YES	NO
423	2017-212102	Mathematician						YES					NO	NO
424	2017-541902	Emergency Service and Rescue Official						YES					NO	NO
425	2017-721101	Machinery Assembler						YES					NO	NO
426	2017-263504	Rehabilitation Counsellor	YES										NO	NO
427	2017-831101	Mining Support Worker	YES										NO	NO
428	2017-832903	Timber and Wood Process Worker	YES										NO	NO
429	2017-215102	Electrical Engineering Technologist											YES	YES
430	2017-216401	Urban and Regional Planner											YES	YES
431	2017-311702	Metallurgical or Materials Technician											NO	YES
432	2017-215301	Telecommunications Engineer											NO	YES
433	2017-215303	Telecommunications Network Engineer											NO	YES
434	2017-216201	Landscape Architect											NO	YES
435	2017-352201	Telecommunications Technical Officer or Technologist											NO	YES

436	2017-441501	Filing or Registry Clerk												NO	YES
437	2017-611302	Landscape Gardener												NO	YES
438	2017-642302	Plasterer												NO	YES
439	2017-712101	Metal Processing Plant Operator												NO	YES
440	2017-721201	Electrical and Electronic Equipment Assembler												NO	YES
441	2017-733101	Bus Driver												NO	YES
442	2017-734202	Backhoe Operator												NO	YES
443	2017-734203	Bulldozer Operator												NO	YES
444	2017-734205	Grader Operator												NO	YES
445	2017-734214	Dump Truck Operator												NO	YES
446	2017-831313	Water Process Worker												NO	YES
447	2017-831304	Plumber's Assistant												NO	YES
448	2017-831306	Paving and Surfacing Worker												NO	YES
449	2017-252302	Network Analyst												YES	NO
450	2017-111202	General Manager Public Service												NO	NO
451	2017-111204	Senior Government Official												NO	NO
452	2017-121104	Internal Audit Manager												NO	NO
453	2017-121903	Physical Asset Manager												NO	NO
454	2017-121909	Sustainability Manager												NO	NO
455	2017-122104	Interactive and Direct Marketing Strategist												NO	NO
456	2017-131103	Forestry Operations Supervisor												NO	NO
457	2017-132405	Fleet Manager												NO	NO
458	2017-134904	Office Manager												NO	NO
459	2017-213203	Forest Scientist												NO	NO
460	2017-213204	Wine Maker												NO	NO
461	2017-214302	Environmental Impact and Restoration Analyst												NO	NO
462	2017-214906	Agricultural Engineering Technologist												NO	NO

463	2017-216602	Illustrator												NO	NO
464	2017-216604	Web Designer												NO	NO
465	2017-222103	Registered Nurse (Child and Family Health)												NO	NO
466	2017-222104	Registered Nurse (Community Health)												NO	NO
467	2017-222116	Nurse Manager												NO	NO
468	2017-241203	Investment Advisor												NO	NO
469	2017-241204	Financial Markets Practitioner												NO	NO
470	2017-242306	Labour Market Analyst												NO	NO
471	2017-261106	Advocate												NO	NO
472	2017-261902	Legislation Facilitator												NO	NO
473	2017-311302	Electric Substation Operations Manager												NO	NO
474	2017-311906	Environmental Engineering Technician												NO	NO
475	2017-313102	Fossil Power Plant Process Controller												NO	NO
476	2017-313103	Hydro Power Plant Process Controller												NO	NO
477	2017-313106	Concentrated Solar Power (CSP) Plant Process Controller												NO	NO
478	2017-321201	Medical Technician												NO	NO
479	2017-325703	Agricultural / Horticultural Produce Inspector												NO	NO
480	2017-325704	Aquaculture Produce Analyst												NO	NO
481	2017-333201	Events Manager												NO	NO
482	2017-343203	Visual Merchandiser												NO	NO
483	2017-343902	Light Technician												NO	NO
484	2017-352105	Radio Station Operator												NO	NO
485	2017-352106	Production Assistant (Film, Television or Radio)												NO	NO
486	2017-413101	Word Processing Operator												NO	NO
487	2017-422102	Travel Consultant												NO	NO
488	2017-422301	Switchboard Operator												NO	NO
489	2017-441301	Coding Clerk												NO	NO

490	2017-441302	Proof Reader												NO	NO
491	2017-513101	Waiter												NO	NO
492	2017-513102	Cafe Worker												NO	NO
493	2017-524401	Call Centre Salesperson												NO	NO
494	2017-532903	Nursing Support Worker												NO	NO
495	2017-541403	Retail Loss Prevention Officer												NO	NO
496	2017-641301	Stonemason												NO	NO
497	2017-653304	Diesel Fitter												NO	NO
498	2017-661502	Optical Mechanic												NO	NO
499	2017-671207	Armature Winder												NO	NO
500	2017-671301	Electrical Line Mechanic												NO	NO
501	2017-683401	Upholsterer												NO	NO
502	2017-715201	Weaving Machine Operator												NO	NO
503	2017-715602	Footwear Closing Production Machine Operator												NO	NO
504	2017-313501	Metal Manufacturing Process Control Technician												NO	NO
505	2017-681105	Poultry Slaughterer												NO	NO
506	2017-325801	Ambulance Officer												NO	NO
507	2017-111203	Local Authority Manager												YES	NO
508	2017-332205	Manufacturers Representative												NO	NO
509	2017-684909	Survival Equipment Fitter												NO	NO
510	2017-672206	Communications Operator												NO	NO
511	2017-643302	Chimney Cleaner												NO	NO
512	2017-311901	Forensic Technician (Biology, Toxicology)												NO	NO
513	2017-111101	Local or Provincial Government Legislator												NO	NO
514	2017-111201	Defence Force Senior Officer												NO	NO
515	2017-121203	Compensation and Benefits Manager												NO	NO
516	2017-121906	Franchise Manager												NO	NO

517	2017-131201	Aquaculture Farm Manager												NO	NO
518	2017-132407	Airport or Harbour Manager												NO	NO
519	2017-132409	Fuel Manager												NO	NO
520	2017-134204	Secondary Health Services Manager												NO	NO
521	2017-134401	Social Services Manager												NO	NO
522	2017-134402	Community Development Manager												NO	NO
523	2017-134602	Credit Bureau Manager												NO	NO
524	2017-134912	Commissioned Fire and Rescue Officer												NO	NO
525	2017-134917	Publisher												NO	NO
526	2017-134918	Water production and Supply Manager												NO	NO
527	2017-143102	Gaming Manager												NO	NO
528	2017-143104	Arts / Culture Manager												NO	NO
529	2017-143108	Facility Centre Manager												NO	NO
530	2017-143902	Cleaning Services Manager												NO	NO
531	2017-211201	Meteorologist												NO	NO
532	2017-213305	Air Pollution Analyst												NO	NO
533	2017-315101	Marine Engineer												NO	NO
534	2017-216301	Fashion Designer												NO	NO
535	2017-221201	Anaesthetist												NO	NO
536	2017-222114	Nurse Educator												NO	NO
537	2017-223104	Naturopath												NO	NO
538	2017-223106	Traditional Chinese Medicine Practitioner												NO	NO
539	2017-225102	Veterinary Public Health Professional / Practitioner												NO	NO
540	2017-226102	Dentist												NO	NO
541	2017-226601	Audiologist												NO	NO
542	2017-226902	Occupational Therapist												NO	NO
543	2017-241106	Accountant in Practice												NO	NO
544	2017-242201	Intelligence Officer												NO	NO

545	2017-242203	Company Secretary												NO	NO
546	2017-242204	Corporate Treasurer												NO	NO
547	2017-242305	Occupational Analyst												NO	NO
548	2017-242307	Recreation Officer												NO	NO
549	2017-243101	Advertising Specialist												NO	NO
550	2017-243204	Event Producer												NO	NO
551	2017-243402	ICT Business Development Manager												NO	NO
552	2017-261102	Administrative Lawyer												NO	NO
553	2017-261104	Trade Mark Attorney												NO	NO
554	2017-262101	Archivist												NO	NO
555	2017-262102	Gallery or Museum Curator												NO	NO
556	2017-263505	Student Counsellor												NO	NO
557	2017-263510	Employee Wellness Practitioner												NO	NO
558	2017-264103	Technical Writer												NO	NO
559	2017-264201	Copywriter												NO	NO
560	2017-265405	Technical Director												NO	NO
561	2017-311705	Mine Ventilation Officer: DELETED												NO	NO
562	2017-313912	Mineral Beneficiation Process Controller												NO	NO
563	2017-314302	Forestry Research Technician												NO	NO
564	2017-315203	Ship's Surveyor												NO	NO
565	2017-315304	Flying Instructor												NO	NO
566	2017-321107	Operating Theatre Technician												NO	NO
567	2017-321402	Dental Technician												NO	NO
568	2017-324102	Veterinary Technician												NO	NO
569	2017-325401	Dispensing Optician												NO	NO
570	2017-325601	Clinical Associate												NO	NO
571	2017-325707	Mine Health and Safety Inspector												NO	NO
572	2017-331101	Securities Dealer												NO	NO
573	2017-331105	Asset Swap Administrator												NO	NO

574	2017-331303	Tax Technician												NO	NO
575	2017-331501	Valuer												NO	NO
576	2017-332204	Commercial Services Sales Agent												NO	NO
577	2017-333401	Property Manager												NO	NO
578	2017-333406	Property Lease Administrator												NO	NO
579	2017-333902	Special Services Contracting Agent												NO	NO
580	2017-333904	Business Broker												NO	NO
581	2017-333911	Physical Asset Practitioner												NO	NO
582	2017-334201	Legal Secretary												NO	NO
583	2017-335101	Customs Officer												NO	NO
584	2017-335301	Social Security Assessor												NO	NO
585	2017-335401	Motor Vehicle Licence Examiner												NO	NO
586	2017-335902	Wage Inspector												NO	NO
587	2017-335905	Water Allocation Officer												NO	NO
588	2017-335910	Trade Mark Examiner												NO	NO
589	2017-335915	Transport Operations Inspector												NO	NO
590	2017-341102	Legal Executive												NO	NO
591	2017-341109	Private Investigator												NO	NO
592	2017-341203	Social Auxiliary Worker												NO	NO
593	2017-342202	Sports Umpire												NO	NO
594	2017-342303	Caving Guide												NO	NO
595	2017-343101	Photographer												NO	NO
596	2017-343903	Stage Manager												NO	NO
597	2017-351101	Computer Operator												NO	NO
598	2017-351401	Web Technician												NO	NO
599	2017-411102	Back Office Process Consultant												NO	NO
600	2017-421101	Bank Teller												NO	NO
601	2017-421102	Bank Worker												NO	NO
602	2017-421103	Currency Exchange Officer												NO	NO

603	2017-422201	Inbound Contact Centre Consultant												NO	NO
604	2017-422203	Contact Centre Real Time Advisor												NO	NO
605	2017-422204	Contact Centre Resource Planner												NO	NO
606	2017-422602	Medical Receptionist												NO	NO
607	2017-422701	Survey Interviewer												NO	NO
608	2017-422901	Admissions Clerk												NO	NO
609	2017-431103	Taxation Clerk												NO	NO
610	2017-431201	Insurance Administrator												NO	NO
611	2017-431202	Securities Services Administrative Officer												NO	NO
612	2017-431203	Statistical Clerk												NO	NO
613	2017-431204	Insurance Claims Administrator												NO	NO
614	2017-432105	Lampman												NO	NO
615	2017-441101	Library Assistant												NO	NO
616	2017-441201	Courier												NO	NO
617	2017-441202	Postal Delivery Officer												NO	NO
618	2017-441203	Mail Clerk												NO	NO
619	2017-441502	Office Machine Operator												NO	NO
620	2017-441603	Compensation and Benefits Clerk												NO	NO
621	2017-511201	Transport Conductor												NO	NO
622	2017-512101	Cook												NO	NO
623	2017-514207	Somatologist												NO	NO
624	2017-515101	Hotel Service Manager												NO	NO
625	2017-515102	Housekeeping Service Manager												NO	NO
626	2017-515103	Commercial Housekeeper												NO	NO
627	2017-516501	Driving Instructor												NO	NO
628	2017-521101	Street Market Vendor												NO	NO
629	2017-521201	Street Food Sales Person												NO	NO
630	2017-521202	Cash Van Salesperson												NO	NO
631	2017-522102	Salon Manager												NO	NO

632	2017-522303	Automotive Parts Salesperson												NO	NO
633	2017-523101	Checkout Operator												NO	NO
634	2017-524902	Rental Salesperson												NO	NO
635	2017-532902	Hospital Orderly												NO	NO
636	2017-532904	Personal Care Assistant												NO	NO
637	2017-541402	Alarm, Security or Surveillance Monitor												NO	NO
638	2017-541906	Security Consultant												NO	NO
639	2017-542101	Naval Combat Operator												NO	NO
640	2017-542203	Special Forces Operator												NO	NO
641	2017-542302	Artillery Soldier												NO	NO
642	2017-542306	Signal Soldier												NO	NO
643	2017-611102	Field Vegetable Farmer												NO	NO
644	2017-611303	Green Keeper												NO	NO
645	2017-612101	Livestock Farmer												NO	NO
646	2017-622301	Master Fisher												NO	NO
647	2017-642201	Wall and Floor Tiler												NO	NO
648	2017-642401	Insulation Installer												NO	NO
649	2017-651402	Structural Steel Erector												NO	NO
650	2017-652204	Patternmaker												NO	NO
651	2017-652205	Master Toolmaker												NO	NO
652	2017-652401	Metal Polisher												NO	NO
653	2017-652404	Grinder												NO	NO
654	2017-653109	Automotive Engine Mechanic												NO	NO
655	2017-653402	Non-motorised Transport Equipment Repairer												NO	NO
656	2017-661101	Precision Instrument Maker and Repairer												NO	NO
657	2017-662105	Gravure Cylinder Preparation Technician												NO	NO
658	2017-662107	Printing Plate Maker												NO	NO
659	2017-662202	Small Offset Lithography Operator												NO	NO
660	2017-662209	Gravure Printing Technician												NO	NO

661	2017-662215	Stationery Machine Technician												NO	NO
662	2017-662216	Commercial Digital Printer												NO	NO
663	2017-662217	Packaging Flexographic Printing Technician												NO	NO
664	2017-662309	Adhesive Binding Machine Operator												NO	NO
665	2017-662311	Gathering Machine Operator												NO	NO
666	2017-662313	Newspaper and Magazine Mailroom Machine Operator												NO	NO
667	2017-672103	Business Machine Mechanic												NO	NO
668	2017-672104	Electronic Equipment Mechanician												NO	NO
669	2017-672205	Telecommunications Technician												NO	NO
670	2017-681201	Confectionary Baker												NO	NO
671	2017-681301	Dairyman												NO	NO
672	2017-681402	Oil Expeller												NO	NO
673	2017-681505	Fruit and Vegetable Grader / Classer												NO	NO
674	2017-682303	Wood Machinist												NO	NO
675	2017-683601	Shoemaker												NO	NO
676	2017-684401	Pest or Weed Controller												NO	NO
677	2017-684901	Textile, Clothing, Footwear and Leather Processing Machine Mechanic												NO	NO
678	2017-684913	Melter												NO	NO
679	2017-711202	Jewellery Processing and Finishing Machine Operator												NO	NO
680	2017-711203	Diamond Cutter and Polisher												NO	NO
681	2017-711204	Gemstone Cutter												NO	NO
682	2017-711205	Gemstone Machine Operator												NO	NO
683	2017-711401	Concrete Products Machine Operator												NO	NO
684	2017-711402	Glass, Clay and Stone Manufacturing Machine Setter and Minder												NO	NO
685	2017-711404	Cement Production Plant Operator												NO	NO
686	2017-713201	Photographic Developer and Printer												NO	NO

687	2017-714101	Rubber Production Machine Operator												NO	NO
688	2017-714102	Rubber Manufacturing Machine Setter and Minder												NO	NO
689	2017-714201	Plastic Cablemaking Machine Operator												NO	NO
690	2017-714205	Reinforced Plastic and Composite Production Worker												NO	NO
691	2017-714206	Rotational Moulding Operator (Plastics)												NO	NO
692	2017-715101	Fibre Preparation Production Machine Operator												NO	NO
693	2017-715102	Yarn Production Machine Operator												NO	NO
694	2017-715301	Sewing Machine Operator												NO	NO
695	2017-715302	Clothing, Textile and Leather Goods Production Operator												NO	NO
696	2017-715501	Leather Processing Machine Operator												NO	NO
697	2017-715701	Laundry and Dry Cleaning Machine Operator												NO	NO
698	2017-716104	Dairy Products Machine Operator												NO	NO
699	2017-716107	Coffee and Tea Processing Machine Operator												NO	NO
700	2017-716108	Seed Processing Machine Operator												NO	NO
701	2017-716109	Milling Process Machine Operator												NO	NO
702	2017-716116	Cereals, snacks, pasta and condiments machine process operator												NO	NO
703	2017-717102	Paper and Pulp Mill Operator												NO	NO
704	2017-717201	Wood Processing Machine Operator												NO	NO
705	2017-718101	Clay Production Machine Operator												NO	NO
706	2017-718301	Labelling Machine Operator												NO	NO
707	2017-718901	Silicon Chip Production Machine Operator												NO	NO
708	2017-718907	Weighbridge Operator												NO	NO
709	2017-718908	Car Compactor Operator												NO	NO
710	2017-718912	Wash Plant Operator												NO	NO
711	2017-731101	Train Driver												NO	NO
712	2017-731201	Railway Signal Operator												NO	NO

713	2017-731202	Train Controller												NO	NO
714	2017-732102	Delivery Driver (Motorcycle)												NO	NO
715	2017-732201	Chauffeur												NO	NO
716	2017-732202	Taxi Driver												NO	NO
717	2017-733202	Aircraft Refueller												NO	NO
718	2017-735101	Deck Hand												NO	NO
719	2017-735102	Jetty Operator												NO	NO
720	2017-811202	Healthcare Cleaner												NO	NO
721	2017-811203	Tea Attendant												NO	NO
722	2017-811204	Caretaker / cleaner												NO	NO
723	2017-812101	Laundry Worker (General)												NO	NO
724	2017-812201	Vehicle Detailer (Valet Servicer)												NO	NO
725	2017-812901	Septic Tank Cleaner												NO	NO
726	2017-812903	Washroom Attendant												NO	NO
727	2017-821104	Harvester / Picker												NO	NO
728	2017-821201	Livestock Farm Worker / Assistant												NO	NO
729	2017-821205	Wool Handler												NO	NO
730	2017-821301	Mixed Crop and Livestock Farm Worker / Assistant												NO	NO
731	2017-821401	Garden Workers												NO	NO
732	2017-821403	Indoor Plant Worker												NO	NO
733	2017-821501	Forestry Worker												NO	NO
734	2017-821601	Fishing Hand												NO	NO
735	2017-831102	Driller's Assistant												NO	NO
736	2017-831103	Mineral Beneficiation Plant Worker												NO	NO
737	2017-832101	Packer (Non Perishable Products)												NO	NO
738	2017-832102	Meat Packer												NO	NO
739	2017-832902	Plastics, Composites and Rubber Factory Worker												NO	NO

740	2017-832904	Food and Beverage Factory Worker												NO	NO
741	2017-832905	Footwear and Leather Factory Worker												NO	NO
742	2017-832906	Glass Processing Worker												NO	NO
743	2017-832908	Clay Processing Factory Worker												NO	NO
744	2017-832909	Textile, Clothing and Footwear Factory Worker												NO	NO
745	2017-833302	Truck Driver's Offsider												NO	NO
746	2017-833303	Waterside Worker												NO	NO
747	2017-833304	Airline Ground Crew												NO	NO
748	2017-841101	Fast Food Cook												NO	NO
749	2017-841201	Kitchenhand												NO	NO
750	2017-841202	Food Trade Assistant												NO	NO
751	2017-861101	Recycling or Rubbish Collector												NO	NO
752	2017-861202	Waste Material Sorter and Classifier												NO	NO
753	2017-862301	Meter Reader												NO	NO
754	2017-862913	Event Assistant												NO	NO
755	2017-862914	Sheltered Workshop Worker												NO	NO
756	2017-862916	Farm Maintenance Worker												NO	NO
757	2017-862922	Electronics and Telecommunications Trades Assistant												NO	NO
758	2017-862926	Ticket Collector												NO	NO

Source: WSP submissions, March 2019, CHIETA system DG Funding, SIPS list, DHEST Occupations in High Demand (OIHD).

Note: Sector Demand Assessment fields indicate whether DG funding was requested for learners in the listed occupations that year. This allows CHIETA to measure sector demand against occupations and interventions. The Funding Matrix lists all occupations used in the Chemicals Industry through the WSP analysis. The primary indicator was the Sector Demand Assessment (demand from the sector) then scarcity identified by the sector. SIPS and OIHD were used as additional indicators to assist in ranking the occupations.