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Chemicals & Cosmetics National Sector Skills Council C&CNSSC

International Labour Organization

Skills for Trade and Economic Diversification (STED) in the

Chemicals and Cosmetics Manufacturing Sector

In Jordan

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Foreword

A productive industrial sector absorbs local jobs and manpower, produces exports that affect the national economy and satisfies the country's needs for basic commodities. This study was carried out by a specialized team with the support of the International Labor Organization (ILO) and under the supervision and guidance of the Chemicals & Cosmetics National Sector Skills Council. It aims to adapt training, qualification, and skill development to the needs of the industrial sector.

The Chemical Industries sector, with its institutions and operating companies, was analyzed. The study examines the demand for jobs, skills and competencies in the industrial sector along with the ways to direct the training and qualifications system towards the industry›s need of the skills required to ensure the employment of the largest number of Jordanians, and to achieve development in the performance of the industrial companies.

This study highlights the actual need for skills to employ the largest number of the unemployed. It based on a systematic examination of specific factories, their need for employment and the types of jobs required. It aims at assessing the demand for jobs and skills in the sector from the perspective of the private sector and evaluating the gap between the needs of the labour market and education/training outcomes. Ultimately, it will serve as a building block for establishing technical standards for training curricula, and improving and developing skills for these jobs.

Sincere gratitude goes to everyone who contributed to this study, especially the International Labor Organization (ILO) and the Russian government for providing the technical and financial support needed for this achievement. Thanks are also due to the scientific research team of Leaders International. They have my full appreciation and gratefulness for the tasks they carried out, and the clear perceptions that have been crystallized for the actuality of industrial enterprises in the chemical industries sector.

Chairman of the Chemicals & Cosmetics National Sector Skills Council

Eng. Ahmad Al Bess

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Executive summary

The ILO's Skills for Trade and Economic Diversification (STED) study on the C&C sector identifies skills needed for promoting international trade and spurring economic growth in the sector. The report reflects on the positioning of the C&C sector in the Jordanian economy from a skills and labour market perspective. It further examines the sector's employment, export potential and challenges that hinder its competitive position. The C&C is one of the leading economic sectors in Jordan; it accounts for nearly 20 percent of total national exports[1] that reached US$ 1.5 billion in 2018.

The C&C sector is mainly driven by the manufacturing of Fertiliser. As per the data ITC Trade Map the sub-sectors exports have reached US $809.9 in 2018, with 9.7 percent CAGR between 2016 -2018. Other dominant sub-sectors within the Chemical & Cosmetics, according to the same source, include the inorganic chemicals, and the detergents & disinfectants manufacturing. The sector employs over 15,000 workers, where 20 percent compose of top priority occupations. It also indirectly generates an additional 2.6 jobs[2]. That translates to 39,543 indirect jobs in 2018 based on JCI's direct employment figures.

The industrial survey results undertaken on a representative sample of 137 firms (42 percent of population) in the C&C sector demonstrates that the majority of firms, accounting for 64 percent export, and are owned mostly by Jordanian investors. These firms are located all across the Kingdom with the highest majority located in Amman, followed by Irbid, and AlZarqa. Large firms operate in Manufacturing of Detergents and Disinfectants, the Manufacturing of Fertilizers and Pesticides, and the Manufacturing of Paints, Inks, and Dyes. While the majority of firms in the Sector are micro and small enterprises, and work across all sectors. Most Surveyed firms within the C&C sector export to the MENA region and Gulf-countries, while some have export markets within the European Union and China for certain kinds of products.

The priority occupations in the sector were identified in collaboration with the C&C NSSCs, prior to launching the industrial survey and in-depth interviews with training/education providers. The surveyed firms, according to their records, employ 5,535 workers in the priority occupations, representing over 48 percent of total workers in the sector as per the 2018 official data. Jordanian workers account for 81 percent of the worker force, Syrians account for 11 percent, and from the total workforce females account for approximately 30 percent. The majority of workers in the surveyed sample work within the Manufacturing of Chemical detergents and disinfectants, from which the majority are Production Workers. It was observed from the survey data that the C&C sector has the potential to hire people with disabilities mainly those with hearing disability, impaired mobility, deaf and speechless.

1 Domestic exports means total exports excluding re-export of imported goods without further processing.
2 Euromonitor International's calculations based on data from the Department of Statistics of Jordan

The C&C sector based on the surveyed sample is anticipating a total of 862 job vacancies by 2020. Though "Production workers" occupation has the highest demand for current and future employment, yet this occupation lacks adequate occupational standards and dedicated training programs. Moreover, the surveyed firms confirmed that one of the top recruitment challenges they face is the lack of the technical on the job skills. The skill gaps identified by these firms were mainly technical skills (41 percent) associated with the occupation itself, the use of equipment, technology…etc.

In terms of the supply side of skilled labour within the C&C sector, there are 23 unique programs that are relevant to the skills requirements. The programs are segregated across 10 universities, and are mainly administered as a "Bachelor's degree". These programs combined have graduated over 1,000 students in 2018. However, due to ad hoc job placement measures adopted by training/ education providers, graduates' transition to work in the C&C sector is not clearly known. **In this context, the education and training providers should review whether the programs they offer match the needs of industry, and collaborate with the private sector to ensure that graduates from these institutions have the necessary skills demanded by the industry in terms of technical skills and employability life skills**.

The report is divided into 9 sections: **The 1st"Country Background"** presents a summary on the Jordanian economy and the Jordanian labour market. **The 2nd "Research Methodology"** presents a summary on the methodology adopted for the research, the industrial survey, and the training/ education providers' in-depth structured interview. **The 3rd "Sector Background"** presents a background on the overall sector based on the literature review. **The 4th "Sector Characterization"** presents the structure of the C&C sector classified according to the harmonized system (HS Code) and the International Standard Industry Classification (ISIC) 4.0. This section also presents the results of the secondary data analysis related to sector employment and Industrial Survey indicators using DoS database. **The 5th "C&C Trade Patterns**" presents the results of the secondary data analysis conducted on the sector using ITC Trade Map database. **The 6th "Industrial Survey Results (Demand Side)"** presents the findings of the industrial in terms of structure of surveyed firms, trade patterns, skill gaps, as well as a review of current and future demand for priority occupations. **The 7th "Training Providers Survey (Supply Side)** provide the findings of the structured in-depth interview results conducted on training and education providers. **The 8th "COVID-19 impact survey"** assess the effect of COVID-19 on the sector, and how future strategies and indicators, especially those of exports and employment will change. **The 9th "STED Validation of results and Scenario Planning**" presents results of the validation sessions conducted with the C&C NSSC in relation to the findings of this study and presents the forecasted growth for the sector in terms of exports and employment based on a "Business-as-usual" scenario. The final 9th section "Conclusion" provides a summary conclusion and presents next steps of action.

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List of Acronyms

ABET	Accreditation Board for Engineering and Technology
AQAC	Accreditation and Quality Assurance Commission for Higher Education Institutions
CAGR	Compound Annual Growth Rate
CBJ	Central Bank of Jordan
C&C	Chemicals & Cosmetics
DoS	Department of Statistics (Jordan)
ERP	Enterprise Resource Planning
FDI	Foreign Direct investment
FTA	Foreign Trade Agreement
GDP	Gross Domestic Product
GMP	Good Manufacturing Practice
GFCF	Gross Fixed Capital Formation
GIZ	The German International Cooperation Agency
GPA	Government Procurement Agreement
GSP	Generalized System of Preferences
HS	Harmonized System trade codes
IHR	International Health Requirements
ISIC	International Standard Industry Classification
ISO	International Organization for Standardization
ILO	International Labour Organization
ITA	Information Technology Agreement
ITC	International Trade Center
JEGP	Jordan's Economic Growth Plan
JIC	Jordan Investment Commission
NHRDS	National Human Resource Development Strategy

MENA	Middle East and North Africa
MITS	Ministry of Industry, Trade and Supplies
MOH	Ministry of Health
MOL	Ministry of Labour
MOPIC	The Ministry of Planning and International Cooperation
PAFTA	Pan-Arab Free Trade Agreement
RSS	Royal Scientific Society
SME	Small & Medium Enterprise
SOP	Standard Operational Procedures
STED	Skills for Trade and Economic Diversification
TVSDC	Technical and Vocational Skills Development Commission
JCI	Jordan Chamber of Industry
POI	Point of Entry
QIZ	Qualified Industrial Zone
WITS	World Integrated Trade Solution
WTO	World Trade Organization
VTC	Vocational Training Corporation

1 Introduction

This report on the skills needs of the chemicals and cosmetics sector in Jordan was prepared as part of Applying the G20 Training Strategy Project: A Partnership of the ILO and the Russian Federation and in close coordination with the Chemicals and Cosmetics National Sector Skills Council, a tripartite governance body responsible for improving linkages between the skills needs of the chemicals and cosmetics sector and what is offered by public and private education and training providers. The membership of the Council includes representatives of employers', workers' and sectoral associations and of the national Government.

The findings of this report are based on the International Labour Organization (ILO) Skills for Trade and Economic Diversification (STED) methodology. STED is a technical assistance tool that supports growth and decent job creation in sectors that have the potential to increase their exports and contribute to economic diversification. It does so by identifying the skills development strategies needed to promote international trade and spur economic growth by adopting a forward-looking approach.

The chemicals and cosmetics sector was chosen for this analysis as it is one of the most promising industrial sectors in Jordan, accounting for over 20 per cent of total national exports. The sector is also a top priority because it is labour-intensive, currently employing over 15,000 workers. The production of chemicals and cosmetics witnessed slow growth in recent years due to regional political instability and falling oil and gas prices, which impacted demand from key importing markets. According to a study prepared by ILO and the International Trade Centre (ITC), the chemicals industry has the potential to generate more than 14,000 jobs and can thus contribute to resolving high unemployment in Jordan, which exceeded 18 per cent in 2018.

This report examines the positioning of the chemicals and cosmetics sector in the Jordanian economy from a skills and labour market perspective, the sector's export potential and the challenges that hinder its competitiveness in international markets. It identifies the skills needed to promote the exports and overall growth of the sector and makes proposals and recommendations as to what can be done with regard to employment and skills to overcome the challenges identified. Seven priority occupations are identified for skills development for which there are no substantial training courses in Jordan. Proposals are made for the development of curricula and training courses.

The methodology used in the preparation of this report combines sector-level technical research with an enterprise skills survey, a survey of training providers, and consultations with sector stakeholders. A thorough desktop analysis was conducted covering key indicators to profile the sector, including employment, value added, trade patterns, and its positioning in the global value chain. The enterprise skills survey covered all enterprises operating in the sector using the database of the Jordan Chamber of Industry. All training providers were interviewed in order to analyse the gaps between the supply and demand for skills in the sector. The findings of the primary and secondary research activities were validated by the Chemicals and Cosmetics National Skills Council and other sector stakeholders, who also put forward recommendations and proposals.

The chemicals and cosmetics sector is one of two sectors studied in the context of the Applying the G20 Training Strategy project, the other being the garment and leather sector. These two sectors were chosen after extensive technical analysis to identify their export and employment potential. This work is intended to support the work of the Technical and Vocational Skills Development Commission, which is a new umbrella for technical and vocational education and training (TVET) in Jordan. It was established under the Technical and

Vocational Skills Development Act, No. 19 of 2019. The Commission aims to facilitate enhanced participation by the private sector in skills development in order to bridge the gap between educational outcomes and the skills needs of the labour market.

The COVID-19 pandemic started during the preparation of this report, which has shaken the industrial sector's operational capacity, production, employment, exports and other factors. To take account of this, additional interviews were undertaken with sector skill council members, engineer association representative, the higher education institutes (presented by AlBalqa Univeristy) and secondary data collection sources. The updated information has been incorporated in the report, and the scenarios for the sector's future have also been amended.

Specifically, in relation to the current status of skilled labour and future requirements in relation to skill up-grades, findings as result of COVID-19, have highlighted the fact, that there is a major lack of skilled labour, specifically in management, entailing certain specifications (Technicians, R&D, Quality Assurance…etc.) These required occupations, along with the required skill-set are specially lacking among Jordanian workers, and foreign labour is generally brought it to fill in these vacancies. As such during the COVID-19 pandemic, the importance of training the local workforce – especially under a semi-centralized approach to production – becomes ever so important. Additionally, the COVID-19 follow-up survey has reflected, that workers in the C&C sector in general lack any kind of digital skills, in parallel to possessing very basic life skills; as such and due to the imposition of social distancing and the highly reliant increase on digital communication, parallel training should be urgently conducted to upgrade the digital and life-skills of workers in the sector.

2 Country Background

2.1 Economic context

Over the past decade, protracted regional instability has exerted mounting economic pressure on key economic sectors in Jordan. In 2018, economic growth settled at a modest 2 per cent, compared to 5.6 per cent in 2008, prior to the outbreak of the global economic crisis of 2009 and the regional uprisings in 2011 (known as the 'Arab Spring').

Sluggish economic performance has been common around the MENA region, where GDP growth also averaged 2 per cent in 2018. According to the World Bank, Jordan's economic growth is expected to pick up, but only slightly, in the coming years, to reach 2.6 per cent in 2021, an annual increase of 0.2 per cent.

Table 1: Key economic indicators, 2018

Population	9.9 million
GDP	US$42.4 billions
GDP per capita	US$4278
Unemployment	18.6 per cent

In 2019, the population of Jordan is estimated to have exceeded 10 million, 30 per cent of whom were migrants and refugees.[3] The influx of refugees, mainly from Syria, has put pressure on the limited resources of the country, which was already suffering from a large budget deficit that reached 1.6 billion Jordanian dinars (JD) in 2018,[4] a 60 per cent increase over the previous year. This has contributed to a negative trickle-down effect on the economy, slowing down economic growth.

Moreover, as Jordan is excessively reliant on imports, all this has had a direct effect on the balance of trade, especially for commodities such as fuel, energy, machinery and equipment. Exports, on the other hand, are mainly composed of chemical products and ready-made garments. This has resulted in an increase in the trade deficit in favour of imports, which reached JD9 billion 2018,[6] an increase of 50 per cent in less than a decade. Consequently, investments suffered as gross fixed capital formation (GFCF) as a percentage of GDP fell from 28 per cent in 2008 to 22 per cent in 2016,[7] and foreign direct investment (FDI) decreased from US$2.8 billion in 2008 to US$2 billion in 2017.[8]

As part of its National Strategy for Human Resources Development, Jordan has committed to turning the refugee crisis into a 'development opportunity' for donor countries by giving Syrian refugees access to formal employment and education, in return for facilitated and preferential access to the European Union (EU) market. This was effected through the mechanism of the Relaxed Rule of Origin Agreement signed between the European Union and the Government of Jordan.[9] Since then, the Ministry of Labour has issued some 64,000 work permits to Syrian refugees and introduced a number of reforms to facilitate the employment of both Syrians and Jordanians, especially in the manufacturing sector.[10]

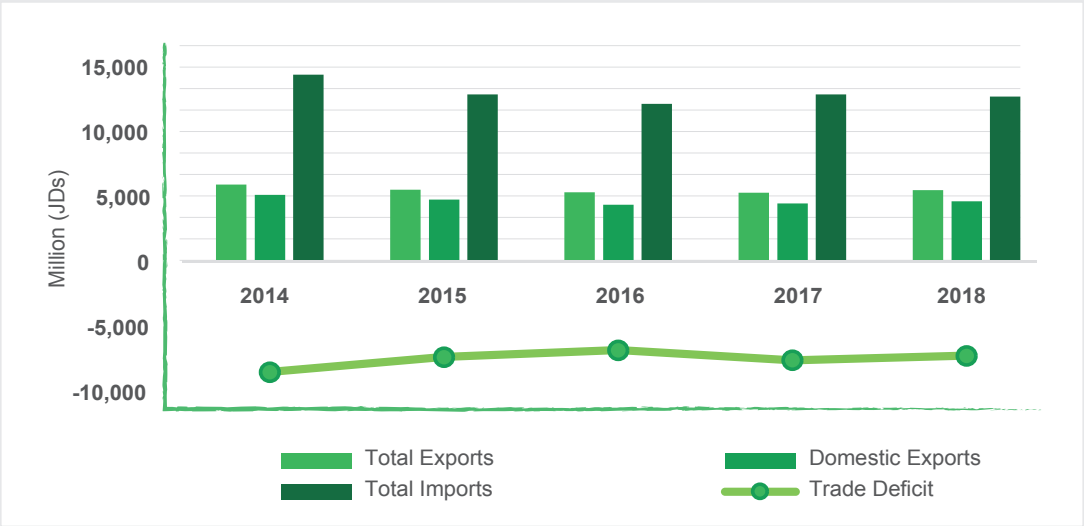
As a response to its vulnerability to endogenous and exogenous shocks, the Government of Jordan is implementing various reforms to spur economic growth and create jobs, especially for the country's youth.

3 Department of Statistics (Jordan), Population Watch 2019.
4 Jordan Ministry of Finance, Annual Financial Bulletin, 2018.
5 Department of Statistics (Jordan), Population Watch 2019.
6 Central Bank of Jordan, Monthly Bulletin, 2019.
7 Central Bank of Jordan, Monthly Bulletin, 2019.
8 World Bank, Development Indicators, 2019.
9 European Commission, 2019.
10 National Strategy for Human Resources Development, Government of Jordan (2015-2020).

2.2 Foreign trade

The decline in domestic exports was mainly the result of disruptions in trade routes with neighbouring countries, specifically the closure of the borders of Syria and Iraq. Overall, trade indices improved in the early years of the decade but, after 2014, exports fell by 7 per cent, to reach JD5.52 billion in 2018. Between 2008 and 2016, exports to Syria and Iraq fell drastically, with a slight pick-up when borders reopened. In 2018, exports to Syria stood at JD33 million, down 77 per cent from the pre-war period. Exports to Iraq, previously a major trade partner for Jordan, experienced similar trends, falling by 22 per cent in 2018 from that of the previoys year, to reach JD446 million.[11]

Figure 1: Trade balance 2014 - 2018, JD MM



Source: CBJ Yearly Statistical Series , 2018

Fortunately, the effects of regional turmoil on domestic exports was somewhat offset by increased exports to the United States, which accounted for 26 per cent of total exports in 2018. In addition, exports to Arab countries, although smaller in volume, also increased in 2018. Exports to the United States are mainly comprised of garments and textiles, produced in qualifying industrial zones (QIZs). The establishment in 1997 of the QIZ Agreement, which allows products to enter the United States duty-free if manufactured in the West Bank or Gaza, or qualifying industrial zones in Jordan and Egypt with a specified amount of Israeli content, played a major role in boosting Jordanian exports. Today, there are over 18 qualifying industrial zones in Jordan exporting products duty-free to the US market and enjoying a number of incentives and exemptions.

11 Central Bank of Jordan, Annual Report 2018, pp.248 – 252.

Table 2: Top importing countries from Jordan, 2017-2018, JD thousands [12]				
Importers	**Exported value in 2017**	**Exported value in 2018**	**% change**	**% of total**
United States of America	1,112,561.7	1,228,544.0	10.42	26.28
Saudi Arabia	571,509.7	503,712.2	-11.86	10.78
India	382,748.9	485,694.7	26.90	10.39
Iraq	367,776.2	469,426.7	27.64	10.04
United Arab Emirates	203,512.7	184,318.4	-9.43	3.94
Kuwait	239,753.5	171,274.0	-28.56	3.66
Palestine	99,037.8	112,398.7	13.49	2.40
Qatar	114,584.3	98,407.6	-14.12	2.11
Indonesia	106,861.0	94,241.3	-11.81	2.02
Egypt	62,869.2	78,529.6	24.91	1.68
Lebanon	84,490.8	76,006.3	-10.04	1.63
China	97,318.2	74,289.2	-23.66	1.59
Algeria	65,317.7	65,351.4	0.05	1.40
Sudan	67,007.5	59,586.2	-11.08	1.27
Turkey	73,702.2	57,744.1	-21.65	1.24
Oman	52,068.6	49,660.9	-4.62	1.06
Bahrain	43,338.5	49,551.2	14.34	1.06
Israel	44,052.9	45,798.3	3.96	0.98
Yemen	36,476.1	34,288.6	-6.00	0.73
Top importers from Jordan	4,504,224.0	4,674,706.3	3.78	84.96
Source: Department of Statistics (Jordan), 2018				

Jordan's imports have increased significantly as a result of disruptions to the flow of natural gas from Egypt to Jordan, forcing the Government to import more expensive fuel products for electricity generation.

Moreover, higher electricity and other utility bills have adversely affected the competitiveness of domestic products as most producers now face higher costs, which translate into higher prices, making imported products more competitive in the domestic market and lowering demand for Jordanian exports.

In 2016,[13] eleven product categories accounted for more than 80 per cent of overall exports (see table 3). Apparel and textiles are Jordan›s top export, followed by chemical products and pharmaceuticals, together contributing almost 30 per cent of exports. Other sectors that contribute significantly to exports include mining and quarrying and food and vegetables.

12 Department of Statistics (Jordan), Jordan's Economy in Numbers 2018.
13 International Trade Centre calculations based on UN COMTRADE statistics, accessed 27 April 2017.

Table 3: Top exports by HS Code, 2015-2016, US$ thousands					
Code	**Product label**	**Exported value in 2015**	**Exported value in 2016**	**% change**	**% of total (2016)**
61	Articles of apparel and clothing accessories, knitted or crocheted	1,317,613	1,128,058	-14.4	21.5
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare earth metals, etc.	331,944	594,849	79.2	11.3
31	Fertilizers	825,634	546,712	-33.8	10.4
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	601,600	521,485	-13.3	9.9
30	Pharmaceutical products	635,011	393,047	-38.1	7.5
62	Articles of apparel and clothing accessories, not knitted or crocheted	68,118	366,615	438.2	7.0
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad.	142,867	217,596	52.3	4.1
07	Edible vegetables and certain roots and tubers	526,336	146,670	-72.1	2.8
29	Organic chemicals	13,374	143,951	976.3	2.7
84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	297,284	129,186	-56.5	2.5
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	163,993	89,892	-45.2	1.7
	TOTAL – highest exports	4,923,774	4,278,061	-13.1	81.5
	TOTAL EXPORTS	13,374	143,951	976.3	2.7
Source: UN COMTRADE, 2017					

The spiral of economic turmoil springing from the COVID-19 pandemic in early March, 2020 has affected all aspects of the economy, with the private sector being hit the hardest. Sectors that present a cornerstone for the Jordanian private sector, such as tourism, mining, and manufacturing ceased operations for over a month from March of 2020. The industrial sector, has witnessed a sharp decline in production and operations, except for factories that were working on “pandemic-related activities”, in other words, manufactures of sanitizers, masks, medical equipment…etc. These factories, nonetheless, compose a small proportion of the manufacturing sector in the country.

Over 90 percent of the Jordanian industrial sector is comprised of small and medium enterprises (SMEs), that account for a large portion of employment in the sector. These SMEs along with the micro-firms have been affected the most by the corona-crisis for several reasons. First and foremost, firms of that size operate at short-turnaround operations and short revenue cycles, with monthly revenue streams re-injected the following month to continue operations. The pandemic has caused a considerable and immediate effect on income and expenses, leading to delays and immediate losses. Additionally, the support injected by the

government for these businesses in accordance to Defence Order (9)[14] is conditional to their registration in the Jordanian Social Security Corporations (SSC) for at least one year to be able to reap its full benefits. Although the law itself has offered alternatives for non-registered entities, and provided them a gap period to register, the immediate effects of this restriction were heavy on these firms, as many of them are not registered in the social security system, and the ones that are, do so for full-time employees only. This is a hurdle for the manufacturing sector, as it accounts of a large portion of part-time workers, daily-wage workers, and foreign labour, which have not been registered in the system. This has caused firms to be unable to cover their wages, and made it difficult for them to resume their full-time jobs. This means that even though these SMEs have been allowed to operate at a maximum of 50 percent capacity depending on their size, they were unable to do so.

Industrial sector SMEs are important to the ability of the Jordanian economy to recover in the medium-run. Realizing their importance, on April 11, 2020, the Central Bank of Jordan (CBJ) issued regulations to support small and medium enterprise with an amount of 500 million Dinar from the bank in partnership with the Jordanian loan guarantee company.[15] This is meant to inject liquidity into the SMEs, and by extension the industrial sector to enable reestablishment of operations and sustainability in the long-term.

2.3 The labour market

In Jordan, formal employment is mainly in the public sector. As public employment offers better job security and working conditions, historically it was the preferred option. In recent years, this has changed somewhat as the composition of employment shifted towards the private sector, especially in the services and financial sectors. Despite this shift, employment in the private sector, and specifically the manufacturing sector, remains dominated by refugees and migrant workers. The surges in arrivals as a result of political and economic factors in the past decade have had a negative effect on the labour market. The unemployment rate increased by 5.9 per cent, to reach 18.6 per cent in 2018,[16] while job creation fell from 66,400 in 2016 to 54,000 in 2017, a 23 per cent decrease.[17]

Unemployment is concentrated among young people, who account for 40 per cent of total unemployment in Jordan, especially among those with higher education (bachelor's degrees and above). In 2018, the youth unemployment rate reached 39 per cent and was the 12th highest in the world. Job seekers find it difficult to enter the market upon completing their education. The transition period between school and work is long: it takes an average of three years to find a stable job in Jordan. According to a survey conducted by ILO in 2014, there is a high mismatch of skills between labour market demand and supply in Jordan.[18] This points to the need for the Jordanian education system to provide graduates with the knowledge and skills that will enable them quickly to integrate the labour market after graduation.

The strong preference for university education and high participation of young Jordanians in the informal economy is reflected in low rates of enrolment in technical and vocational education (TVET). Culturally, great prestige is attached to higher education, especially in the medical and engineering fields, but the lack of job

14 Defense Order (9) for the year 2020, issued on April 16th, 2020 under provisions of Defence Law no. 13 of 1992 to ensure livelihood and job stability for our workers, to sustain work of the private sector for protection of the national economy, to enhance the concept of solidarity, partnership and joint liability among public and private sectors› institutions and persons, and to support the private sector in carrying over its obligations as stipulated in Defence Order number (6) of 2020

15 The Central Bank of Jordan announces a set of procedures aimed to contain the repercussions of the emerging Corona virus impact on the national economy, Central Bank of Jordan, 2020

16 Department of Statistics (Jordan), Employment and Unemployment Survey 2018.

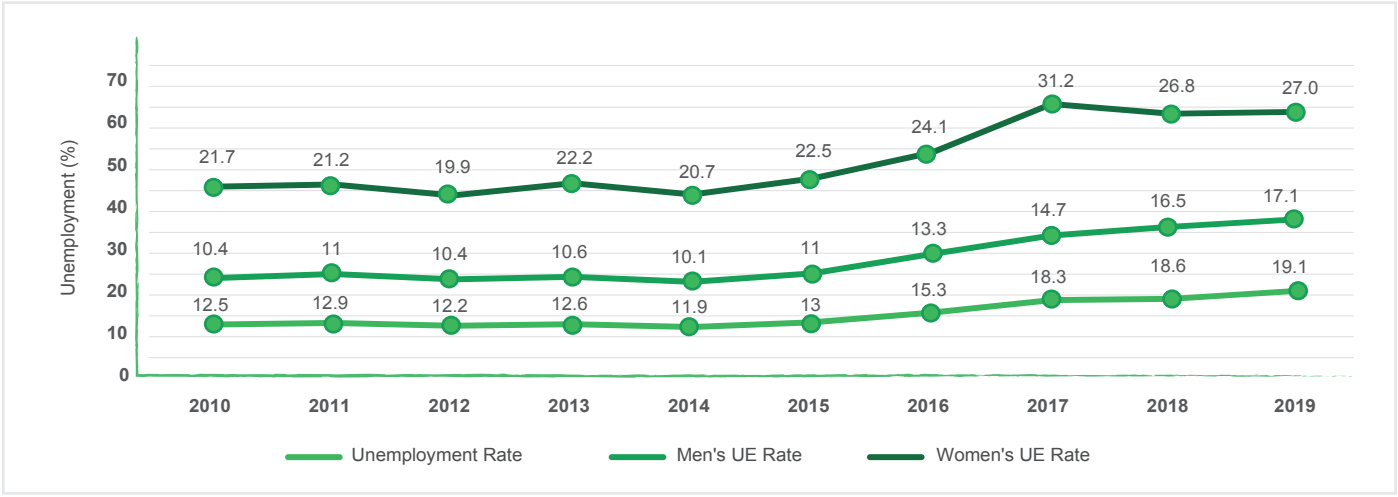
17 UNHCR, Fact Sheet, Jordan April 2019.

18 Work4Youth Project, 2014.

opportunities in these domains means that many young Jordanians accept jobs below their qualifications, with lower wages, long working hours, and generally poor working conditions.[19] This indicates that an increased level of educational attainment has not translated into better employment opportunities in Jordan. The International Monetary Fund (IMF) estimates the informal economy in Jordan contributes around 26 per cent of GDP.[20] Informal employment accounts for a large segment of Jordan's labour market, particularly in agriculture and construction, but it is difficult to trace them due to the high market informality in these two sectors. A study conducted by the United Nations Development Programme (UNDP), the Economic and Social Council and the Ministry of Planning and International Cooperation estimates that at least 44 per cent of the workforce in Jordan is informal and not officially registered.[21] A large segment of the unregistered workforce is composed of refugees. According to the Office of the United Nations High Commissioner for Refugees (UNHCR), only 36 per cent of Syrian refugees of legal working age have acquired work permits. This does not consider the surge of refugees from Iraq, Somalia, Sudan and Yemen in 2019, which now accounts for approximately 12 per cent of the refugees in the country.[22]

Focusing on gender in the labour market, female unemployment is particularly high, at 26.8 per cent in 2018, while male unemployment has also increased but remains lower at 18.6 per cent. Women's participation in the workforce is very low. In 2017, only 16.9 per cent of Jordanian women participated in the labour force, compared with 62.7 per cent of men.[23] According to the World Bank, unemployment among women in Jordan is the eleventh highest in the world, despite the minimal gender gap in terms of higher education attainment.

Figure 2: Unemployment rate by gender



Source: UNHCR, Fact Sheet, Jordan April 2019

In 2018, employment was highly concentrated in the public administration and defence sector (26.4 per cent), followed by wholesale and retail (15.3 per cent) and education (13.3 per cent). Manufacturing employed 9.6 per cent of the workforce; transportation, storage, and communication 7 per cent.[24] In the industrial sector, the highest contributors to employment were: textiles and readymade garments (50,484); food, agricultural and animal stock industries (39,383); and engineering, electrical and information technology (30,268).

As a response to the high unemployment rate, the Government of Jordan launched Vision 2025 in 2015,

19 Barucci and Mrayyan, 2014.
20 International Monetary Fund, Jordan Selected Issues, 2017.
21 UNDP, Ministry of Planning and International Cooperation and Economic and Social Council, The Informal Economy in Jordan, 2013.
22 UNHCR, Fact Sheet, Jordan April 2019.
23 27 Central Bank of Jordan, Annual Report 2018.
24 Central Bank of Jordan, Annual Report 2018.

the goals of which include reducing the unemployment rate to 8 per cent by 2025. To reach this target, an average of 66,000 jobs will have to be created every year. The total number of jobs that need to be created today, however, is estimated to be much higher, if Syrian refugees are to be integrated in the labour market.[25]

The COVID-19 pandemic has initiated a labour market crisis; it is expected to affect both the quantity or rates of unemployed and underemployment[26], and the quality of work available (e.g. wages, income, social protection). The crisis is especially affecting more vulnerable labour groups (i.e. migrants, refugees, women, persons with disability…etc.)[27], while increasing the wage gap, and by extension the social gaps within the economy.

Although the effects of underemployment and working poverty are expected to affect the country as a whole, a much greater effect will be exerted on vulnerable communities, including refugees and migrant workers, especially within the informal sector. Underemployment is directly affected by the lockdown; working hours and thereby wages slashed lead to diminished incomes and thus purchasing power.[28] This threatens to result in more working poverty as wages are reduced below the level required to meet the standards of decent living conditions.[29]

An assessment conducted by the ILO, covering approximately 1,600 households including vulnerable Jordanian families and Syrian refugees, has indicated that only 6 percent of them have been working as they did before the crisis. From the remaining households only 2 percent were working from home, and 61 percent were either laid-off or temporarily laid-off, while the remaining 31 percent have received paid leave.[30] In accordance with that same assessment, the 'manufacturing sector' has performed a bit better than other sectors. It has been able to preserve the rights of its labour force more, as almost 60 percent of the workers in the sector have been granted paid leave, and 10 percent have been permanently laid-off.[31]

The majority of workers that have been laid-off permanently were within the 'informal market', with either verbal contracts or no contracts between employers and their employees. This was a pattern to be expected due to lack of legal consequence of laying-off these employees. Formalization of the labour market becomes much more essential at this time, specifically, when it comes to drafting contracts for migrant workers and Syrian refugees working within Jordan.[32]

Migrant workers in the informal economy[33] are losing their jobs, and thus their means of livelihood, as the system in most cases is either unwilling or unable to support them in time of crisis. In many cases, the situation is exacerbated, as they are unable to leave to their home countries, due to travel restrictions imposed to curb the spread of the pandemic.[34] The ones in the formal economy, on the other hand, still face the risk of contract termination, or wage retention, less pay, and late pay, as they lack in many cases the means for the preservations of employees' rights.

Even when migrant workers and refugees are meant to receive their full wages, they may be unable to do so, as they often lack access to digital platforms, at a time where cash payments have stopped. In parallel,

25 Department of Statistics (Jordan), Jordanian Economy in Numbers 2017.
26 Underemployment is particularly important because of growing casual and informal employment
27 COVID-19: Labour Market Impact and Policy Response in Arab States, International Labour Organization
28 COVID-19: Labour Market Impact and Policy Response in Arab States, International Labour Organization
29 COVID-19: Labour Market Impact and Policy Response in Arab States, International Labour Organization
30 Rapid assessment of the impact of COVID -19 on vulnerable workers in Jordan, International Labour Organization
31 Rapid assessment of the impact of COVID -19 on vulnerable workers in Jordan, International Labour Organization
32 Rapid assessment of the impact of COVID -19 on vulnerable workers in Jordan, International Labour Organization
33 Migrant day/casual labourers, freelance workers, such as live-out migrant domestic workers and cleaners
34 COVID-19: Labour Market Impact and Policy Response in Arab States, International Labour Organization

due to the crisis' socio-economic pressures, migrant workers, may face higher risk of violence, xenophobia, discrimination, stigmatization and further marginalization.[35]

In terms of Syrian refugees specifically, approximately 300,000 have not received cash assistance, due to their previous access to the formal and informal market, that in most cases is no longer available. Palestinian refugees, especially those originating from Gaza-strip and Syria have faced similar challenges, particularly as some of them still do not possess documentation, and it is very difficult to reach them, either by UN organization – specifically UNCHR – to offer support, or by government support agencies, mainly vulnerable communities' support funds (ex: Himmit Watan)[36].

A recent survey by UNCHR has reflected that refugees, along with vulnerable Jordanian families in the informal market, reflected major implications on livelihoods. The survey included over 1,000 households, from which 54 percent of Jordanians, and 65 percent of refugees reported that they became unemployed due to the COVID-19 crisis, and are not expecting to find work beyond the crisis, as the main source of income for over 40 percent was in the informal market (daily-paid workers). From the refugees surveyed only 5 percent stated that they received salaried work with regular income, as the rest rely on family or aid support for survival.[37]

Even with the extra pressures faced by these groups as an outcome of the crisis, refugees and migrant workers are not covered to a large extent by the official government regulations to assist vulnerable communities. The Jordan Compact was meant to integrate Syrian refugees into the crisis, however, its regulations were not amended to fit the current circumstances.[38]

The pandemic has also widened the gap of gender inequalities, even within the formal market that is relatively more stable. The closure of schools and care facilities has forced many women to work from home when possible, or put their careers on hold altogether, due to inability to conduct both without child care support. Again, this problem is worse among refugees, as only 8 percent of women were reported to be employed before the crisis.[39] Specifically, in relation to the Garment and Leather Sector; according to the Jordan Garments, Textiles and Accessories Exporters Association (JGATE), "30 percent of their employees – mainly women – are expected to lose their jobs in May and June."[40]

2.4 Overview of Jordan's education sector (with a focus on TVET)

In recent years, and in accordance with the National Strategy for Human Resources Development, Jordan has improved the indicators of its education system in comparison to neighbouring countries.[41] The Government has implemented an education-intensive policy, under which around 12.5 per cent of current and capital expenditure has gone towards granting education for all,[42] and enabled over 74 per cent of Jordanian students to attend public schools.[43] This has boosted adult literacy rates to 98 per cent,[44] which is very high compared

35 COVID-19: Labour Market Impact and Policy Response in Arab States, International Labour Organization
36 UNRWA, Agency Inputs, 18 April 2020
37 Multi-Sectoral Rapid Needs Assessment –COVID19, UNCHR
38 Informal economy, refugees, and vulnerable workers, ILO-COVID 10 vulnerable labour survey, International labour organization
39 COVID-19: Labour Market Impact and Policy Response in Arab States, International Labour Organization
40 COVID 19 socio-economic framework "working draft for technical review", ILO, 2020
41 National Strategy for Human Resources Development, Government of Jordan (2015-2020).
42 Jordan Ministry of Finance, Annual Financial Bulletin 2018.
43 Department of Statistics (Jordan), Jordan in Figures 2018.
44 World Bank Development Indicators, 2019.

to the world average of 86.2 per cent and the Middle East and North Africa (MENA) region average of 80 per cent.

Unfortunately, improved inclusion in education has not been matched by high quality of education. This is apparent when Jordanian students take international standardized tests, such as Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS), as the majority perform far below the world average.[45] There are two contributing factors to this phenomenon. First, the academic structure within the primary and higher education systems is still very traditional. In other words, most courses and programmes are purely academic and do not include core skills such as learning to learn, communication, critical thinking, problem-solving, teamwork and language skills. Second, educational institutions are unable to keep up with the changing needs of the labour market and still use outdated curriculums.[46] The National Human Resources Development Strategy 2016-2025 acknowledged that the skills of young Jordanian graduates failed to meet the needs of the economy.

The education system in Jordan comprises two years of (optional) pre-school education, ten years of basic education and two years of either academic secondary or vocational secondary education. The ten years of basic education are compulsory for children aged between 6 and 16.[47] Students who pursue academic secondary schooling receive the Tawjihi (secondary education certificate) upon completion of two years' further schooling, which allows them to proceed to tertiary education offered at either universities or community colleges.[48] Technical and vocational training, the other option, is seen as second-best. It is mainly offered by Ministry of Education training centres and vocational training institutes supervised by the Vocational Training Corporation (VTC), which comes under the Ministry of Labour. Although the demand for vocational secondary education is on the rise, especially in the manufacturing sector, very few students enrol in this option. Because of the cultural aspects described earlier, it is the least favoured option among Jordanians, only 3.6 per cent of students enrolling in it.[49]

The Jordanian Government is aware of the need for TVET and is working on policies under the National Human Resources Development Strategy to bridge the gap between higher education and private sector needs, to equip young Jordanians with the skills that are needed in the labour market and that will give them a better chance of finding a job, and offer the private sector the skills required to operate at higher capacity.[50] It is hoped that the policy will increase the number of students enrolled in TVET to 15 per cent by 2025 by enhancing access, quality, and governance in the sector.[51]

In order to reform the governance structure of the TVET sector, the Technical and Vocational Skills Development Act, No. 19 of 2019, was passed in April 2019. It established the Technical and Vocational Skills Development Commission, a new umbrella for TVET in Jordan. The majority of its members are from the private sector, while others are nominated by the Government. Unfortunately, the absence of trade union representatives on the Commission undermines the contribution of the workers to the system and its capacity to improve its inclusiveness. The Commission has a very broad mandate that includes overseeing sectoral skills councils, unifying skills standards through the Centre for Accreditation and Quality Assurance (CAQA), the Jordanian national apprenticeship framework, anticipating skills needs, accreditation of training providers through CAQA, standardized testing and recognition of prior learning.

45 Tayeh and others, "The Reasons for the Decline of the Results of Jordanian Students in TIMSS and PISA", 2015.
46 Arabian Business Consultants for Development, The Jordan STEM Education Landscape, 2017.
47 National Strategy for Human Resources Development, Government of Jordan (2015-2020).
48 Nuffic, The Education System in Jordan: Described and Compared with the Dutch System, 2017.
49 National Strategy for Human Resource Development, Government of Jordan (2015-2020).
50 UNESCO, Jordan TVET Country Profile, 2019.
51 National Strategy for Human Resource Development, Government of Jordan (2015-2020).

3 Chemicals and cosmetics manufacturing sector in Jordan

The chemicals and cosmetics sector plays a key role in the Jordanian economy. It is a major contributor to local employment and a key driver of GDP and exports. Overall, the chemicals industry directly employed nearly 15,200 workers in 2018,[52] equivalent to 6 per cent of total employment in the industrial sector.[53] With US$1.5 billion in export revenues in 2018, the sector contributed more than 20 per cent of total exports.[54]

The chemicals and cosmetics sector is heavily dominated by three main subsectors: fertilizers; inorganic chemicals, precious metals and isotopes; and soaps, lubricants, waxes, candles and modelling pastes. The three subsectors combined accounted for 87 per cent of total exports of the sector in 2018, fertilizers alone accounting for nearly 53 per cent. Jordan enjoys a particularly strong competitive edge for calcium phosphates, accounting for nearly 24 per cent of global exports in 2017.[55]

While the sector's export revenues have fluctuated in recent years, the chemical industry is projected to experience a partial recovery over the five years ending in 2023. The implementation of the Economic Growth Plan 2018-2022, higher global commodity prices, firmer demand from Gulf Cooperation Council (GCC) countries, and the reopening of borders with Syria (in 2018) and Iraq (in 2019) are all factors that support the growth of the sector.[56]

According to ILO projections, the chemicals sectors will be a major contributor to job growth going forward, creating more than 21,000 jobs. Moreover, it is estimated that each direct job in the Jordanian chemical industry generates an additional 2.6 indirect jobs,[57] which, based on Jordan Chamber of Industry direct employment figures, means 39,543 indirect jobs in 2018. Fertilizers and other chemical products are projected to be a major contributor to new jobs. The fertilizer industry is the second largest sector in terms of forecast employment and is expected to create around 14,362 jobs.[58] [59]

The chemicals and cosmetics sector in Jordan faces the same challenges observed across the industrial sector, including: scarcity of skilled labour due to the overall weakness of the technical and vocational education and training system; the increasing complexity of hiring foreign labour due to increasing labour costs and the restrictions imposed on granting work permits to foreigners; increasing production costs due to increasing energy costs, which typically comprise a significant portion of production costs; and the Inherent difficulty of securing credit financing requirements. These challenges contribute to Jordan's unfavourable competitive position in international markets.[60]

52 Jordan Chamber of Industry, Main Industrial Indicators, Issue No.18, 2018.
53 Calculated on the basis of Jordan Chamber of Industry data.
54 Calculated on the basis of Department of Statistics (Jordan) data, 2019.
55 Observatory of Economic Complexity, 2019.
56 GIZ, Value Chain Analysis of The Chemicals Industry in Jordan, 2019.
57 Euromonitor International calculations based on data from the Department of Statistics of Jordan.
58 ILO, More Trade for More Jobs, Identifying the Employment Potential of Jordan's Exports, 2019.
59 This includes direct employment in the sector, indirect employment outside the sector in businesses (both goods and services) in the supply chain that supplies the sector, and induced employment driven by the consumer spending of those employed directly and indirectly by the sector.
60 Economic and Social Council, Industrial Sector Report, 2018.

4 Features of the chemicals and cosmetics sector

The chemicals and cosmetics manufacturing sector includes companies that are engaged in manufacturing chemicals and chemical preparations from organic and inorganic raw materials. It consists of state-owned industrial establishments and privately owned small and medium-sized enterprises. The sector offers a variety of products that are used in areas such as construction, manufacturing processes, metal processing, sterilization and disinfection products and cosmetics.[61] According to the Jordan Chamber of Industry, the chemical and cosmetics sector in Jordan consists of the following subsectors:

- Soaps, detergents, cleaning and polishing preparations
- Perfumes and cosmetics
- Shampoos, hair sprays, cosmetics and shaving preparations
- Explosives and matches
- Gums and glue
- Refined and processed salt
- Dead Sea products (salts, mud, natural cosmetics materials)
- Lighting products, cinematographic and photographic materials, including films
- Materials used in the completion of tissue processing and dyeing
- Oil refining products
- Inorganic chemical materials
- Organic chemical materials
- Petrochemicals
- Fertilizers
- Pesticides and other agricultural chemicals
- Dyes, paints and similar coatings
- Printing inks
- Anti-freeze materials, fluids processing and hydraulic transport processors

For measuring cross-border trade in goods, the exports of the chemicals and cosmetics manufacturing sector is comprised of the following HS trade codes.

Table 4: Manufacture of chemicals and chemical products, HS codes

HS Code	Description
28	Inorganic chemicals, precious metals compounds, isotopes
29	Organic chemicals
31	Fertilizers
32	Tanning or dyeing extracts, tannins and their derivatives, pigments, etc.
33	Essential oils, perfumes, cosmetics, toiletries
34	Soaps, lubricants, waxes, candles, modelling pastes
35	Albuminoids, modified starches, glues, enzymes
36	Explosives, pyrotechnic products, matches, pyrophoric alloys, etc.
37	Photographic or cinematographic goods
38	Miscellaneous chemical products

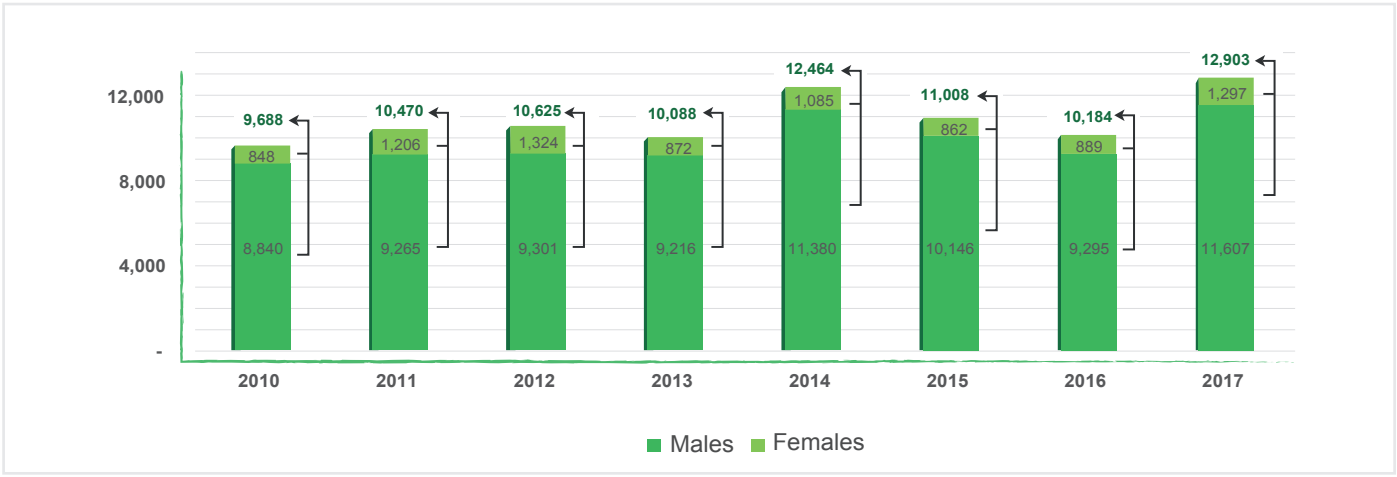
International Standard Industrial Classification (ISIC) Revision 4 categorizes the chemical manufacturing industry as Division 20 (Manufacture of chemicals and chemical products) of Section C (Manufacturing), a detailed listing of the relevant ISIC categories is provided in the Appendix.

61 Jordan Chamber of Industry, 2019.

5 Chemicals and cosmetics sector employment and establishments

According to the Jordan Chamber of Industry, the chemicals and cosmetic sector employed 15,209 workers across 692 establishments in 2018, compared to 12,903 in 2017, according to Department of Statistics data. Of these establishments, 243 are classified by the Jordan Chamber of Industry as industrial firms, while 449 are classified as smaller handicraft firms.[62] The Department of Statistics data breaks down the gender distribution of Jordanian workers by subsector, indicating that male workers accounted for 90 per cent of workers in the sector in 2017,[63] the number of female workers steadily increasing between 2015 and 2017. Figure 3 shows the number of workers in the sector by year between 2010 and 2017, broken down by gender.

Figure 3: Number of workers in chemicals and chemical products manufacturing by gender, 2010-2017



Source: Department of Statistics (Jordan), 2019a

According to ILO projections, fertilizers and other chemical products are anticipated to be a major contributor to the creation of new jobs. The two subsectors combined are expected to create more than 2,500 direct jobs in the sector, 7,300 indirect jobs outside the sector, and 11,690 induced jobs driven by the consumer spending of those employed directly and indirectly by the sector.[64] It is worth noting that 21 per cent of these jobs are expected to be filled by women. While still a relatively low percentage, it marks an increase on the current representation of females in the sector, as illustrated in figure 3. Table 5 shows the number of anticipated new jobs in fertilizers and other chemicals for Jordanian workers.

Table 5: Number of anticipated new jobs in fertilizers and other chemicals, 2019

	Direct jobs	Indirect jobs	Induced jobs
Fertilizers	1,346	5,457	7,559
Other chemical products	1,158	1,902	4,137
Total	**2,504**	**7,359**	**11,696**

Source: ILO, 2019

62 Jordan Chamber of Industry, Main Industrial Indicators, Issue No.18, 2018.
63 Calculated based on Department of Statistics (Jordan) data, 2019.
64 Indirect employment is employment outside the sector in businesses (both goods and services) in the supply chain that supplies the sector. Induced employment is employment driven by the consumer spending of those employed directly and indirectly by the sector.

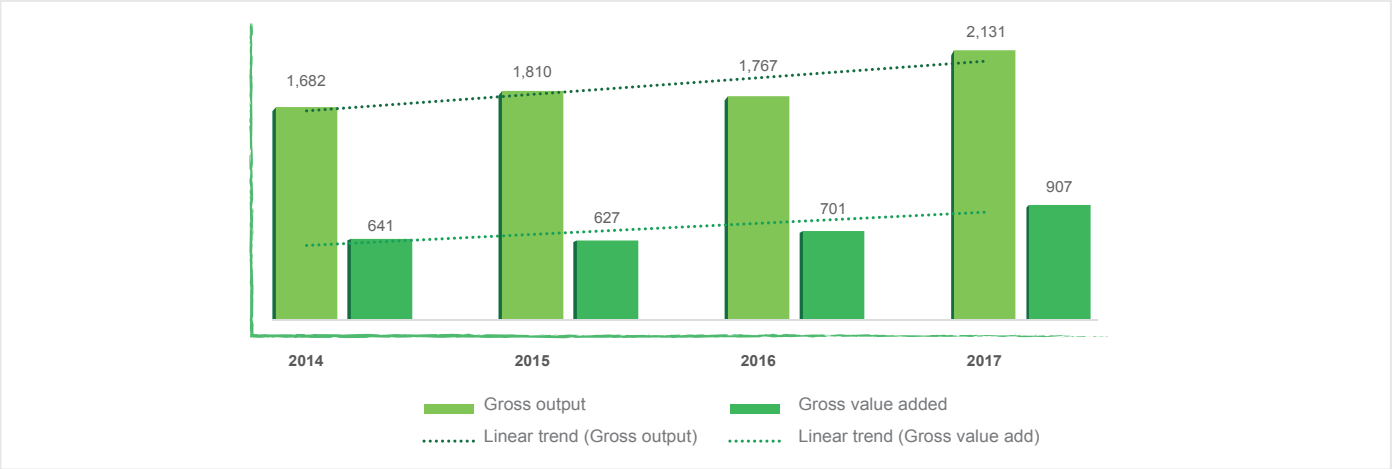
6 Chemicals and cosmetics sector: industrial indicators

To assess the performance of the chemicals and cosmetics manufacturing sector, selected industrial indicators published by the Department of Statistics were reviewed: gross output, gross fixed capital formation, intermediate consumption, taxes on production, and total compensation of employees.

6.1 Gross output and gross value added

Gross output measures the total value of output, without any deduction for the cost of inputs. According to the Department of Statistics, the gross output of chemicals and chemical products was US$2.1 billion in 2017, accounting for nearly 9.1 per cent of the gross output of all industrial activities in Jordan.[65] The chemicals and chemical products industry contributed 8.5 per cent of the gross value added of all industrial activities in Jordan, a total of US$10.7 billion in 2017.[66] Figure 4 shows gross output and gross value add between 2014 and 2017:

Figure 4: Chemicals: gross output and gross value added, 2014-2017 (US$ MM)



Source: Department of Statistics (Jordan), 2019b

The fluctuations in the output of the chemicals and cosmetics sector in recent years are mainly attributed to the following factors:[67]

- **Regional political instability,** particularly the conflicts in Syria and Iraq, have had a major impact on the sector. Exports to Syria, which was considered a major export market for chemicals, ceased when the border was closed. Trade with Iraq also stopped after the Iraqi border was closed in July 2015. With those two markets lost, local manufacturers had to re-route exports to Saudi Arabia and Kuwait at higher cost, which impacted competitiveness.
- **Falling oil and gas prices:** this has particularly impacted exports to Saudi Arabia, a key market for chemicals exports. Falling oil prices have also led to a decline in grants to Jordan by Gulf countries.

65 Department of Statistics (Jordan), Industrial Statistics Survey, 2019a.
66 Amounts reported do not include the manufacture of plastics and synthetic rubber in primary forms (ISIC 2013).
67 Oxford Business Group, "Jordanian industry makes progress on phosphate, chemicals and pharmaceuticals", 2017.

A closer look at gross output by subsector reveals that the manufacture of fertilizers and nitrogen compounds (ISIC 2012) had the largest gross output in 2017, reaching US$806 million, while the manufacture of paints, varnishes and similar coatings, printing ink and mastics (ISIC 2022) was the fastest growing subsector between 2014 and 2017, with a compound annual growth rate (CAGR)[68] of 9.6 per cent, reaching a total gross output of US$388 million in 2017. Table 6 breaks down gross output by subsector.

Table 6: Gross output by subsector, 2017

Subsector	2017 Gross output (US$ thousands)	% of total	2014-2017 CAGR %
2011 - Manufacture of basic chemicals	294,091	13.8	-0.9
2012 - Manufacture of fertilizers and nitrogen compounds	806,379	37.8	5.5
2021 - Manufacture of pesticides and other agrochemical products	60,445	2.8	-9.7
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	387,510	18.2	14.0
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	485,133	22.8	9.4
2029 - Manufacture of other chemical products n.e.c.	97,603	4.6	9.6
Total	**2,131,161**	**100**	13.49

Source: Department of Statistics (Jordan), 2019b

As for gross value added, the manufacture of fertilizers and nitrogen compounds (ISIC 2012) had the largest gross value added in 2017, while the manufacture of paints, varnishes and similar coatings, printing ink and mastics (ISIC 2022) was the fastest growing subsector between 2014 and 2017, with a CAGR of 20.3 per cent. Table 7 breaks down gross value added by subsector.

Table 7: Gross value added by subsector, 2017

Subsector	2017 Gross value added (US$ thousands)	% of total	2014-2017 CAGR %
2011 - Manufacture of basic chemicals	161,624	17.8	-0.8
2012 - Manufacture of fertilizers and nitrogen compounds	387,932	42.8	11.7
2021 - Manufacture of pesticides and other agrochemical products	18,292	2.0	-9.1
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	131,537	14.5	20.3
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	174,982	19.3	13.1
2029 - Manufacture of other chemical products n.e.c.	32,854	3.6	3.6
Total	**907,222**	**100.0**	

Source: Department of Statistics (Jordan), 2019b

68 CAGR is used to smooth the growth over a specified number of year/s as if the growth had happened steadily each year over that time period. CAGR formula = (Ending Value)/(Beginning Value)^(1/(n-1)-1.

6.2 Gross fixed capital formation [69]

Gross fixed capital formation in the chemicals and cosmetics sector was US$89.6 million in 2017, with a compound annual growth rate of 14.8 per cent for the period 2014-2017. Gross fixed capital formation directed to the sector accounted for 8.4 per cent of total GFCF for all industrial activities in Jordan, which reached a total of US$1.02 billion in 2017.[70]

Table 8 shows that the manufacture of basic chemicals (ISIC 2011) had the largest gross fixed capital formation in 2017 and the fastest growth in such capital formation between 2014 and 2017.

Table 8: Gross fixed capital formation by subsector, 2017

Subsector	2017 GFCF (US$ thousands)	% of total	2014-2017 CAGR %
2011 - Manufacture of basic chemicals	58,932	65.8	43.0
2012 - Manufacture of fertilizers and nitrogen compounds	8,333	9.3	-21.7
2021 - Manufacture of pesticides and other agrochemical products	2,448	2.7	1.6
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	8,488	9.5	5.0
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	10,252	11.4	20.5
2029 - Manufacture of other chemical products n.e.c.	1,142	1.3	-1.3
Total	**89,596**	**100.0**	

Source: Department of Statistics (Jordan), 2019b

6.3 Intermediate consumption

The manufacture of chemicals and chemical products accounts for 9.5 per cent (US$1.22 billion)[71] of the total intermediate consumption of industrial activities in Jordan, with a CAGR of 4.1 per cent for the period 2014-2017.[72] Intermediate consumption is highest for the fertilizers and nitrogen compounds subsector (ISIC 2012), reflecting the value created by the Jordanian extractive industries that supply it. It is worth noting that the fertilizers subsector uses raw materials from the inorganic chemicals sector (including potash, phosphates, bromides, ammonia, nitrogen compounds and potassium nitrates) and many other inorganic compounds to manufacture potassium, phosphate, and nitrogen-based fertilizers. Products classified under other chemicals (ISIC 2029) were the fastest growing subsector between 2014 and 2017, with a CAGR of 13.4 per cent.

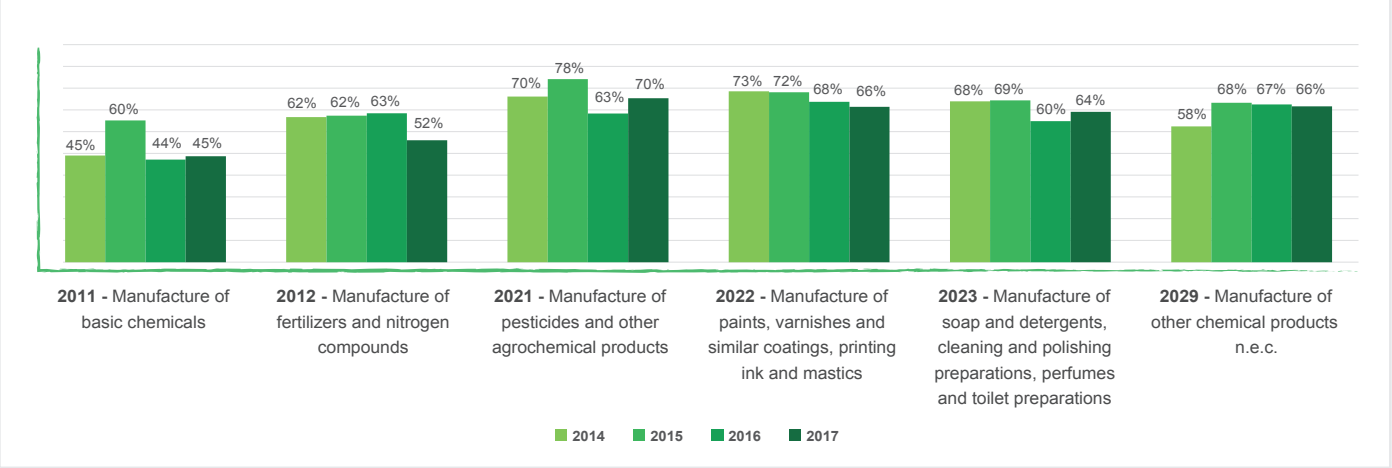
Table 9 provides further detail on intermediate consumption by subsector.

69 Gross fixed capital formation measures investment in fixed capital assets such as machinery and buildings, without any deduction for depreciation or asset sales, so it is a good indicator of new investment.
70 Department of Statistics (Jordan), Industrial Statistics Survey, 2019a.
71 Calculated based on Department of Statistics (Jordan) data, 2019.
72 Calculated based on Department of Statistics (Jordan) data, 2019.

Table 9: Intermediate consumption by subsector, 2017			
Subsector	**2017 Intermediate consumption (US$ thousands)**	**% of total**	**2014-2017 CAGR %**
2011 - Manufacture of basic chemicals	132,467	10.8	-1.1
2012 - Manufacture of fertilizers and nitrogen compounds	418,447	34.2	1.0
2021 - Manufacture of pesticides and other agrochemical products	42,153	3.4	-9.9
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	255,973	20.9	11.3
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	310,151	25.3	7.6
2029 - Manufacture of other chemical products n.e.c.	64,749	5.3	13.4
Total	**1,223,939**	**100.0**	
Source: Department of Statistics (Jordan), 2019b			

To assess the trends in intermediate consumption, figure 5 presents intermediate consumption as a percentage of gross output between 2014 and 2017. The manufacture of pesticides and other agrochemical products subsector (ISIC 2021) recorded the highest increase in intermediate consumption in 2017 relative to gross output, which indicates a decline in domestic gross value added. In contrast, the manufacture of fertilizers and nitrogen compounds (ISIC 2012), which contributes the largest output across all subsectors, recorded a 9 per cent drop in intermediate consumption, indicating an improvement in gross value added.

Figure 5: Intermediate consumption by subsector as a percentage of gross output, 2014-2017



Source: Department of Statistics (Jordan), 2019b

6.4 Taxes on production

Taxes on production for the manufacture of chemicals and chemical products reached US$95.9 million in 2017, accounting for 4.6 per cent[73] of total taxes on production for industrial activities in Jordan. It is worth noting that taxes on production grew rapidly between 2014 and 2017, with a CAGR of 7.0 per cent.[74]

A closer look at the subsectors in table 10 reveals that the manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (ISIC 2022) made the highest contribution to total taxes on production in 2017. It was also the fastest-growing subsector between 2014 and 2017, with a CAGR of 12.9 per cent.

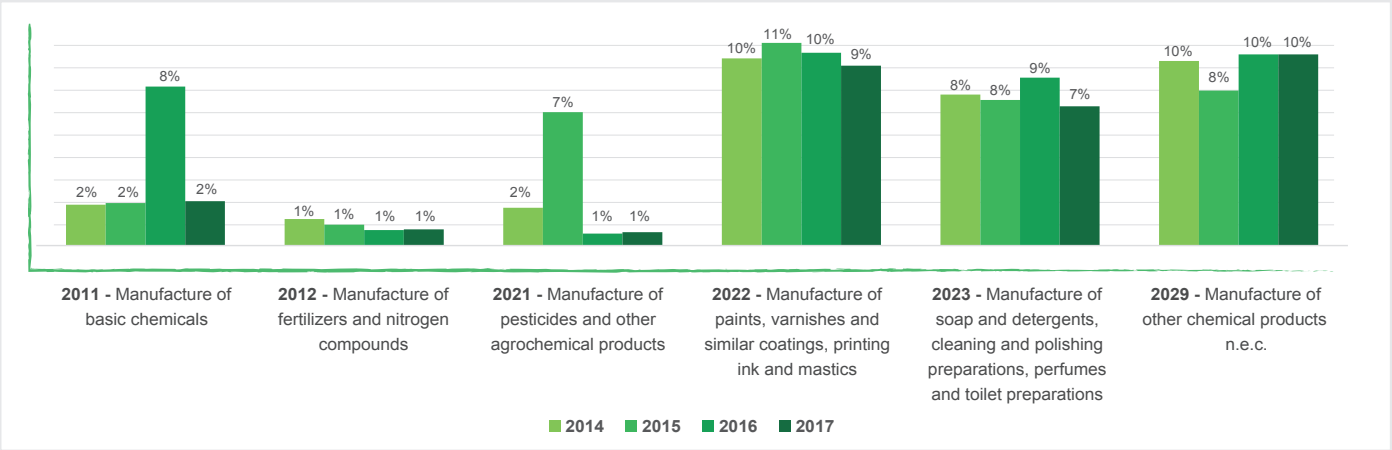
Table 10: Taxes on production by subsector, 2017

Subsector	2017 production (US$ thousands)	% of total	2014-2017 CAGR %
2011 - Manufacture of basic chemicals	6,847	7.1	1.2
2012 - Manufacture of fertilizers and nitrogen compounds	6,775	7.1	-6.9
2021 - Manufacture of pesticides and other agrochemical products	424	0.4	-30.3
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	36,613	38.2	12.9
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	35,473	37.0	7.2
2029 - Manufacture of other chemical products n.e.c.	9,798	10.2	10.6
Total	**1,223,939**	**100.0**	

Source: Department of Statistics (Jordan), 2019b

To assess the trends in taxes on production, figure 6 presents taxes on production as a percentage of gross output. It shows that the subsectors that witnessed a decline in taxes on production relative to gross output were: manufacture of basic chemicals (ISIC 2011), manufacture of paints, varnishes and similar coatings, printing ink and mastics (ISIC 2022) and manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (ISIC 2023).

Figure 6: Taxes on production by subsector as a percentage of gross ouput, 2014-2017



Source: Calculated based on Department of Statistics (Jordan) data, 2019

73 Calculated based on Department of Statistics (Jordan) data, 2019.
74 Calculated based on Department of Statistics (Jordan) data, 2019.

6.5 Total worker compensation

The total compensation of workers in the manufacture of chemicals and chemical products sector amounted to US$223 million in 2017, growing at a rate of 12.6 per cent between 2014-2017, and accounting for nearly 8.3 per cent of total worker compensation in the industrial sector.[75]

As shown in the following table, the manufacture of fertilizers and nitrogen compounds (ISIC 2012) was the main contributor to worker compensation in 2017, comprising nearly 30 per cent of total compensation in the chemicals and chemical products sector.

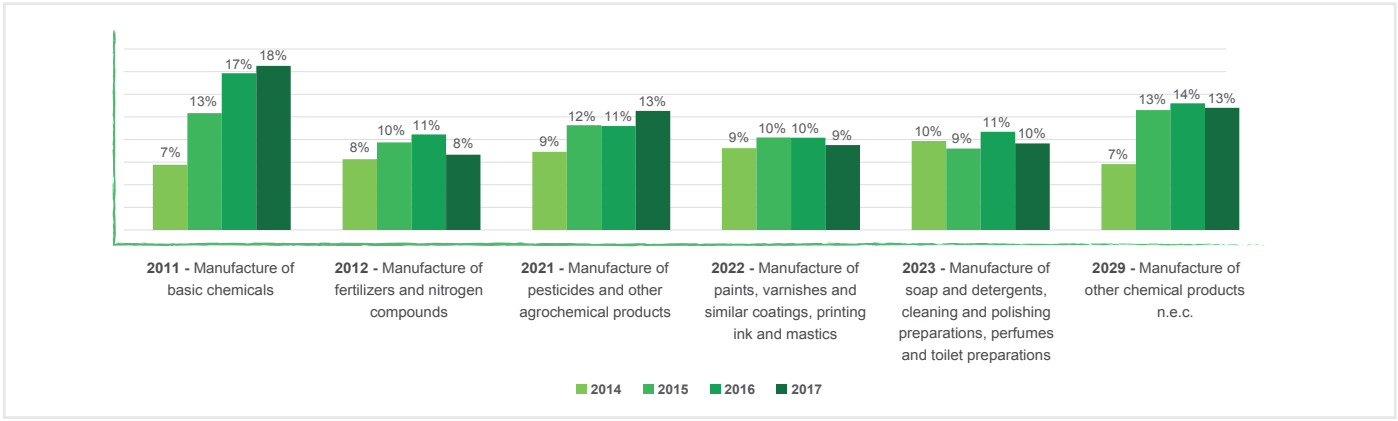
Table 11: Total worker compensation by subsector, 2017

Subsector	2017 Total worker compensation (US$ thousands)	% of total	2014-2017 CAGR %
2011 - Manufacture of basic chemicals	53,196	23.8	24.7
2012 - Manufacture of fertilizers and nitrogen compounds	66,924	29.9	7.1
2021 - Manufacture of pesticides and other agrochemical products	7,934	3.5	0.4
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	36,209	16.2	15.0
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	46,313	20.7	8.7
2029 - Manufacture of other chemical products n.e.c.	13,140	5.9	27.9
Total	**223,716**	**100.0**	

Source: Department of Statistics (Jordan), 2019b

Examining total worker compensation relative to gross output reveals that the manufacture of basic chemicals (ISIC 2011) had the highest worker compensation relative to gross output in 2016 and 2017, with the exception of the manufacture of pesticides and other agrochemical products (ISIC 2021) and the manufacture of basic chemcials (ISIC 2011), the increase in worker compensation in these two subsectors being attributed to the relative sophistication of the skills and expertise required in certain chemical industries such as reagents, chemical solvents, gums and anti-freeze agents, among others. All the other subsectors saw a decline in total worker compensation relative to gross output.

Figure 7: Total worker compensation as a percentage of gross output, 2014-2017



Source: Calculated based on Department of Statistics (Jordan) data, 2019

75 Calculated based on Department of Statistics (Jordan) data, 2019.

6.6 Summary of industrial indicators

Based on the review of the various industrial indicators presented above and examining the overall performance of all the subsectors, the manufacture of pesticides and other agrochemical products (ISIC 2021) stands out as seeing a significant decline across all indicators with the exception of a slight increase in total fixed capital formation. The manufacture of paints, varnishes and similar coatings, printing ink and mastics (ISIC 2022) stands out as showing the highest increase in gross output and gross value added and taxes on production during the period 2014-2017. Table 12 provides a summary of the compound annual growth rate for each of the selected industrial indicators between 2014 and 2017.

Table 12: Summary of industrial indicators, 2014-2017 - CAGR [76]

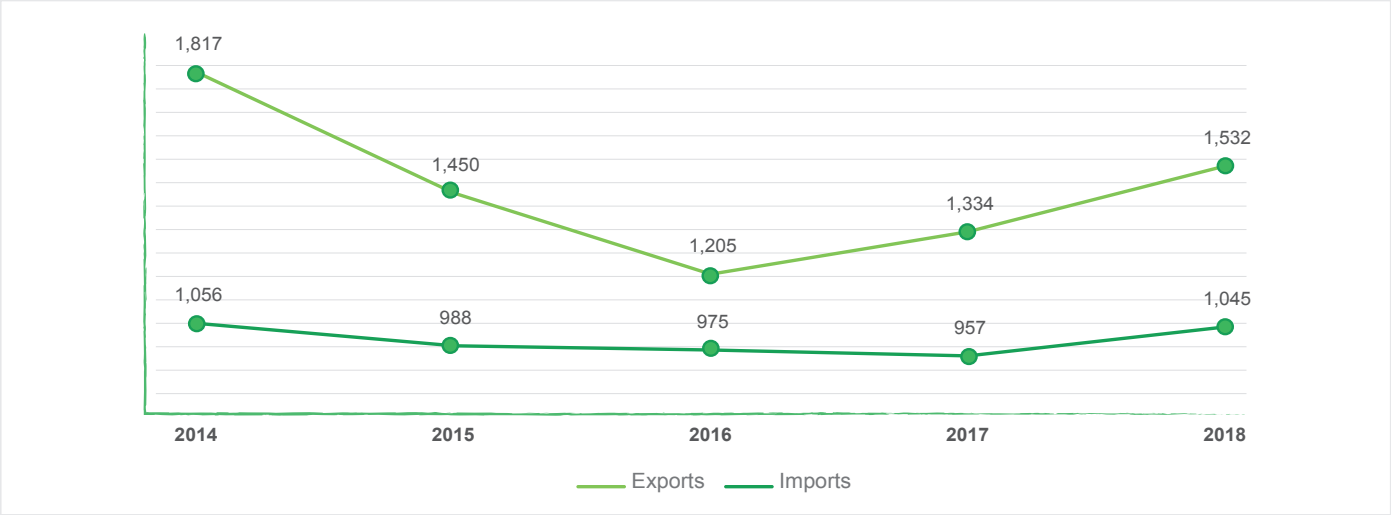
Subsector	Gross output %	Gross value added %	Total fixed capital formation %	Taxes on production %	Compensation of employees %	Intermediate consumption %
2011 - Manufacture of basic chemicals	-0.9	-0.8	43.0	1.2	24.7	-1.1
2012 - Manufacture of fertilizers and nitrogen compounds	5.5	11.7	-21.7	-6.9	7.1	1.0
2021 - Manufacture of pesticides and other agrochemical products	-9.7	-9.1	1.6	-30.3	0.4	-9.9
2022 - Manufacture of paints, varnishes and similar coatings, printing ink and mastics	14.0	20.3	5.0	12.9	15.0	11.3
2023 - Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	9.4	13.1	20.5	7.2	8.7	7.6
2029 - Manufacture of other chemical products n.e.c.	9.6	3.6	-1.3	10.6	27.9	13.4
Source: Department of Statistics (Jordan), 2019b						

76 Compound annual growth rate was calculated using data from Department of Statistics (Jordan) (2019a).

7 Trade patterns and trends

Exports of chemical products reached approximately US$1.5 billion in 2018, a 14.9 per cent increase compared to the previous year[77] and comprising 20 per cent of total exports of goods. This recent increase came after a significant drop between 2015 and 2016. Meanwhile, imports of chemical products saw a slight decline between 2015 and 2017, but rebounded in 2018 with a 9 per cent increase compared to 2017. Figure 8 shows the sector's imports and exports in the period 2014-2018.

Figure 8: Imports and exports of chemicals, 2014-2018 (US$ MM)



Source: ITC Trade Map, 2019

7.1 Trading partners

Exports of chemicals and cosmetics reached US$1,532 million in 2018, accounting for nearly 20 per cent of Jordan's exports of goods. Fertilizers alone (HS code: 31) accounted for 53 per cent of chemicals and cosmetics exports. Free zones were the primary export destination, accounting for 51 per cent of the subsector's exports. Free zones are areas outside the jurisdiction of Jordanian Customs and provide a duty-free and tax-free environment for the storage of goods transiting in Jordan. Free zones were established to promote export-oriented industries and transit trade. India, Iraq and Saudi Arabia were the main exporting markets for Jordan after free zones.

As for imports, the primary commodity imported was organic chemicals (HS code: 29), which accounted for 31 per cent of chemicals and cosmetics imports. China was the primary source of imports, accounting for 26 per cent of the subsector's imports, followed by India, Egypt, Saudi Arabia, and Germany.[78] Imports of organic chemicals from China are primarily inputs for locally produced chemical and pharmaceutical products. Table 13 lists Jordan's top trading partners by type of commodity (HS Code) in 2018.

77 Calculated based on Department of Statistics (Jordan) data, 2019.
78 ITC Trade Map, 2019.

Table 13: Main trading partners 2018, US$ thousands and percentages						
	Exports			Imports		
Subsector	Partner	Trade value US$ thousands	% of subsector total	Partner	Trade value US$ thousands	% of subsector total
28 - Inorganic chemicals, precious metal compounds, isotopes	Free zones	204,242	51	China	18,784	26
29 - Organic chemicals	Free zones	4,333	27	China	84,942	27
31 – Fertilizers	India	273,346	34	Egypt	10,145	30
32 - Tanning, dyeing extracts, tannins and their derivatives, pigments, etc.	Iraq	18,722	31	China	19,113	23
33 - Essential oils, perfumes, cosmetics, toiletries	Free zones	9,569	23	Egypt	28,132	13
34 - Soaps, lubricants, waxes, candles, modelling pastes	Iraq	80,776	62	Saudi Arabia	34,390	26
35 - Albuminoids, modified starches, glues, enzymes	Saudi Arabia	1,294	21	Saudi Arabia	2,624	14
36 - Explosives, pyrotechnic products, matches, pyrophoric alloys, etc.	Iraq	60	56	India	1,201	42
37 - Photographic or cinematographic goods	Egypt	12	52	China	1,480	26
38 - Miscellaneous chemical products	Saudi Arabia	8,423	13	Germany	22,095	14
Source: ITC Trade Map, 2019						

7.2 Export patterns

According to trade data published by ITC Trade Map, fertilizers (HS code: 31) and inorganic chemicals, precious metals, isotopes (HS code: 28) comprised 79 per cent of the sector's total exports in 2018. Soaps, lubricants, waxes, candles, modelling pastes (HS code: 34) were next, contributing 8 per cent, while all the other subsectors contributed the remaining 12 per cent.[79] Table 14 provides a breakdown of Jordan's exports by subsector for the period 2016-2018:

79 Calculated based on ITC Trade Map data, 2019.

Table 14: Chemicals exports by subsector, 2016-2018 (US$ MM)					
Code	**Subsector**	**2016**	**2017**	**2018**	**2016-2018 CAGR %**
31	Fertilizers	612.7	657.7	809.8	9.7
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare earth metals, etc.	318.3	385.2	401.5	8.0
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, etc.	100.5	101.5	130.1	9.0
38	Miscellaneous chemical products	62.3	69.3	67.6	2.8
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments, etc.	52.7	56.7	59.7	4.2
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	38.1	39.0	41.3	2.7
29	Organic chemicals	13.9	17.5	16.2	5.2
35	Albuminoidal substances; modified starches; glues; enzymes	5.8	6.5	6.1	2.0
37	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	0.1	0.1	0.1	8.7
36	Photographic or cinematographic goods	0.5	0.1	0.0	-64.7
	Grand Total	**1,204.9**	**1,333.7**	**1,532.3**	**8.3**
Source: ITC Trade Map, 2019					

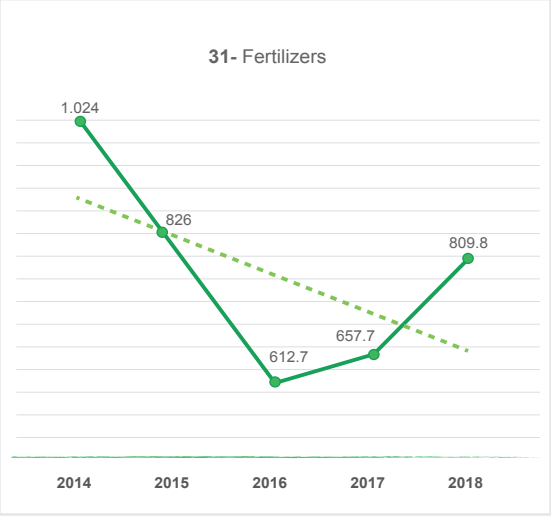
The next sections provide a more detailed view of the exports of the three key subsectors, which comprised more than 87 per cent of Jordan's exports in 2018.

Fertilizers

Fertilizers (HS code: 31) are the main driver of Jordan's chemicals exports, comprising nearly 53 per cent of the sector's total exports in 2018. The subsector's exports reached US$809 million in 2018, a 23 per cent increase over 2017. This increase came after a drastic fall in 2015 and 2016, caused mainly by political instability in the region and the decline in oil prices, which impacted demand from the Gulf countries.

The fertilizers sector usually uses raw materials from the inorganic chemicals sector, particularly potassium fertilizers (from the Dead Sea area) and phosphate-based fertilizers (from the phosphate mine at Russiefa, east of Amman, and the Al-Hasa mines to the south). The main export markets include India, China, Egypt, Malaysia and Indonesia, followed by some

Figure 9: Exports of fertilizers 2014-2018, US$ MM



Source: ITC Trade Map, 2019

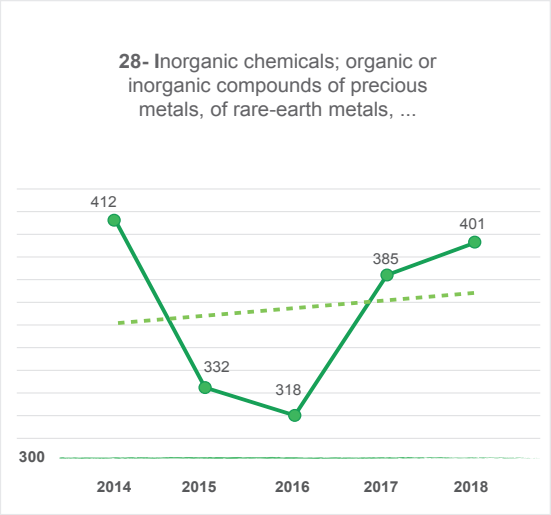
countries in the Middle East and South-East Asia. The main providers of base fertilizers/raw materials are the Arab Potash Company, JPMC, KEMAPCO, JAFCCO, Indo-Jordan Chemicals, Nippon Jordan Fertilizers and First Global Company.

Inorganic chemicals

Inorganic chemicals, organic or inorganic compounds of precious metals, of rare earth metals, of radioactive elements or of isotopes (HS code: 28) are the second driver of chemicals exports, comprising more than 26 per cent of the sector's total exports in 2018. The subsector's exports reached US$401 million in 2018, a 4 per cent increase over 2017. The decline in previous years was for the same reasons described above for fertilizers.

Inorganic chemicals include potash, bromides, phosphates, and potassium nitrates as extractive materials from the Dead Sea area. These chemicals are mainly used as raw materials for other industries such as fertilizers and some chemical applications. Eighty per cent of the sector›s production capacity is concentrated with two key players, the Arab Potash Company and Jordan Phosphate Mines Company (JPMC).

Figure 10: Exports of inorganic chemicals 2014-2018, US$ MM

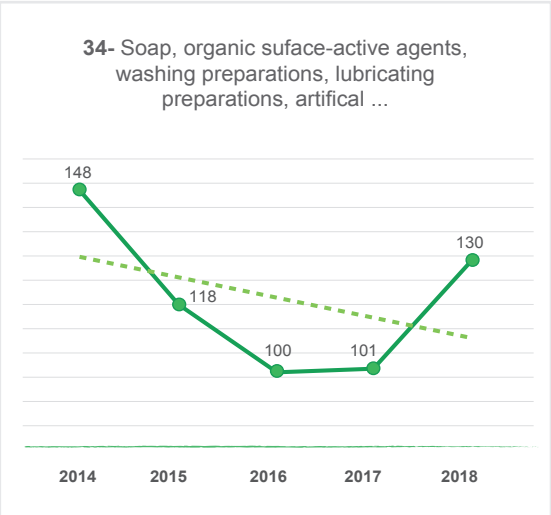


Source: ITC Trade Map, 2019

Soaps, lubricants, waxes, candles, modelling pastes

Exports of soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, «dental waxes» and dental preparations with a basis of plaster (HS code: 34) reached US$130 million in 2018, accounting for 8 per cent of the chemicals sector's exports. This subsector recorded a 28 per cent increase over 2017. This subsector covers a spectrum of products including liquid and powder detergents, soaps and glass cleaners, among others.

Figure 11: Exports of soaps, lubricants, waxes, candles, modelling pastes 2014-2018, US$ MM



Source: ITC Trade Map, 2019

All other subsectors

The remaining subsectors combined comprised less than 13 per cent of chemicals sector exports in 2018. With the exception of essential oils and resinoids (HS code: 33), all the remaining subsectors saw a slight decrease in exports compared to 2017. The minor decrease in exports in these subsectors did not, however, impact significantly on the outcome of the chemicals sector as a whole because of their small contribution to overall exports.

7.3 Import patterns

Jordan's imports of chemical products are primarily comprised of organic chemicals (HS code: 29), essential oils, perfumes, cosmetics, toiletries (HS code: 33), and miscellaneous chemical products (HS code: 38). These three product categories accounted for 69 per cent of total imports of chemical products. In the 2018[80] Table 15 provides a breakdown of Jordan's imports by subsector between 2016 and 2018:

Table 15: Chemicals imports by subsector, 2016-2018 (US$ MM)

Code	Subsector	2016	2017	2018	2016-2018 CAGR %
29	Organic chemicals	270.0	271.5	321.0	5.9
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	204.6	203.5	218.3	2.2
38	Miscellaneous chemical products	149.3	153.7	158.6	2.0
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, etc.	127.9	121.0	131.9	1.1
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments, etc.	77.1	83.8	83.7	2.8
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare earth metals, etc.	71.0	58.0	70.6	-0.2
31	Fertilizers	47.2	36.4	33.4	-10.9
35	Albuminoidal substances; modified starches; glues; enzymes	18.4	21.3	19.0	1.1
37	Photographic or cinematographic goods	8.4	6.2	5.7	-12.2
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	1.3	1.9	2.9	31.6
	Grand Total	**975.3**	**957.2**	**1,045.1**	**2.3**
Source: ITC Trade Map, 2019					

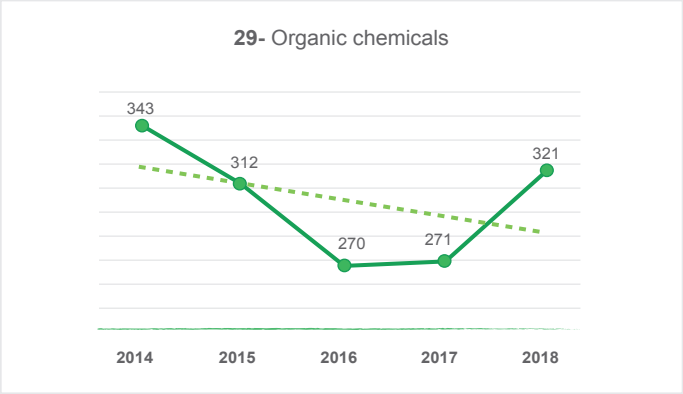
The next section provides a more detailed view of the imports of the three key subsectors.

80 Calculated based on ITC Trade Map data, 2019.

Organic chemicals

Products with a higher value-added chemical derived from carbon, such as amino-compounds, isocyanates, and acyclic alcohols and their derivatives, categorized under organic chemicals (HS code: 29), were the primary driver of chemicals imports, accounting for more than 30 per cent of total chemicals imports. Imports of organic chemicals reached US$321 million in 2018, an 18 per cent increase over the previous year. This increase in imports came after a steady decrease between 2014 and 2016, as shown in figure 12.

Figure 12: Imports of organic chemicals 2014-2018 (US$ MM)

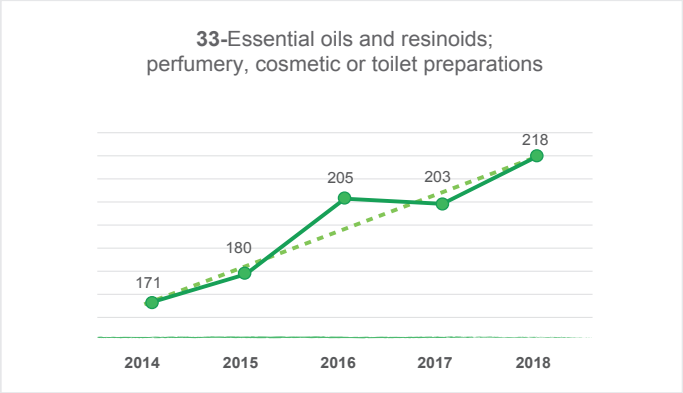


Source: ITC Trade Map, 2019

Essential oils, perfumes, cosmetics, toiletries

Imports of essential oils, perfumes, cosmetics, toiletries (HS code: 33) have increased steadily since 2014, reaching US$218 million in 2018 and marking a 7 per cent increase over 2017. Products categorized under preparations for use on the hair (HS code: 3305) accounted for US$75 million of total imports in this subsector.

Figure 13: Imports of essential oils, perfumes, cosmetics, toiletries 2014-2018, US$ MM

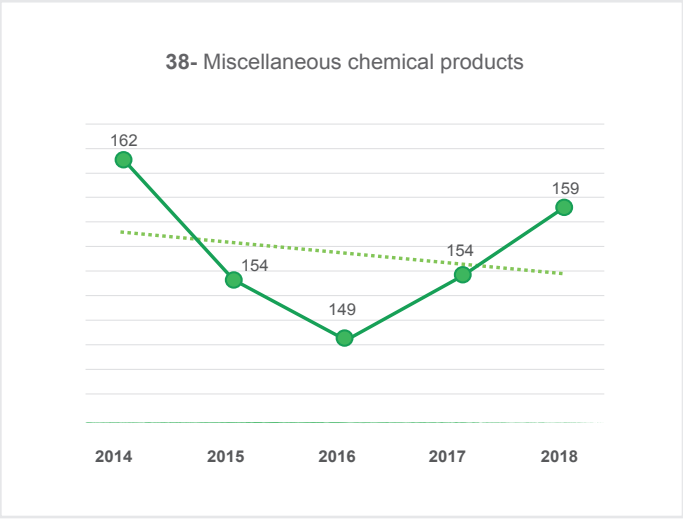


Source: ITC Trade Map, 2019

Miscellaneous chemical products

Imports of miscellaneous chemical products (HS code: 38) reached US$159 million in 2018, accounting for 15 per cent of Jordan's imports. Diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents (HS code: 3822) were the primary products imported, with imports totalling almost US$41 million in 2018.

Figure 14: Imports of miscellaneous chemical products 2014-2018, (US$ MM)



Source: ITC Trade Map, 2019

All other subsectors

All the other subsectors combined accounted for nearly 30 per cent of chemicals imports, with products categorized under soap, organic surface-active agents, washing preparations, lubricating preparations (HS code: 34) being the main driver of imports.

7.4 C&C Sector in light of COVID-19

In the chemical & cosmetics sector some subsectors have flourished and expanded during the pandemic. These sub-sectors include Detergents & Disinfectants, and Fertilizers & Pesticides. Some have suffered greater negative impacts across all economic indicators for example Paints, and cosmetics (especially Dead Sea Products). The residual effect in the aftermath of the pandemic and its effect on all major economic indicators (Output, Income, contribution to GDP, employment…etc.) is still unclear at the moment, especially with an absence of a clear vision for the future of the sector. A better assessment will become possible after the month of July, under the assumptions that factories will be able to resume production efficiently, and at their original capacity by then.

Major internal economic shocks have occurred since the pandemic emerged in Jordan back in mid-March, that have crippled the functionalities of the sector on multiple fronts. The supply chain for many businesses has deteriorated with a lack of access to raw materials production has halted for over two months; access to target markets has been interrupted, specifically via reduced export, and the reduced consumer purchasing power. Beyond the difficult conditions for the sector as a whole, a number of sub-sectors within the Chemicals and Cosmetics sector are producing highly rated “essential” products, which provides great potential and much-needed hope in the midst of the crisis.

Given the circumstances factories within the Chemical & Cosmetics Sector have shifted their strategies and methods of operations to more efficient ways that cope with the “new-norm”. On the top of the list was are changes to sales strategies and revenue cycles. As operations ceased for almost three months, most factories faced difficulties in collecting proceeds of their sales, especially on credit, as post-dated cheques started accumulating and banks received dishonoured cheques. In a cycle that was highly dependent on “accounts receivable”, factories have found themselves struggling to collect sales proceeds (i.e. revenue). While some have resorted to reducing sales so as to a more guaranteed pay-stream, others have issued policies to permit cash-sales only.

The sales problem has been exacerbated as most sub-sectors have found it very difficult to access the external market, due to the regulations and closures imposed and subsequent extreme shipping costs, even to neighbouring countries that were once reliable markets such as Egypt. Furthermore, export orders placed were reported to have dropped to third of the usual quantities. As some factories tried shifting to local sales, restricted access between governorates for over three months caused difficulties.

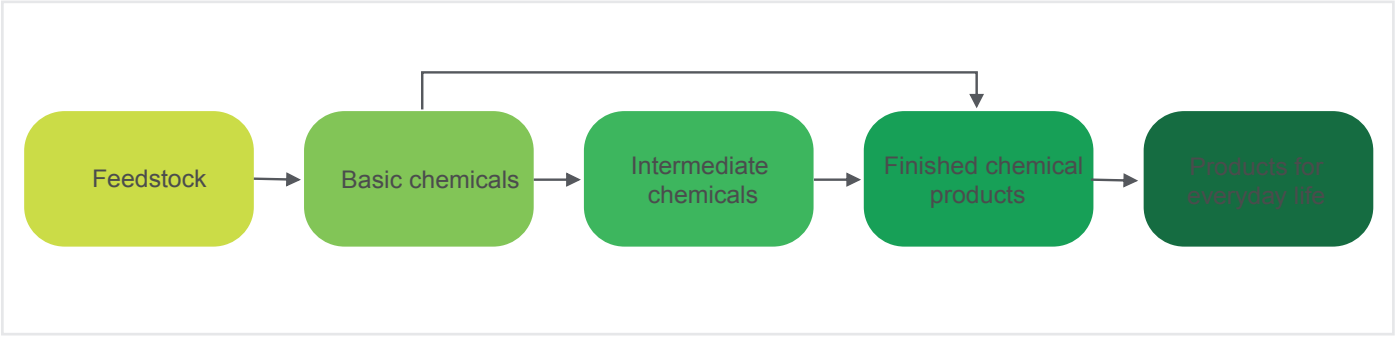
On the other hand, as Jordan is rich with raw materials for chemical production (ex: phosphate, potash, among others) many factories have not faced problems in acquiring most of their required raw materials. However, prices have increased on these inputs, as they became scarcer during the crisis. Combined with the problem in the revenue cycles and chains, this has affected the sector’s production chain, and with the low sales in most sub-sectors and accumulating operational expenses (prices on water and electricity have not changed); most factories find themselves in critical positions that will be clearer in terms of how they will be operating by the end of the year.

The Chemicals & Cosmetics factories, like most other enterprises resuming their operations, have worked on implementing new safety regulations to counteract the effect of COVID-19, and the possibility of infections for both employees and customers. Many have suspended large meetings and trainings, and did not renewed employee contracts that expired in March. Additionally, all expenses that were considered non-essential were completely cut-off, as they were already operating at low capacity. Factories are also being sterilized regularly and social distancing measures have been implemented, in addition to it becoming mandatory for each employee to wear gloves and a mask. Furthermore, many firms have invested in electronic platforms, and in E-commerce approaches to sales, including Arabic-language virtual shops, and some are considering investing in ERP systems to be able to manage employees remotely in a more effective manner.

8 Value chain and value-added services

The various subsectors of the chemicals and cosmetics sector have significantly different value chains. A conventional chemical industry value chain is comprised of key stages that are illustrated in figure 15[81].

Figure 15: Conventional chemical industry value chain



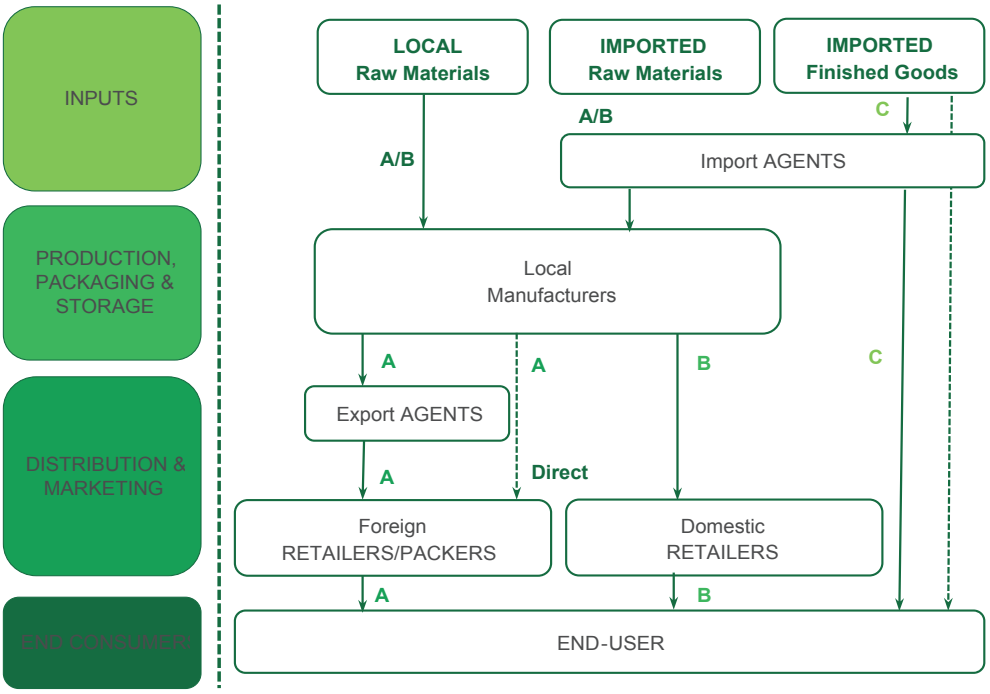
Feedstock and raw materials are typically the main driver of production costs. Hence, procuring a reliable supply of low cost feedstock and raw materials that meet quality requirements is a major factor in competitiveness. Volatility of such costs is a critical issue that requires managing and can directly impact profitability and cash flow. In addition, the limited availability of materials has sometimes constrained the ability of producers to deliver product to their customers.[82]

A study completed by the German International Cooperation Agency (GIZ) in 2019 provides a deeper analysis of the value chains of three chemicals and cosmetics subsectors: soaps and detergents, pesticides and Dead Sea products.The next sections of the present report provide an overview of the key themes of the GIZ report.

81 Genomatica Inc. 2011 Annual Report.
82 Genomatica Inc.

A typical value chain in Jordan's chemicals sector is broken down into four main stages, as illustrated in figure 16.

Figure 16: Chemicals value chain flow



A. Domestically produced finished goods channelled to export markets
B. Domestically produced finished goods for sale in the domestic market
C. Imported finished goods for sale in the domestic market

Source: GIZ, 2019

The different stages across the value chain are:

- **Sourcing:** raw ingredients/materials: There are two main sources of raw materials used in chemicals manufacturing in Jordan: domestic and imported. Most local manufacturers in the sector import their raw materials and are therefore exposed to various risks, such as currency fluctuations, bureaucratic delays, and negotiations with foreign suppliers or agents. According to the GIZ report, the limited domestic supply forces manufacturers to opt for imports, which are associated with higher costs and more risks.

- **Research and development:** Most Jordanian players in the chemicals sector do not consider research and development an essential expense and, to save costs, do not allocate resources to it. This is primarily driven by their limited financial capacity and limited knowledge. Consequently, manufacturers usually copy the formulae/ingredients used by other products rather than investing in their own research and development (R&D). According to the GIZ report, R&D is associated with high costs to set up laboratories and acquire the laboratory equipment needed for testing and/or to outsource testing services. There is also a skills gap, with a mismatch between market needs and the skills of local graduates.

- **Production:** Production is generally characterized by a lack of capacity for investment, which dictates increasing dependence on labour-intensive processes and limits any investment in new machinery and equipment. Production costs represent a significant proportion of the total operating costs of local manufacturers and have steadily increased in recent years due to higher utility costs, the expiry of Jordan's income tax subsidy scheme for exported goods at the end of 2018, and limitations around financing.

- **Packaging and storage:** Typically, packaging costs do not comprise a large fraction of total production, but there are major differences among manufacturers, depending on their size, maturity and target market. Packaging costs for higher-margin consumer products, for example, may be much higher than for products marketed to industrial users. Packaging material is sourced domestically and internationally. Importing packaging material is associated with various challenges and risks such as availability, timeliness of delivery, customs delays, and minimum orders quantity requirements. Storage is handled locally and the cost is typically dependent on each product's specific requirements, but special storage requirements for certain products also contribute to an increase in storage costs.

- **Distribution and marketing:** Chemical products are distributed to three main customers: small retailers, industrial goods retailers, and "agrivets". Domestic distribution can be handled directly by manufacturers, typically for an additional mark-up on the selling price, or through agents for a predetermined fee. Depending on the product, marketing is done on one of two levels: B2C, whereby products are directly marketed to end-users through promotions, flyer distribution and discounts; and B2B, whereby products are marketed to large customers and institutional channels through customer relationship-building, incentives for purchasing in volume, and account management. Government institutions are also an important channel for certain chemicals, such as pesticides.

Consumers: In general, consumers of chemicals are divided into end-users, companies, and government institutions. The institutional segment includes government institutions, such as the Ministry of Health and local government for pesticides.

9 Primary research methodology

The research methodology is based on ILO Skills for Trade and Economic Diversification. STED is a sector-level study that aims to align skill policies with sectoral strategies that contribute to export growth, economic diversification and employment creation.

In relation to the chemicals and cosmetics sector, the STED research methodology aims to answer the following questions:

- What are the major characteristics of the sector and enterprises in the sector? What is the regulatory framework affecting the sector?
- What is the structure of the workforce in the sector? What are the current skills needs for industrial firms in the sector?
- What are the skills needs and other employment characteristics of microenterprises[83] in the sector? How do they compare to the needs of industrial firms?
- What do training providers offer? What skills do they typically train graduates and job seekers in?
- What are the gaps between skills supply and demand in the sector?
- What are the possible growth scenarios for the sector?
- What are the business and skills capability gaps in the sector and how can they be overcome?

Accordingly, the STED-Plus research was implemented in five main phases:

1. **Desk-top review:** Quantitative and qualitative analysis of the sector was undertaken using secondary data sources such as UN Comtrade, the Department of Statistics Industrial Survey and Jordan Chamber of Industry data. The desk-top review also included a review of recent literature published on the sector.
2. **Field survey:** A quantitative and qualitative analysis of the sector was undertaken using primary data collected in the field. The survey covered both the demand side (i.e. enterprises working in the sector). and the supply side (i.e. training providers and educators)
3. **Validation of findings:** The findings of the first two phases were discussed and validated with the sector skills council and representatives of the industry covering:
   - o Economic, trade and employment data reported on the sector.
   - o General outcomes of the field survey in relation to the labour demand and supply side of the industry.
   - o Detailed outcome of the field survey covering occupations demanded by subsectors.
   - o Detailed outcome of the field survey covering challenges facing the sector.
4. **Scenario Planning:** Based on the outcomes of the study, a scenario planning session was organized with the sector skills council to discuss industry growth prospects until 2025 in terms of export values and job prospects.
5. **Report writing:** The final report was drafted based on the outcome of the study and the validated data, which was finally reviewed and approved by the sector skills council and ILO.

83 According to the Jordan Chamber of Industry classification, microenterprises employ fewer than 10 workers and have a registered capital of less the JD30,000. Industrial firms employ more than 10 workers and have a registered capital of more than JD30,000.

9.1 Survey methodology

To better understand the occupations in the sector in terms of demand and supply, primary field data were collected from enterprises through the "industrial survey" and from training providers/educators through "structured in-depth interviews".

Preparatory work

9.1.1 Industrial survey database, population and sample population

Data on officially registered enterprises was collected from the Jordan Chamber of Industry database of enterprises operating in the sector. The total population of enterprises that were reviewed and approved by the sector skills council was of 495 firms.

Table 16: Total survey population

C Enterprises	# of firms
Verified firms and contacts	327
Did not cooperate	57
Did not reply	54
Wrong numbers	56
Total population	**495**
Closed	49
Not related to chemicals and cosmetics	76

Another phase of data clean-up was undertaken to verify numbers and contacts using the KINZ database. A total of 327 companies (66 per cent) from the original population were contacted, **of which 137 firms were surveyed**.

9.1.2 List of training/education providers

Data on officially registered training providers for the sector were collected from the Centre of Accreditation and Quality Assurance database. Additional Internet research was undertaken to collect and fine-tune the data. A list of 25 training/education providers was developed, of which a final list of ten institutions was selected by the sector skills council as the sample for the in-depth structured interviews.

9.1.3 Questionnaire design

Firms in the chemicals and cosmetics sector were classified into the following five categories:

(A) Manufacture of paints, inks and dyes
(B) Manufacture of perfumes cosmetics and Dead Sea products
(C) Manufacture of detergents and chemical disinfectants
(D) Manufacture of fertilizers and pesticides
(E) Manufacture of other chemical products.

Priority occupations by subsector were identified in collaboration with the sector skills council and industrialists operating in each subsector. Accordingly, a total of 26 occupations were prioritized by subsector. Main duties per occupation were identified and coded using the International and the Arab Standard Classification of Occupations (ISCO and ASCO) (See appendix 2 for details).

The industrial and the training/education providers' questionnaires were drafted in English and translated into Arabic. Both questionnaires were pre-approved by the sector skills council and ILO. Training sessions were delivered to enumerators to familiarize them with the technical questions on the sectors/subsectors and priority occupations for both questionnaires.

The questionnaire for training providers contained six main categories with a total of 59 questions, while the industrial survey questionnaire contained five main categories with a total of 39 questions. Table 17 provides an overview of the topics covered in the survey.

Table 17: Questionnaire categories

Questionnaire for training providers	# of Questions	Industrial survey questionnaire	# of Questions
Firmographics	17	**Firmographics**	11
Training/educational programmes	10	**Production and business**	10
Employability life skills	5	**Structure of workforce**	2
Collaboration with employers	20	**Current workforce skills**	7
Educational/training standards and trainers	7	**Workforce development**	9
Total	**59**		**39**

9.1.4 Piloting

Industrial Survey: The questionnaire was programmed on a tablet to facilitate data collection and secure daily data transfer to SPSS Statistics, the software package used. Survey validity was established using a pilot conducted on a randomly selected 10 per cent of the population to time the survey and resolve problems with interviews and questions. The pilot was used to test data entry, data analysis, coding, data cleaning, and data consistency using Cronbach's alpha.

Once the questionnaire was programmed, the enumerators received a third training session to test the programmed questionnaire.

Training/education providers structured in-depth interviews: The questionnaire was completed manually. The pilot was carried out on two training/education providers. The data from the structured in-depth interviews was tabulated and analysed using Microsoft Excel.

The pilot data collection results proved rational when verified with the sector skills council. Nonetheless some questions required rearrangement to enhance the flow of questions.

9.2 Data collection

9.2.1 Industrial survey

The industrial survey was conducted on a representative sample of 137 firms in three phases:

1. Field survey from August 2019 to December 2019.
2. Field survey from early to mid-January 2020.
3. Focus group organized at the end of January 2020 to facilitate the collection of additional enterprise data.

The industrial survey was completed in a face-to-face interview using a mixed approach of scheduled appointments and random visits to guarantee a higher response rate. All interviews were conducted by one lead interviewer and two enumerators.

The enumerators reported daily on field visits, describing the success and/or the hurdles they faced. An assessment and re-evaluation of the data collection process was performed weekly. To further guarantee accuracy, the data on the system was reviewed again by section and refined to eliminate any possible errors or miscommunication.

9.2.2 Training providers: in-depth structured interviews

The in-depth structured interviews of training providers were conducted on a sample of ten institutes. The face-to-face interviews were held by one lead interviewer and two enumerators.

The enumerators reported daily on the interviews, describing the success and/or the hurdles they faced. An assessment and re-evaluation of the interview process was performed daily. Interview outputs were tabulated into Excel every day and the results were reviewed on a weekly basis.

9.3 Research limitations

9.3.1 Sample Size

Sample size was influenced by several variables:

1. **Database accuracy:** Despite several attempts to fine-tune the database, the researchers were unable to contact the whole population (only 137 out of 495 were contacted) due to non-responsive or inaccurate telephone numbers, permanent and/or temporary closure of some factories due to the seasonality of their business (e.g. manufacture of uniforms).
2. **Refusal of firms to hold interviews:** Several firms were contacted but refused to schedule interviews with enumerators due to the absence of senior management to provide approval, or simply lack of desire to cooperate.
3. **Refusal of firms to hold interviews after scheduling meetings:** Some firms, with which appointments had been scheduled, did not attend the interview, either because they forgot the appointment, or they were too busy to spend time with the enumerators
4. **Duplicated names:** Some firms appear in the database under more than one name.

9.3.2 Incomplete / inaccurate data provided

It is important to highlight various challenges that were encountered in collecting the required data because they affected how certain insights were analysed. The challenges were primarily in two areas:

- **Unavailability of required data:** A significant number of the academic institutes surveyed were unable to provide data on the number of students enrolled in relevant courses. Some were also unable to provide the total number of graduates from their programmes. One academic institution, the German Jordanian University, was unable to provide data on the employment rates of their programmes. They were also unable to say how they select the programmes offered under industrial engineering. The absence of this information prevents the report from providing a granular view of the number of enrolled students and graduates at the programme level. In some cases data were aggregated and presented across institutions.
- **Inability to link supply data to sector needs:** Several academic institutes were unable to provide specific answers on the relevance of their courses and training. While this demonstrates an apparent disconnect between training institutes and the market, it also affects the insights provided below.

Some firms did not want to provide data on specific questions due to time limitations or unavailability of data. Others provided estimates, while some provided answers to only half the questions.

9.4 Adaptation of methodology during project implementation period

Certain adjustments had to be made in the course of the primary research.

9.4.1 Inaccuracy in some surveyed companies

The primary research, based on the SPSS data and findings, surveyed 137 companies. During analysis of the data, discrepancies were found in the data for some of the companies. Data verification concluded that eight of the 137 companies surveyed did not form part of the chemicals and cosmetics sector. These companies were registered with the Chamber of Industry as chemical companies because of their use of chemical processes for manufacturing, and the system classified them as such. Nonetheless, the main industrial products they manufacture are plastics so they are in fact in the *plastics and rubber* sector and had to be removed from the survey to maintain the accuracy of results. **The final number of companies analysed was 129.**

9.4.2 Broadening priority occupations

ILO, the project implementation team, and the sector skills council initially identified 26 priority occupations specific to the subsectors and harmonized them with the ASCO (see Appendix 2).

Upon completion of the industrial survey work on employment and projected future vacancies, the data on occupations were validated by focus groups from the industry and the sector skills council. After a number of sessions, the council suggested that it would be preferable to place the priority occupations into more general occupational categories that would serve the sector as a whole, instead of narrowly-defined occupations for specific subsectors. Accordingly, the sector skills council, with advice from ILO and the project implementation team, identified seven more broadly-defined occupations that are important for the sector as a whole, especially in terms of scenario planning and bridging gaps between labour demand and supply.

It was agreed that the main skills needed are common across all enterprises in the sector and all fall into the following seven categories:

- Machine operator
- Laboratory technician (R&D)
- Production supervisor
- Industrial machinery maintenance technician
- Warehouse technician
- Chemicals preparation, packaging and filling technician
- Laboratory technician (quality assurance).

The future vacancies figures produced by the primary research were redistributed across these categories to form the basis for scenario planning in accordance with enterprise and market needs.

10 Industrial survey results (demand side)

The STED survey of the chemical and cosmetics industry focused on identifying the skills needs of each subsector within the sector, focusing on demand in the labour market, and the skills lacking. Each subsector within the industry has different skills needs, and the analysis was conducted on this basis. The Jordanian chemical and cosmetics industry has the following main subsectors:

- Manufacture of paints, inks and dyes
- Manufacture of perfumes, cosmetics and Dead Sea products
- Manufacture of detergents and chemical disinfectants
- Manufacture of fertilizers and pesticides
- Manufacture of other chemical products

10.1 Profiling of surveyed firms

10.1.1 Number of firms by subsector and governance

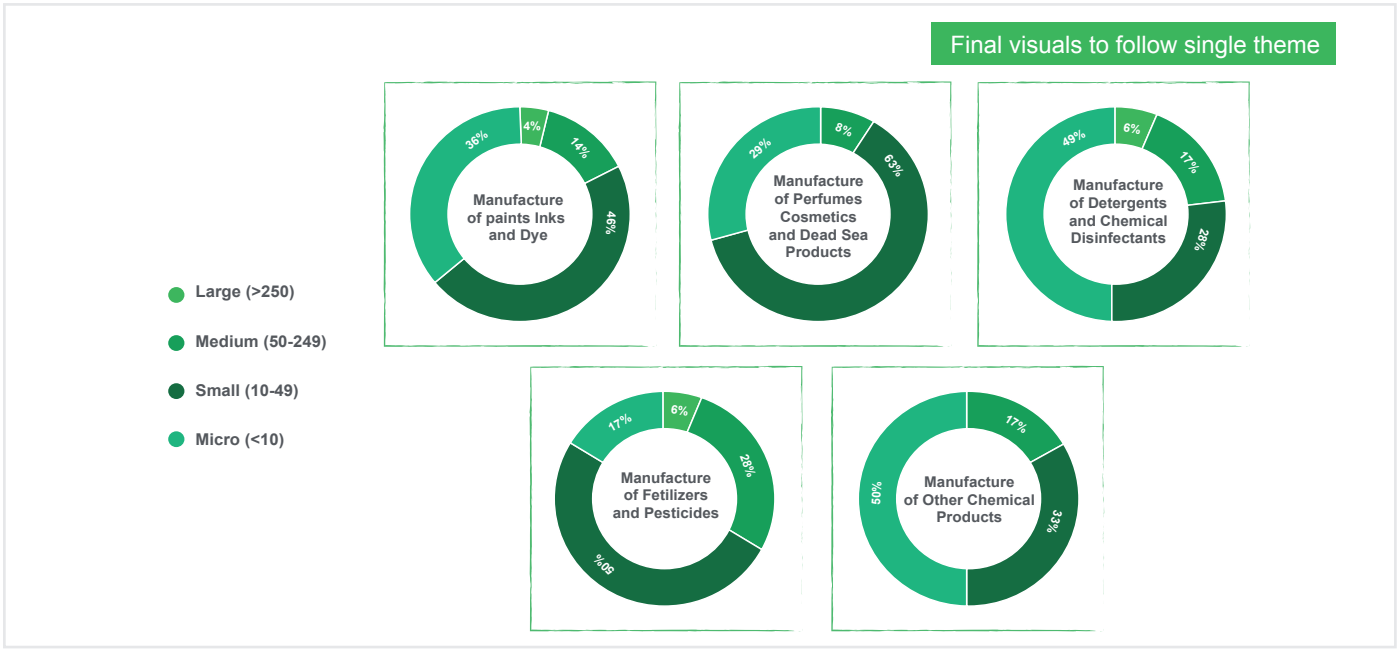
The detergents and chemical disinfectants subsector represents the largest group of the firms surveyed, comprising 41 per cent of the total number of firms. Next is the paints, inks, and dyes subsector at 22 per cent, followed by perfumes, cosmetics and Dead Sea products at 19 per cent. These firms are distributed across the Kingdom, but over 80 per cent are in the capital, Amman.

Figure 17: Industrial firms by district

10.1.2 Number of firms by subsector and size

The majority of firms surveyed, across all sectors, are microenterprises and small enterprises, with microenterprises comprising half of the those in the detergents and disinfectants and other chemical products subsector. The number of large firms, defined by labour law as those employing more than 250 individuals, is relatively small.

Figure 18: Industrial firms by size



10.1.3 Ownership of firms by nationality

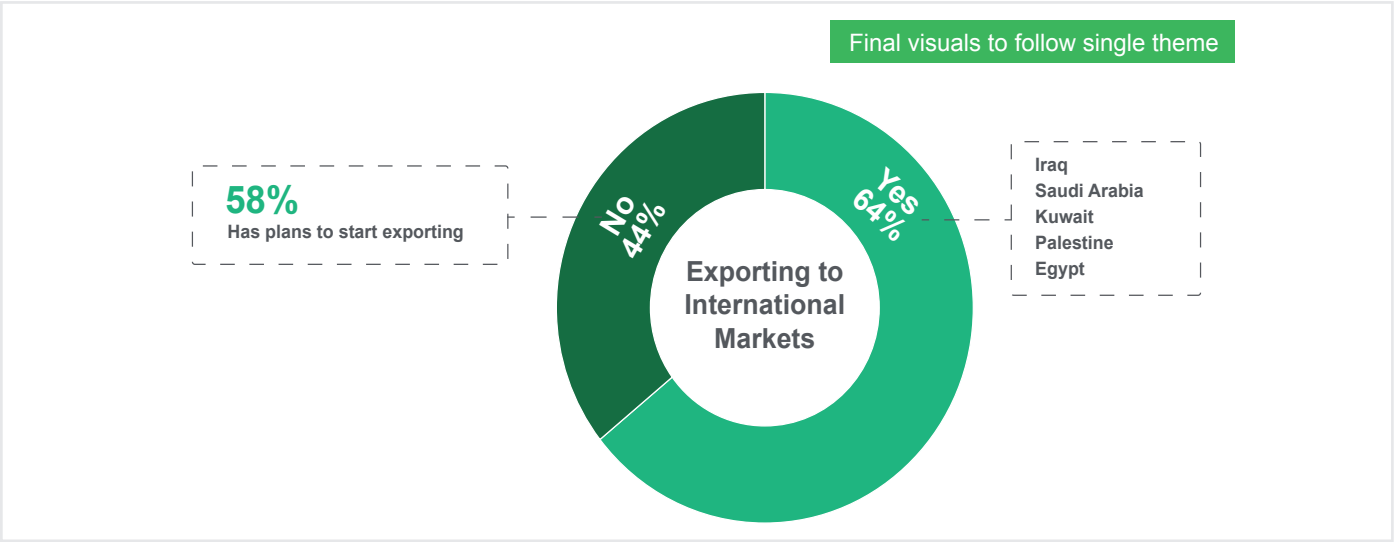
The majority of firms surveyed across the sector are owned by Jordanian investors. The whole manufacture of other chemical products subsector is owned by Jordanians. While 44 per cent of the firms in the fertilizers and pesticides subsector are owned by foreign investors, they comprise only 8 per cent of firms in the overall chemicals and cosmetics sector.

Figure 19: Nationality of ownership by subsector

10.1.4 Exports by destination country

As the chemicals and cosmetics sector is a major driver of industrial exports in Jordan, it was essential to assess firms' exporting activities from primary data. The STED survey assessed multiple dimensions for their engagement with export markets. Responses from the firms surveyed, indicate that 64 per cent of them export, mainly to the Middle East and North Africa and to Gulf Countries. Jordanian firms are more competitive in these regions than in the European Union or the United States.

Figure 20: Exporting to international markets



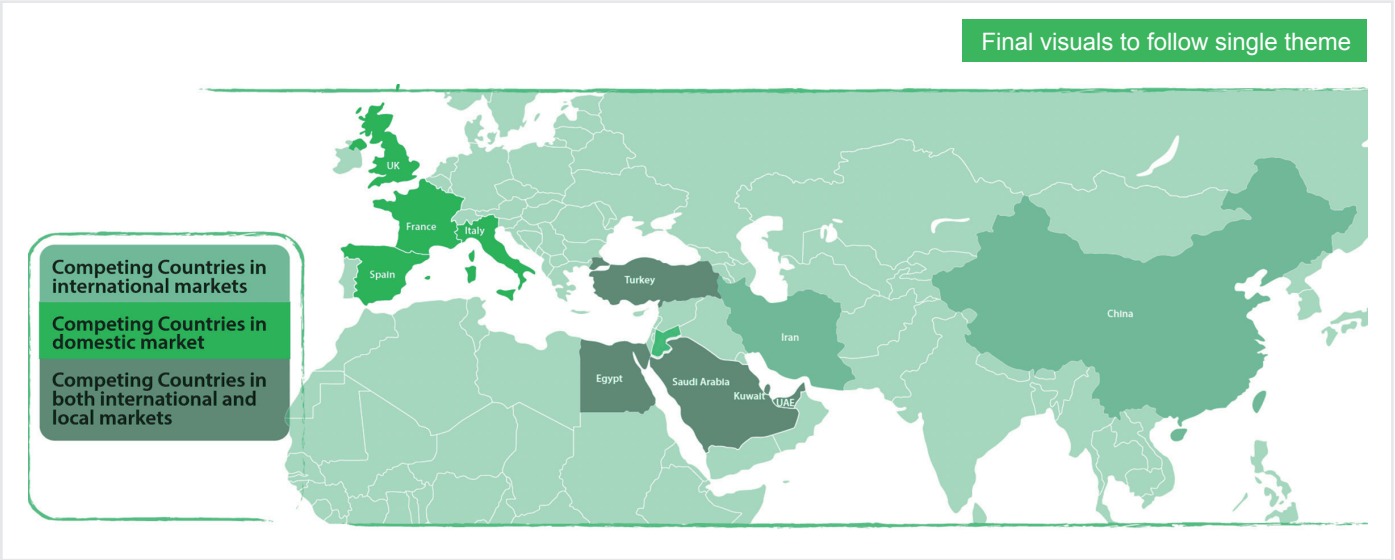
In addition, market access and procedures for chemical and cosmetics products are more relaxed within these countries, which makes exporting to them easier. Nonetheless, other markets have significant potential, especially for the Dead Sea products subsector, as the products offer a unique selling point that facilitates branding and sales.

There is significant interest among non-exporting firms in expanding to foreign markets, 58 per cent of them indicating that they plan to change their strategies to start exporting. This is a positive indicator for the long-term growth of the sector.

The firms surveyed were asked to identify their top competing countries domestically, internationally, and across both. For international markets, China was identified as the main competitor, with substantial economies of scale and relatively low labour costs giving Chinese competitors significantly lower production costs. Iran was identified as a strong regional competitor that also covers international markets, competing companies in Iran being particularly strong in the paints, inks, and dyes subsector by virtue of their strength in production and international distribution.

In terms of local competition, imports from West European countries were viewed as the most competitive, particularly given the high quality of the products they export to Jordan. Western European countries also enjoy high exemption rules, which reduce their overall exporting costs. According to factory owners, these advantages are further reinforced by cultural factors since consumers perceive the quality of foreign products as better and this impacts domestic sales.

Figure 21: Geographical distribution of competitors



Packaging quality and branding techniques were highlighted by the firms surveyed as an important factor with a negative impact on competitive advantage. The firms interviewed rated themselves very poorly compared to European and Chinese quality in that regard. They said that their packaging was not attractive to buyers and was very basic in design. Almost none had worked on a marketing and branding strategy, whether for the local or international market. Those interviewed said that their firms did not yet recognize the value of such tools in increasing outreach and sales, whether to traditional or non-traditional markets.

A majority of firms interviewed believed that neighbouring countries pose the greatest competitive threat as they have similar manufacturing processes and export mechanisms. This makes them a source of direct competition for the same market segments in which Jordanian firms compete, especially in the sector's main target markets within the MENA region.

10.2 Employment by priority occupation, gender and nationality

10.2.1 Employment by priority occupation

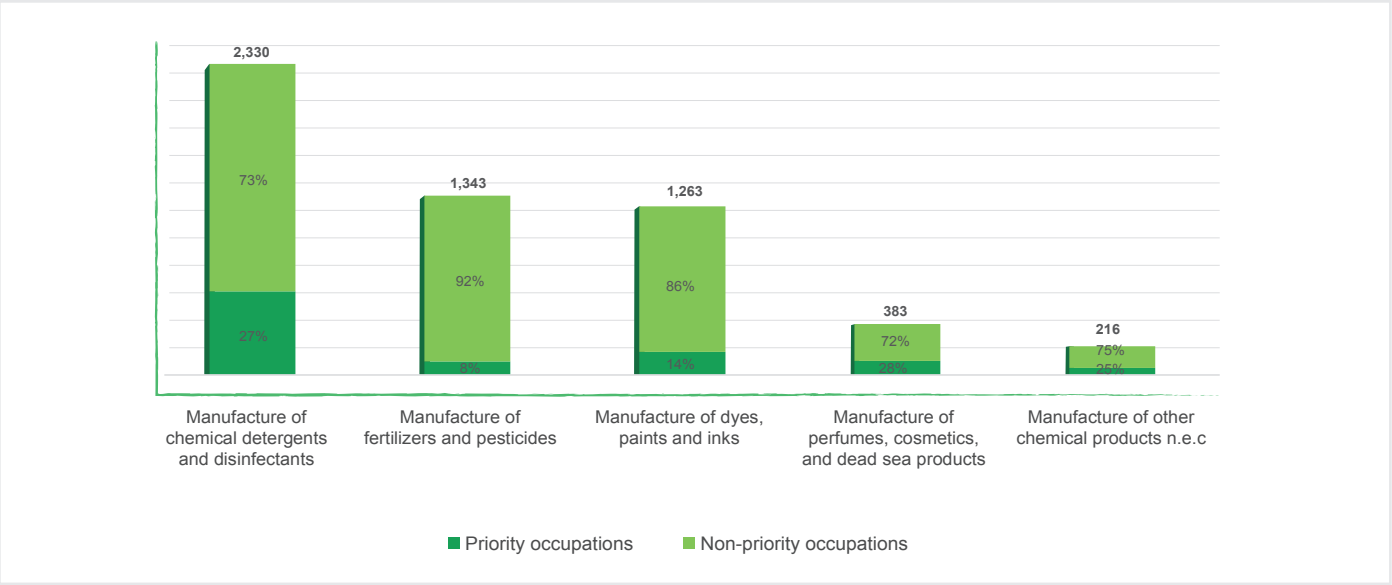
According to their records, the firms surveyed employed a total of 5,535 workers, which comprises 48 per cent of employment in the sector, based on Department of Statistics data for 2018. This is a sufficiently large sample to enable assessment of demand for skills in the priority occupations in the sector and to propose future scenarios for accelerated growth. The chemicals and cosmetics sector has a good fit with the objectives of Jordan Vision 2025 to counteract unemployment and to support this by meeting the skills needs of firms.

According the survey results, the five priority subsectors combined had 1,060 workers employed in priority occupations, which is nearly 20 per cent of total employees across all the firms surveyed. Although this is not a high percentage, a large proportion of other workers across subsectors are in manual occupations such as warehouse wardens, packaging workers and loading workers.

The survey highlights significant differences in the number of workers in priority occupations across the different priority subsectors. For example, in the manufacture of perfumes, cosmetics, and Dead Sea products, 27 per cent of employees are in priority occupations, while in the manufacture of fertilizers and pesticides only 8 per cent are. The variations in the concentration of priority occupations among subsectors are attributed to

the differences in the nature of the skills and expertise required by these subsectors. Figure 22 provides a breakdown of priority and non-priority occupations, along with the total number of workers in each subsector.

Figure 22: Number and percentage of workers in priority and non-priority occupations



Source: STED survey

10.2.2 Employment by gender

Approximately a quarter of Jordanian workers employed in priority occupations are female (209 of 856 workers). It is important to note that this breakdown covers Jordanian workers only and does not include foreign workers or Syrian refugees, who together comprise roughly 20 per cent of the workers in priority occupations combined.[84] Female employment varies across the subsectors. For example female workers comprise 30 per cent of workers in the manufacture of chemical detergents and disinfectants, but only 10 per cent of workers in the manufacture of dyes, paints and inks subsector. Figure 23 provides a breakdown of workers by gender and subsector. It is important to note that the manufacture of chemical detergents and disinfectants accounts for 70 per cent of female employment by the firms surveyed, with 146 of 209 female workers in those occupations.

Figure 23: Workers by gender and subsector

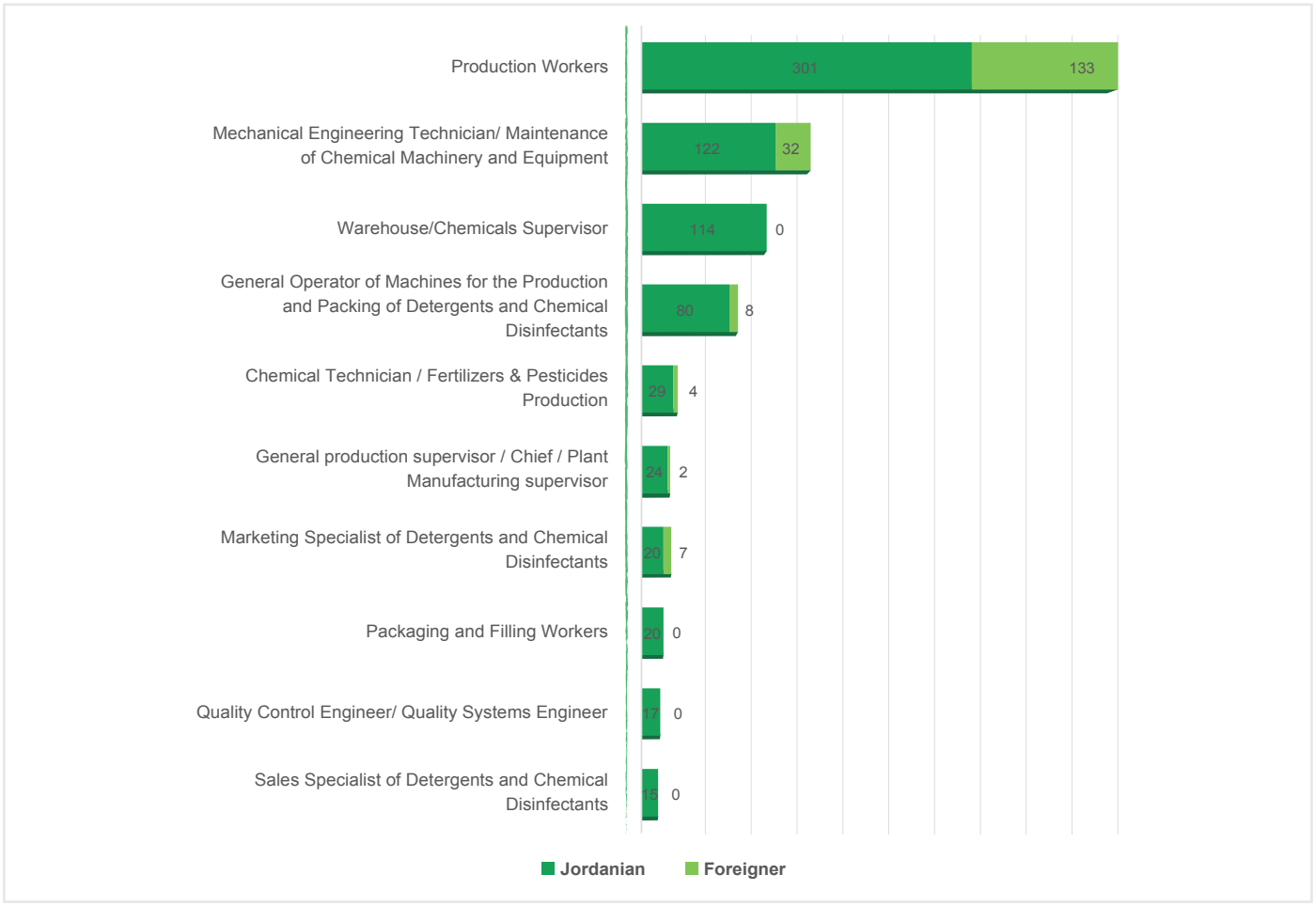
Source: STED survey

84 The total number of foreign workers across surveyed firms was 87, while the total number of Syrian refugee workers across surveyed firms was 117, together making a grand total of 204 workers.

10.2.3 Employment by nationality

Based on the sample surveyed, the workforce of the sector is mainly Jordanian, accounting for 81 per cent of the total number of workers. Syrian refugees comprise 11 per cent of the workforce, while migrants of other nationalities comprise the remaining 9 per cent. In terms of occupations, figure 24 provides a breakdown of workers by nationality among the top ten priority occupations, which represent 70 per cent of all priority occupations.

Figure 24: Worker nationality by occupation



Source: STED survey, 2019

As the chart shows, the vast majority of foreign workers are production workers. The 133 foreign workers in this occupation account for more than two thirds of all foreign workers among the top ten priority occupations.

10.2.4 Anticipated vacancies by priority occupation

In accordance with the STED methodology, the survey has estimated the number of anticipated vacancies for 2019-2020 based on the data from the firms. The results help to identify the priority occupations out of 28 occupations identified by the sector skills council. Figure 25 breaks down anticipated vacancies by key occupation by the end of 2020 for the top ten occupations, which comprise 73 per cent (630 jobs of a total number of 862) of the projected vacancies in the sector. As the chart shows, vacancies are heavily concentrated in the first three occupations, which add up to a total of 329 projected vacancies.

Figure 25: Anticipated vacancies by occupation, 2019-2020

Source: STED survey, 2019

An examination of anticipated vacancies by subsector shows that roughly 600 of the 630 vacancies in the top ten priority occupations are concentrated in three sectors: manufacture of chemical detergents and disinfectants (345 vacancies), manufacture of fertilizers and pesticides (182 vacancies), and manufacture of perfumes, cosmetics, and Dead Sea products (70 vacancies). Table 18 provides a breakdown of vacancies in the top ten priority occupation in the top three subsectors.

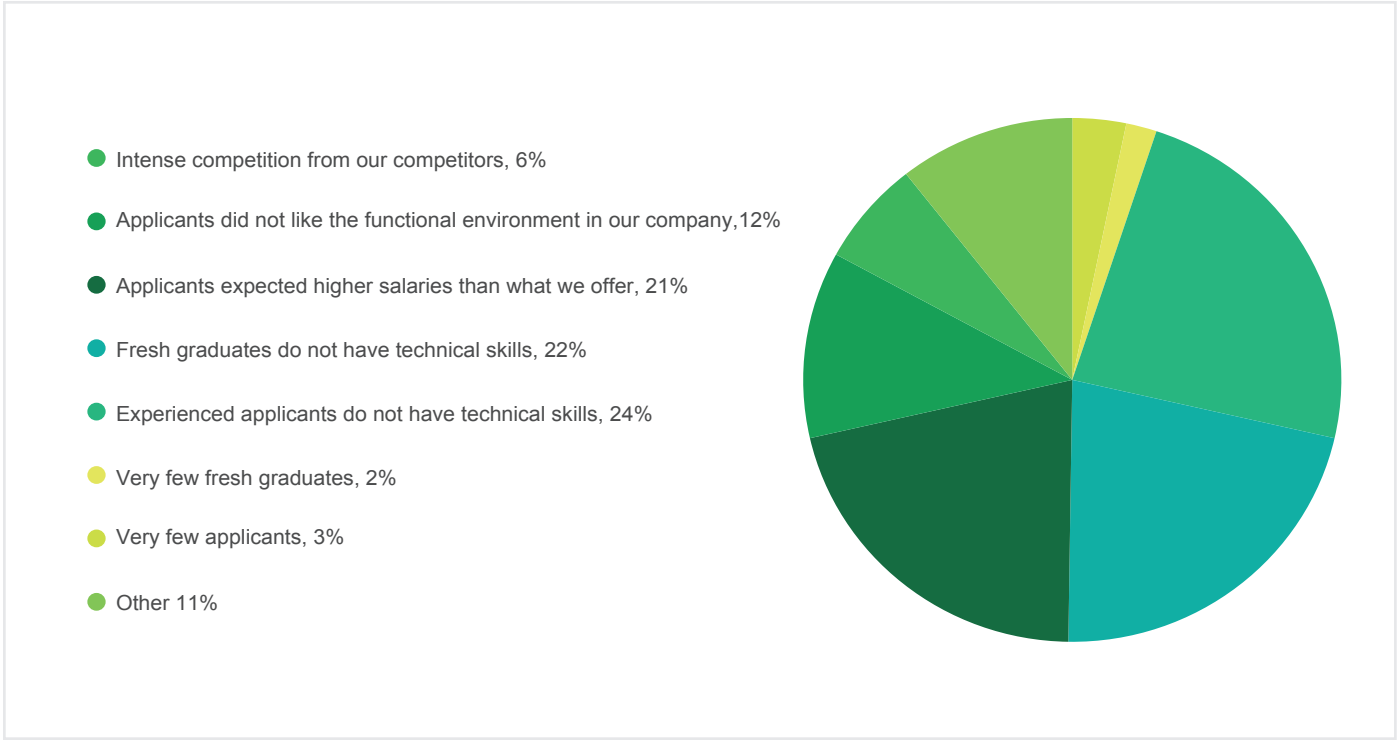
Table 18: Anticipated vacancies by priority occupation and subsector				
Occupation	**Manufacture of chemical detergents and disinfectants**	**Manufacture of fertilizers and pesticides**	**Manufacture of perfumes, cosmetics, and Dead Sea products**	**Total**
Production workers	143	4	-	147
General operator of machines for the production and packing of detergents and chemical disinfectants	27	80	2	109
General production supervisor / Chief / Plant manufacturing supervisor	34	17	7	58
Chemical lab technician/ Analysis and examination of detergents, chemical disinfectants and polishing materials	53		4	57
Chemical technician / Fertilizers and pesticides production	13	33	-	46
Mechanical engineering technician / Maintenance of chemical equipment	26	11	7	44
Warehouse/chemicals supervisor	20	4	1	25
Packaging and filling workers	10	10	18	38
Chemical lab technician / Analysis of perfumes, cosmetics and Dead Sea products	11	0	27	38
Mechanical engineering technician/ Maintenance of chemical machinery and equipment	8	23	4	35
Total	**345**	**182**	**70**	**597**
Source: STED survey				

10.3 Recruitment, skills gaps and collaboration with training and academic institutes

10.3.1 Recruitment challenges

The three main recruiting challenges identified by the firms were lack of technical skills among experienced applicants (24 per cent), lack of technical skills among fresh graduates (22 per cent) and high salary expectations among applicants (21 per cent). Figure 26 breaks down the various challenges identified by the firms. Other challenges included: difficulties obtaining job permits; difficulty hiring female workers in certain occupations; and transportation difficulties.

Figure 26: Recruitment challenges

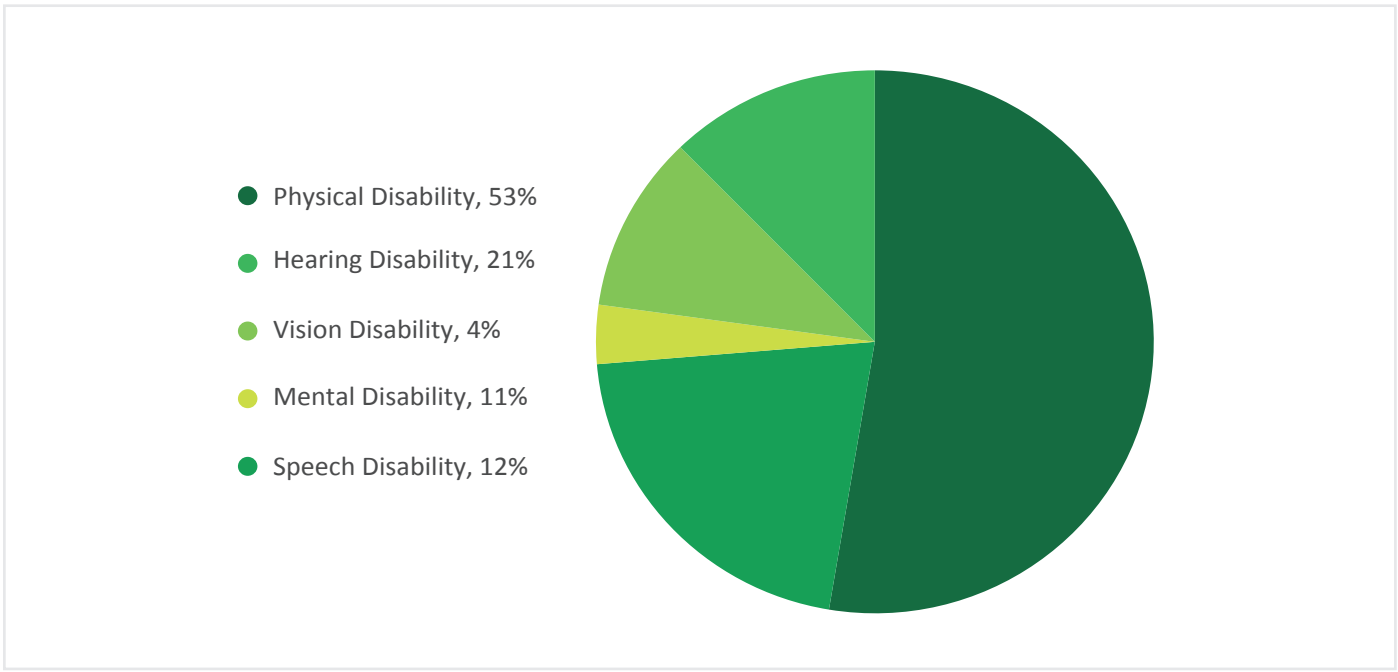


Source: STED survey

10.3.2 Hiring people with disabilities

Nearly two thirds of the firms surveyed indicated that they do not hire people with disabilities. The reason given was difficult working conditions. More than half of the workers with disabilities have a physical disability. Figure 27 breaks down the various types of disabilities among workers in the firms surveyed.

Figure 27: Types of disabilities

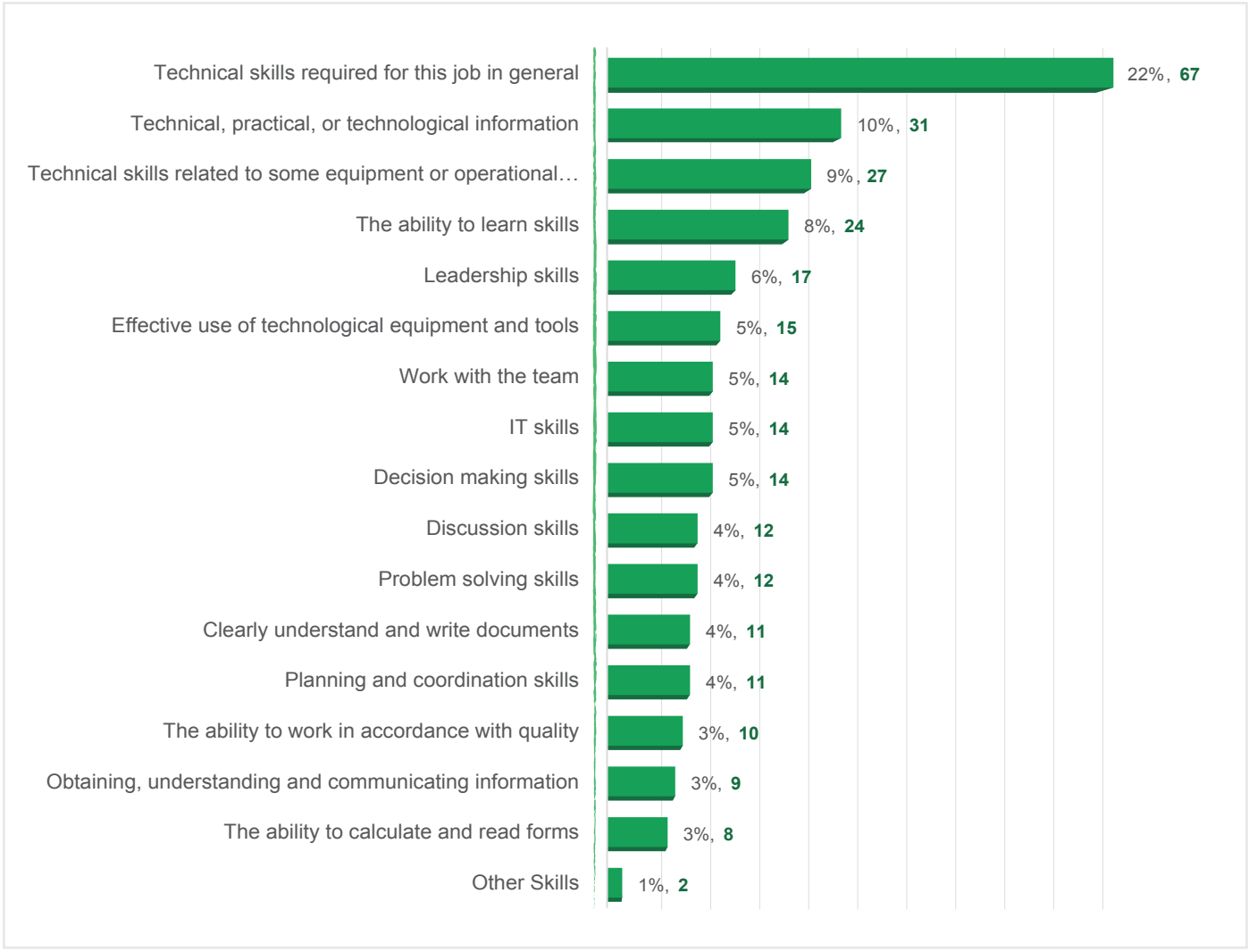


Source: STED survey

10.3.3 Skills gaps

Of the firms surveyed, 45 per cent identified certain skills gaps that impact their operations. Figure 28 shows that the top three types of skills lacking are: technical skills required for this job in general (22 per cent); technical, practical or technological information (10 per cent); and technical skills related to equipment or operational matters (9 per cent).

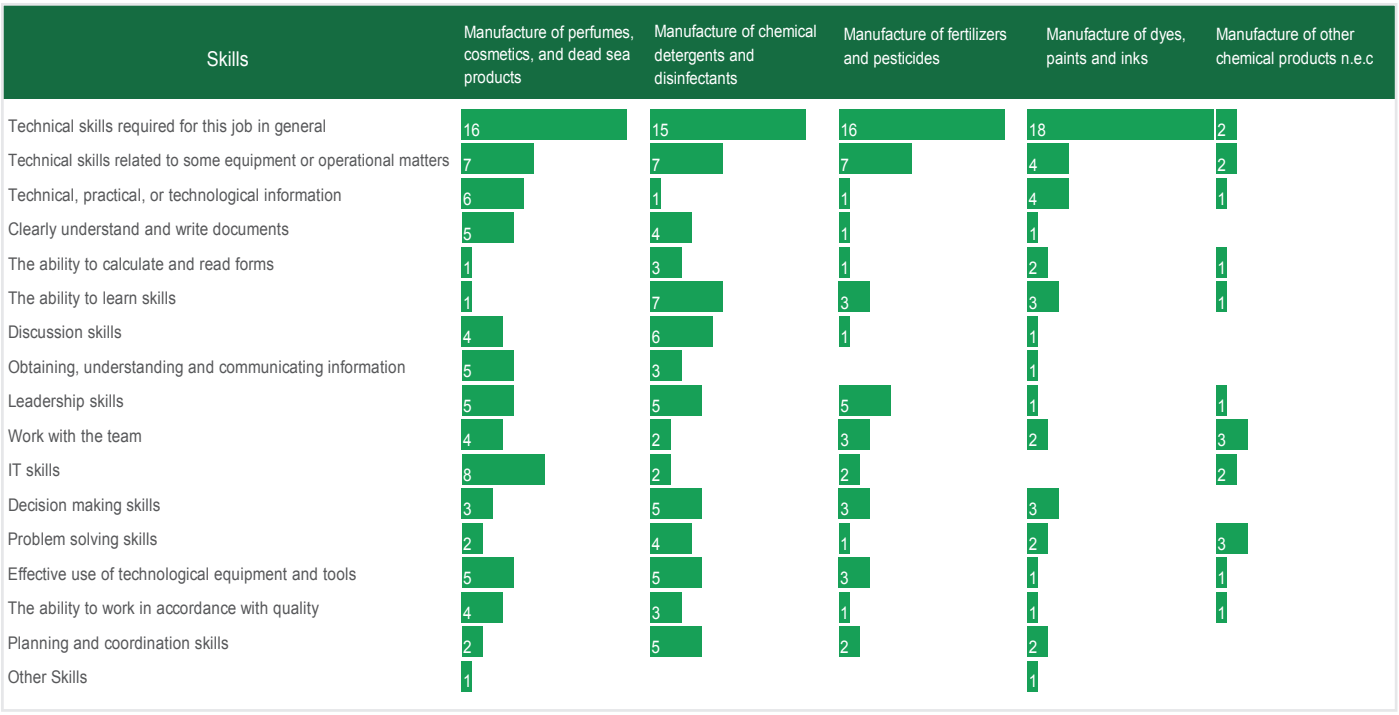
Figure 28: Skills gaps across subsectors, percentage and count



Source: STED survey

While the lack of general technical skills is observed across all subsectors, the survey reveals some differences among subsectors. For example, eight firms in the manufacture of perfumes, cosmetics, and Dead Sea products indicated a gap in IT skills, while none of the other subsectors had such a high number of firms reporting this issue. Figure 29 compares the skills gaps across all the priority subsectors.

Figure 29: Skills gaps by subsector, count



Source: STED survey

10.3.4 Collaboration with research and training centres

More than 80 per cent of the firms indicated that they do not collaborate with training providers, and more than 60 per cent indicated that they do not think there are adequate training centres in their subsectors. This suggests that they do not make extensive use of training centres, but provide training internally or use other external sources.

Only 7 per cent of the firms surveyed stated that they collaborate with research and development institutions. What collaboration there is, is mainly with the University of Jordan and the Royal Scientific Society, which are both governmental institutions.

10.3.5 Collaboration with donors

Approximately 45 per cent of the firms indicated that they knew about donor-funded programmes relevant for their subsector, but only 34 per cent of the same group indicated that they had actually benefited from such programmes. This suggests that there is an opportunity to inform firms in the sector about these programmes and to further increase the number of beneficiaries.

10.4 Challenges to priority subsectors

The industrial survey and the workshop conducted to present the findings to the sector skills council and prominent players in the sector, highlighted a number of threats and challenges at both the sector and subsector levels. Four prominent threats were identified at the sector level through the industrial survey:

- ***Utility costs*** restrict firms from operating at higher capacity and directly impact their production costs and profit margins
- ***Quality of raw materials,*** is a challenge to exports for Jordanian companies. Other than raw materials from the Dead Sea, the Kingdom is not rich in the inputs required for the sector, and importing inputs that meet quality requirements is expensive for all firms and raises their production costs.
- ***Lack of information on market demand*** constrains firms in marketing, sales and improving and developing their products. This correlates with data collected from other questions. 26 per cent of the firms surveyed have never collaborated with any research and development institute, and all lack dedicated marketing expertise, which makes it very difficult to acquire any information on market demand, especially local.
- ***Political Instability*** has affected the sector quite strongly. Over the last decade, the Arab Spring, the Syrian war, and instability in Iraq have created great political and economic instability in the region. These exogenous shocks have affected the Kingdom and had their greatest impact in 2016, which saw low levels of employment and exports for the chemical and cosmetics sector.

In addition to the sector-wide challenges, the industrial survey and workshop highlighted challenges facing particular subsectors.

Manufacture of fertilizers and pesticides

- Taxes are determined as an average curve based on the highest year of income in a decade. Not only does this policy conflict with the firms' financial cycles but, given that they are actually selling and exporting less, this policy severely diminishes their profitability.
- The 'hazardous' nature of the products mandates routine testing, which is associated with increasing fees and also slows down production. Manufacturers believe government regulations should be eased.
- The lack of skilled labour. The cost of bringing in foreign labour is very high, especially as pension contributions are paid on their behalf, which are then reimbursed upon their return to their home countries, which causes rigidity in the system and an increase in operational costs.
- Shipping and delivery costs are very high, both for exports and domestically between Jordanian cities.
- High packaging costs due to the need to work with specific packaging factories able to meet quality requirements.
- Access-to-finance was also identified as a major challenge, especially as 70 per cent of the subsector is composed of microenterprises and small enterprises that have difficulty providing the collateral required to secure funding.
- Challenges in dealing with insurance companies, as they consider the subsector too risky, and either refuse to insure them altogether or impose very high premiums.
- Stringent government procedures and regulations as a result of oversight by multiple ministries for the same purposes and reasons are time-consuming and cause complications. The sector representatives suggest a strategy whereby they are visited by one representative who reports the required information to each ministry. They specifically referred to the Ministry of Health, which they believe is conducting extra investigations on the raw material for their sector that are unnecessary and that cause higher costs and delays to their production processes.

Manufacture of perfumes, cosmetics, and Dead Sea products

- Strict Food and Drug Administration (FDA) registration compliance requirements and associated costs were identified as a major challenge for exporters.
- The lack of proper research and development capabilities and the possibility of conducting clinical studies, combined with poor marketing strategy were also identified as key hurdles for the sector
- Conflicting regulations and policies also affect the daily operations of factories, and there is a lack of government funding compared to other industrial sectors.
- Concentrated market power affects the pricing of raw materials by the large conglomerates of the potash industry, which results in a competitive advantage for large companies, allowing them to take a larger share of the consumer market.

It is worth noting that the subsector representatives suggested that the Jordanian Ministry of Industry and Trade should evaluate the idea of hiring internal assessors with a suitable background to handle the compliance requirements for the firms as this would ease the process and reduce compliance costs.

Manufacture of paints, inks and dyes

- The high costs of inputs, the high costs of utilities, and lack of government incentives were identified as the key challenges for this subsector.
- Local regulations also make their production process ineffective, driven by high taxes and pension costs.
- Policies favour imports of competing products into the country, even from vendors without good manufacturing practice certification, which has a negative effect on sales of domestically produced products.

Manufacture of detergents and chemical disinfectants

- High cost of production, primarily driven by high utilities costs, high packaging costs and strict government procedures and regulations are the main challenges faced by the subsector.
- Limited access to finance and high borrowing costs were also identified as key obstacles for local producers.
- Limited export routes (only through the port of Aqaba), driving high shipping costs. The alternative routes by land via Saudi Arabia are very difficult. It is also very difficult to comply with the export regulations to different regions, which limits the export routes available to this subsector.
- Lack of proper local research and development centres. Participants indicated that the quality delivered was not what they expected in terms of information content and analysis.
- Access to finance, particularly as a result of high interest rates. This issue is particularly critical since 80 per cent of enterprises in this subsector are microenterprises and small enterprises with fewer than 50 workers and in most cases do not have the collateral required to obtain loans.

No consistent insights were provided on the fifth subsector, the manufacture of other chemical products, which includes six firms that produce very different products.

11 Academic / training institutes survey results (supply side)

This section describes the insights from the supply side analysis, providing information on the overall supply of skilled workers from the academic and training institutions surveyed. This section also examines the relevance of academic and vocational training to the chemicals and cosmetics sector occupational categories and employability life skills and the collaboration between the various institutes and employers.

11.1 Supply of skilled workers

The academic institutes surveyed offer 23 unique programmes that are relevant to the skill requirements of the chemicals and cosmetics sector. These programmes are spread across various levels of qualifications, as detailed in table.

Table 19: Programmes offered by level of qualification and academic institution

Level of Qualification (NQF)	Programs Offered	Academic Institutions
Master's Degree	• Crisis Management • Engineering Management • Industrial Engineering • Maintenance and Quality Management • Production and Design Engineering • Systems Engineering	• Jordan University for Science & Technology • Mutah University • The Hashemite University • The University of Jordan
Bachelor's Degree	• Chemical Engineering - Medicinal • Chemical Industries Engineering (general not specialized) • Electromechanical Engineering/ Bachelors • Industrial Engineering • Industrial Engineering (Production & Management) • Operations and Supply Management • Systems Engineering	• Balqa Applied University • German Jordanian University • Jordan University for Science & Technology • Luminius Technical University College • The Hashemite University • The University of Jordan • Yarmouk University
Diploma	• Electronics and Electronical Engineering • HVAC Diploma • Mechanical Engineering • Production Diploma • Supply Management • Vehicle Maintenance Diploma	• Balqa Applied University • Luminius Technical University College
Certificates of Attendance	• Specialized training	• Jordan University for Science & Technology

Source: STED survey

Data reported in the survey confirms that more than 1,000 students were enrolled in these programmes in 2018. A significant number of the academic institutes surveyed could not provide accurate enrolment figures, hence the number reported is considered the bare minimum, while the actual number of enrolled students was probably much higher. The average graduation rate across all the academic institutes and programmes is 92 per cent, which is relatively high.

The academic institutes surveyed do not track employment data for graduates of the programmes listed. However, qualitative input from the survey suggests that females graduating from chemical engineering domains find it more difficult to find employment due to cultural and social norms in Jordan. This finding is in line with the employment data reported across the sector, which shows that female representation was around 10 per cent in 2017.

In terms of geographical location, the academic institutes are spread across the Kingdom, with campuses in Amman, Al Zarqa, Madaba, Irbid, Ajloun, and Al Karak. Most institutes are government-owned (88 per cent) while the remainder are privately owned. 25 per cent of the surveyed institutes are accredited by the Accreditation Board for Engineering and Technology (ABET), while 38 per cent are accredited by the Accreditation and Quality Assurance Commission for Higher Education Institutions (AQAC).

None of the academic institutes surveyed offers courses or specific training programmes that are required for the sector's advancement as a specialization, but all offer some skill requirements as part of regular classes. The next section gives more detail on the overlap between the programmes offered and the occupational categories for the chemicals and cosmetics sector

11.2 Programme overlap with priority occupations

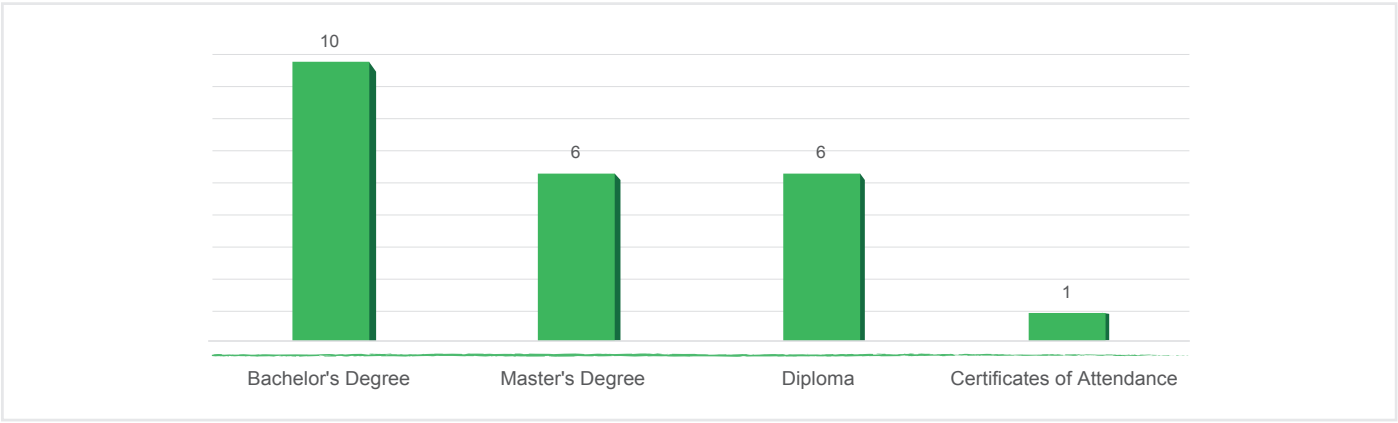
The programmes offered by the academic and training institutes surveyed overlap with several priority occupations. Figure 30 shows the number of programmes relevant to each of the priority occupations covered, along with the specific subsectors they are most relevant to. Quality control engineer/quality engineer and systems application, mechanical engineering technician/ maintenance of equipment and chemical machinery, and general production supervisor are the three occupations most commonly covered in these programmes.

Figure 30: Number of overlapping programmes by occupation

Source: STED survey

The survey reveals that most of the 23 relevant programmes are at the bachelor's and master's levels, a contrast with the priority occupations that do not necessarily require the level of knowledge and skill provided by such degrees. Figure 31 provides a breakdown of relevant programmes by level of qualification. Appendix 3 provides a cross-tabulation of relevant programmes by university and educational level.

Figure 31: Relevant programmes by level of qualification



Source: STED survey

11.3 Employability life skills

The majority of academic institutes indicated that they offer employability life skills as part of the educational programmes and courses offered to students. The five main skills covered by the institutes surveyed are: communication skills, problem-solving, teamwork, self-marketing, and computer literacy. Further details are given in figure 32, which presents the number of academic institutes and universities covering each skill.

Figure 32: Employability life skills, number of academic institutes covering each skill

Source: STED survey

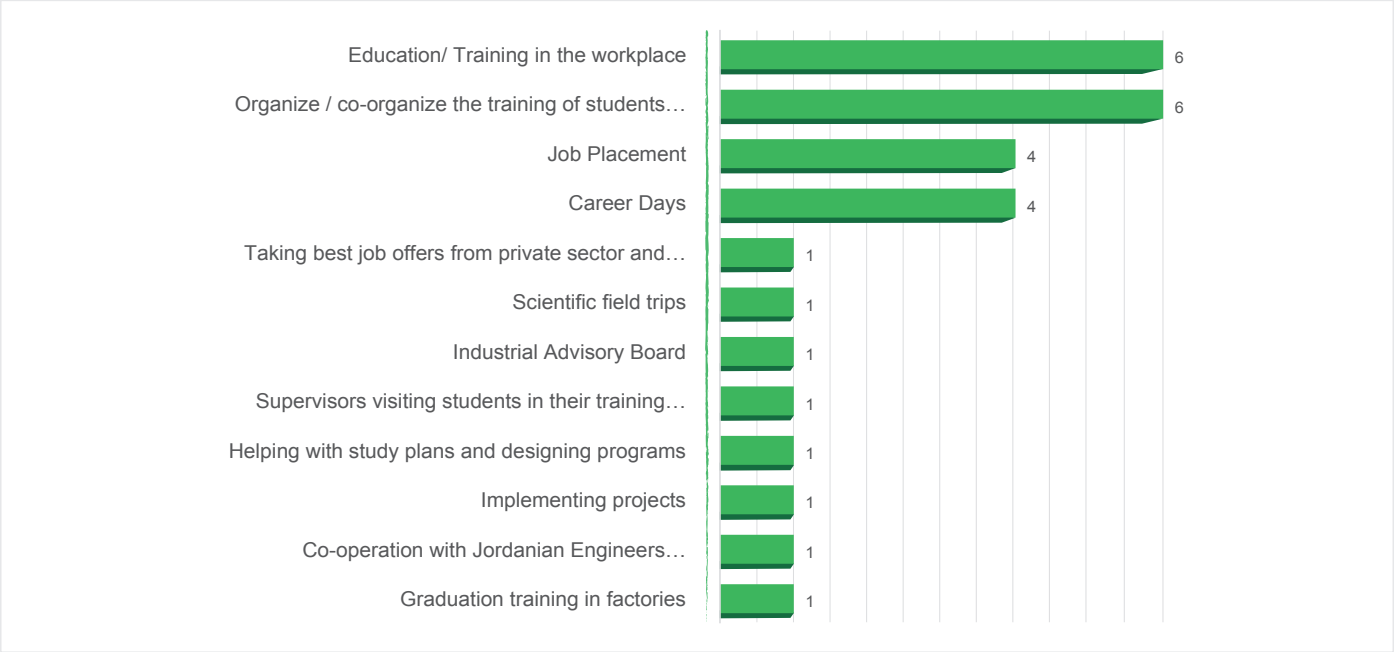
The majority of the programmes offer practical training activities that typically account for 10 to 25 per cent of total hours required (therefore 15 to 40 hours). Most centres indicated that they train students with equipment currently used in the industry but find it difficult to keep equipment, training materials, and expertise up-to-date, mainly because of the expense. Two universities, Al-Yarmouk University and the Chemical Engineering Department at the Jordan University for Science and Technology, do not offer any practical training programmes.

A majority of the academic institutes indicated that they are able to integrate employability life skills with the technical course material by offering presentations in class on both communication and employability skills. In some specific cases analytical case studies are presented.

11.4 Academic institute collaboration with employers and private sector entities

The survey indicates that there is collaboration between the various institutes and employers in three main areas: education/training in the workplace, job placements and career days, in addition to other areas. Further details are provided in figure 33, which presents the number of academic institutes covering each skill in their programmes.

Figure 33: Areas of collaboration, number of academic institutes collaborating by area



Source: STED survey

The survey highlighted the fact that some academic institutes adapt their programmes to employers' needs, primarily through 'unstructured consultation with employers'. They also maintain contact on job placement programmes, mainly through periodic reports and phone calls. Half of the institutes surveyed have memoranda of understanding with employers. Institutes that do not were unable to provide clear reasons for not having more formal frameworks for collaboration with employers. Collaboration is mainly around projects and is primarily driven by the industry's needs. Only one of the institutes surveyed follow up with graduates after graduation regarding job placement. They attribute this mainly to difficulty dealing with employers because of the gap between the education system and private sector requirements.

11.5 Supply-side challenges

In relation to challenges and difficulties on the supply side, several government universities indicated that they face challenges in recruiting qualified trainers because of laws and regulations that require appointments, whether for administrative or teaching staff, to go through the Civil Service Bureau or that require a waiver from the Prime Minister's Office. This creates complications and delays in the recruitment process. A second challenge highlighted by several academic institutes is a lack of skilled teaching staff in Jordan to fill positions. No one offered solid solutions to this problem.

11.6 Gaps identified in academic and training programmes

The insights collected from the supply-side and industrial surveys highlight four main gaps that may have significant implications for the supply of skills and inflate the existing mismatch between graduates and employers' needs. These are set out in figure 34.

Figure 34: Issues regarding relevant programmes and their implications for skills supply

Issues	Findings	Implications on skill supply
Lack of specialized programs	Programs most aligned with the sector's occupational codes are general engineering degrees (ex.Industrial Engineering, Crisis Management, Industrial Engineering)	Freshgraduates do not necessarily have the specialized expertise and skills required by employers as highlighted in the industrial survey
Higher enrollment in more advanced degrees	The vast majority of overlapping programs are at the Bachelors and Masters level, rather than the diploma and / or certificate level	Such degrees are notnecessarily required for current and future vacancies and potentially contribute to a gap in salary expectations as highlighted in the industrial survey
Limited and /or inadequate training programs	Most program offered limited training program and have indicated difficult to keep the equipment, training material, and expertise up-to-date, mainly due to financial constraints	Graduates do not possess the technical skilled and training required by employers
No structured collaboration between academic institutes and employers	The survey highlights that there is a level of 'unstructured consultation' between the institutes and the employers	The absence of properly structured collaboration frameworks limits the ability to addressthe existing mismatch

Source: STED survey

The industrial survey clearly confirms the implications of the issues outlined above: the subsectors surveyed anticipated that they would have over 800 vacancies in 2019 and 2020, despite the fact that the relevant academic and training programmes produce an estimated 1,000 graduates each year. New graduates struggle to find suitable jobs, while employers struggle to find graduates with the right skills and training for vacancies. Lack of specialized programmes, high enrolment in more advanced degrees, limited and/or inadequate training programmes and very limited collaboration between the academic and training institutes and the sector all contribute to the mismatch between supply and demand.

11.7 Key insights

The key insights from the supply-side analysis can be summarized as follows:

- The relevant academic and training programmes are primarily aligned with three occupations: quality control engineer/quality engineer systems application; mechanical engineering technician/maintenance of equipment and chemical machinery; and general production supervisor of a transformative plant.
- According to the survey, the academic and training programmes best aligned with the relevant occupational codes are industrial engineering, crisis management, specialized training and supply management.
- Overlapping programmes are primarily at the bachelor's and master's levels rather than the diploma level. Only one university, Jordan University for Science and Technology, offers a specialized training programme that overlaps with three occupational codes.
- The majority of the programmes offer courses typically comprising 10 to 25 per cent (15 to 40 hours) of the total hours required. Most centres indicated that they train students with equipment currently used in the industry, but find it difficult to keep equipment, training materials and expertise up-to-date, mainly because of the expense. Two universities, Al-Yarmouk University and the Chemical Engineering Department at the Jordan University for Science and Technology, do not offer any courses.
- Some academic institutes adapt their programmes to employers' needs, primarily through 'unstructured consultation with employers'.

12 COVID-19 impact Survey

In light of COVID-19, additional in-depth interviews were conducted with 10 sector representatives, 1 representative from the Engineering Association, and 1 from Al-Balqa University representing the supply-side of the labour market. The main aim of the interviews was to assess any changes in the sector's indicators, and changes to information collected earlier that are anticipated due to the pandemic. The following information and perspectives were collected for the main Chemical & Cosmetics sub-sectors. It also covers the overall labour status in the sector, how it has changed, and what the required skills are moving forward.

12.1 Detergents & Disinfectants

As a sub-sector that was considered highly-essential during the COVID-19 pandemic, the Detergents & Disinfectants sub-sector was able to operate during lock-down, increase its production capacity, and create more revenues in the past few months than it has over the last few years. The majority of factories operating within this sub-sector have mainly produced sanitizers for use in homes and offices. During the crisis they have shifted to personal-use products. They have introduced new production lines, and increased employment. One factory, The Arab Pesticides & Veterinary Drugs mfg. co, reported hiring 20 new employees in the month of April. Exports have also increased in this sub-sector, specifically to adjacent countries, as sanitizers and sterilizers products were in high demand.

The sudden increase in demand and production has resulted in strains on raw materials supply, as factories experienced a shortage of "alcoholic materials" at the beginning of the crisis, and a large shipment was imported to compensate. At the present time, however, there is a stagnation in demand "alcoholic material" within the Jordanian market, due to the very high quantities that entered into the country. This is raising a "red-flag" on multiple fronts, as the increase in production and employment, brought on by a sudden surge in demand, may be a "very temporary" situation. As the pandemic and crisis eases, these factories may end in a situation where they are holding large quantities of products, that are deemed unsalable.

On a different front, many of these factories had to adapt to new strategies and acquire multiple new certification, specifically for the proposes of exports, as many products were not qualified to the required international standards and had to be readapted, and tested; accordingly, a number of European laboratories were contracted to conduct the necessary tests on the sub-sector's products to enable the international accreditation to be obtained.

12.2 Fertilizers & Pesticides

The Fertilizers and Pesticides sub-sector, has also flourished during the COVID-19 crisis, due to its direct relationship with the Agricultural sector, that has become ever so important, as countries shifted to closed-economy approaches, especially in terms of basic resource sufficiency. As such, the sector was able to work during lock-down, and its employees' status was not affected. Nonetheless, as production increased, so did the need for raw materials, which led to an increase in prices. Although the materials for this sub-sector are readily available, and produced in Jordan, overall global demand has caused a surge in prices, which increased the prices of fertilizers and pesticides products when they were most needed.

12.3 Dyes, Paints, & Inks

The paints sub-sector is directly linked to the construction sector, which has completely suspended its operations for almost three months. As a result of the COVID-19 pandemic the demand for construction materials and products has been relatively low. and it is estimated to pick-up at 60 percent of the expected capacity of 2020, based on the factories owners' inputs. As such the sales of the Paints sub-sectors, have approximately decreased by 70 percent from 2019, and efforts to support the sector were introduced for "high-away infrastructure projects", that do not use "paints" as an input material. This has weakened the sub-sectors strength greatly, and it is not expected to reach its previous level of operational capacity anytime soon.

As an innovative approach to improve the sub-sectors' situation, some factories are considering producing antimicrobial paints and coatings, both as a measure for COVID-19 prevention and to access a new market that is more suited to work at these times.

12.4 Perfumes, Cosmetics, & Dead Sea Products

The cosmetics sub-sector, and specifically that of the Dead Sea products has two main business models, depending either on exports or tourism. Its products are treated as "non-essential" by consumers, and as such has suffered more than most sectors, as a result of the corona-pandemic. Most companies within the sector depend heavily on in-bound tourism, and have witnessed a decline in sales to almost zero. In parallel, they have been unable to export their products, due to the restrictions and regulations imposed during lock-down, and were not guaranteed permits to re-open their premises in the first few months when the virus spread as the they were considered non-essential. This has led some Dead Sea Products factories to shit focus to producing personal antisepsis and personal care products, to enable sales generations during the crisis.

Companies have reported that sales have dropped by approximately 95 percent, and even as they resumed operations in mid-May, production did not exceed 25 percent for most, and they have stocked merchandise in their warehouses that they are unable to sell. However, as most of the employees within this sub-sector are Jordanians, they have been supported by Defense Orders, and were not let go. Although, the airport branch – selling Dead Sea Products – had to put its operations on hold, an agreement was conducted with the Ministry of Labour, to pay 50 percent of employee salaries. Under the circumstances, the sub-sector has no clear vision for the future, and has yet to map out by July, as airports start re-opening, how it will recover.

12.5 LABOUR STATUS AND SKILLS IMPLICATIONS

Overall, up to May of 2020, the general status of employees in the sector is stable, as no professions have been significantly affected, and the majority of employees received their full salaries. Some companies have paid from their own reserves to enable these measures. The jobs that were affected more than others are those of the sales representatives and administrative professions, as some of the tasks previously assigned to these employees have shifted to digital platforms. The demand for labour, nonetheless, will decrease in the foreseeable future for most factories, even those within the detergents and disinfectants sub-sector, as they will not need to produce as much quantities. In parallel, demand will shift for some expertise from hiring foreign to hiring Jordanian workers.

The status of the small proportion of foreign labour in the C&C sector was critical during the crisis; for some factories it was easier to resume operations, as foreign workers reside on the premises. However, these workers were not supported by the new regulations issued, and it was much harder to guarantee their job security. Thus, a shift towards replacing foreign workforce with Jordanian workers is on the rise. Essentially foreign workers are brought in by the C&C sector, when they possess very specific expertise (ex: Lab technician and quality officer), However, factory owners are suggesting to start specific training programs for Jordanians to acquire such skills. In efforts to achieve that, several meetings were conducted with the Ministry of Labour to enable the reopening of the Chemical Institute in Marka, in addition to fostering programs to increase the skills of university graduates in Jordan. However, the fact remains, that if closures persist or are re-imposed, training could be almost impossible for factory workers, as on-the-job training is needed. Some have suggested virtual-reality techniques to ease the process, yet they remain ineffective and costly at this time.

Overall, there appears to be a major lack of labour with specific high skills in the C&C sector, especially for managerial positions, as very few employees possess the knowledge and skills to head production processes. Additionally, the COVID-19 pandemic has created a huge demand has resulted for digital skills, especially in E-Commerce and digital marketing. Among the most important new "jobs" required are ones presented in figure 35 below, as any new vacancies in the medium-term will concentrate on those.The focus should be on developing the skills of Jordanian workers to enable them to fulfil these roles successfully. Another important consideration brought on by the "new-norm", specifically within factories, is that employees who are able to work remotely, will have more secure jobs in the future. a few of these departments for which this is relevant include: Export, Research & Development, Logistics, and Accounting.

Figure 35: Top Professions demanded by the Chemical & Cosmetics Sector

To enable this new shift, nonetheless, a foundation needs to be built to enable a successful transition from “traditional methods of operations” to “remote digital methods”. From a general perspective, factory owners reflected that workers lack the basic digital skills (i.e. the majority are unable to deal with electronic devices), they also lack communication skills, and the basics needed to work remotely. Although the majority are unable to do so, due to their nature of work; basic training is still necessary to enable remote communication and arrangements, and to enable workers to deal with new imposed procedures that are essential for them, most importantly that of the logistics of e-payments. In parallel, employees need to be educated thoroughly on the general safety procedures and specification for working under the COVID-19 pandemic, as a considerable proportion are unaware of the necessary measures that need to be taken to stay-safe on the job and elsewhere. However, many factory owners, remain hesitant on offering such training or upgrading the digital skills of employees, as many questions the loyalty of their workers, and whether they are willing to pursue long term contracts, so the question of inefficient costs remain.

13 STED validation of results and scenario planning

The validation of results was undertaken with the SSC, all findings were approved. Furthermore, a workshop and multiple focus groups were conducted with the factory owners and Sector Skill Councils; in which the participants determined that certain priority occupations can be grouped together due to the similarity in the skills they require. Grouping the occupations would overcome the complexity associated with having a significant number of priority jobs that are fundamentally similar in nature and that do not necessarily require unique subsector expertise.

The following diagram shows how roughly 1,000 out of 1,060 jobs in priority occupations were clustered into 7 groups. The 59 jobs not included in any of the 7 groups fell under 6 distinct occupations that the SSC determined are not best aligned with the skill requirements of the sector.

Figure 36: Priority occupations groupings

Priority Occupations	Number of Vacancies		Priority Occupations Groups	Number of Vacancies
General Operator of Perfume, Cosmetics and Dead Sea Products	7	▶	Machinery Operator	529
General Operator of Machines for the Production and Packing of Detergents and Chemical Disinfectants	88			
Production Workers	434			
Mechanical Engineering Technician/ Maintenance of Chemical Machinery and Equipment	154	▶	Industrial machinery Maintenance Technician	165
Mechanical Engineering Technician / Maintenance of Chemical Equipment	8			
Mechanical Engineering Technician/ Maintenance of Chemical Equipment	3			
Warehouse/Chemicals Supervisor	114	▶	Warehouse Technician Chemicals Preparing	137
Paint mixer	13			
Warehouse Supervisor / Paints, Inks & Dyes	5			
Warehouse Supervisor/ Detergents and Chemical Disinfectants	5			
Chemical Technician / Fertilizers & Pesticides Production	33	▶	Laboratory Technician (R&D)	68
Chemical Laboratory Technician / Fertilizers & Pesticides	8			
Chemical Lab Technician / Analysis of Perfumes, Cosmetics and Dead Sea products	12			
Chemical Lab Technician/ Analysis and Examination of Detergents, Chemical Disinfectants and Polishing Materials	15			
General production supervisor / Chief / Plant Manufacturing supervisor	27	▶	Production Supervisor	39
Industrial Engineer / Enterprise resource planning Specialist (ERP)	9			
Industrial Engineer/ ERP Specialist)	3			
Quality Control Engineer/ Quality Systems Engineer	20	▶	Laboratory Technician (Quality Assurance)	39
Quality Control Engineer/ Quality Systems Engineer	14			
Quality Control Engineer / Quality Assurance Systems Engineer	3			
Quality Control Engineer/ Application of Quality Systems	2			
Packaging and Filling Workers	24	▶	Packaging and Filling Technician	24
Total	**1,001**		**Total**	**1,001**

In creating and evaluating the scenarios on how to move forward for a sector strategy that enables better integration between labour demand and supply, two important indicators should be taken into consideration, exports and job creation.

13.1 Employment

Employment in the Chemical & Cosmetics sector has been very volatile (i.e. vast changes in the numbers employed) from 2010 to 2019. Nonetheless, employment was expected to increase post 2019, in a "business-as-usual" scenario, at a constant weighted average increase of 2 percent to reach approximately 17,128 employees by 2025. Due to COVID-19 this original scenario is no longer possible. The effect on employment and on other economic indicators differs within sub-sectors, since although the sub-sectors Detergents & Disinfectants and Fertilizers & Pesticides have performed well in the crisis, due to the necessity of their products, other sectors such as Dyes, paints & inks, and Perfumes, cosmetics, and dead sea products have suffered greatly.

As of 2018, the sub-sectors in question had the following segregations in the terms of the number and proportion of hired workers (table 20), this will help anticipate future scenarios based on each sub-sector performance during the pandemic.

Table 20: Employment in the Chemical & Cosmetics Sector

	Sample of STED-Report			Total Workers	
Occupation Segregation per Sub-Sector	**Number of Workers**	**Percentage of workers from the total of the C&C sector**	**Percentage of non-priority occupation**	**Total Number of Workers**	**Total Number of Workers in non-priority occupations**
Detergents & Disinfectants	2330	42%	73%	4660	3402
Fertilizers & Pesticides	1343	24%	92%	2686	2471
Dyes, paints & inks	1263	23%	86%	2526	2172
Perfumes, cosmetics, and dead	383	7%	72%	766	552

The original STED Chemical & Cosmetics report anticipated that a total of 1,001 jobs in priority occupations would be required to be filled for the sector between 2021 and 2025. Out of these, 225 projected vacancies were under the Dyes, paints & inks, and Perfumes, cosmetics, and dead. In the business-as-usual scenario this would have been valid; however, due to COVID-19, these sub-sectors will not have any vacancies on the short term.

The sample for the STED report, covers approximately 50 percent of the overall enterprises operating in the sector, and thus by a linear extrapolation 500 of the total anticipated vacancies to be filled are no longer expected.

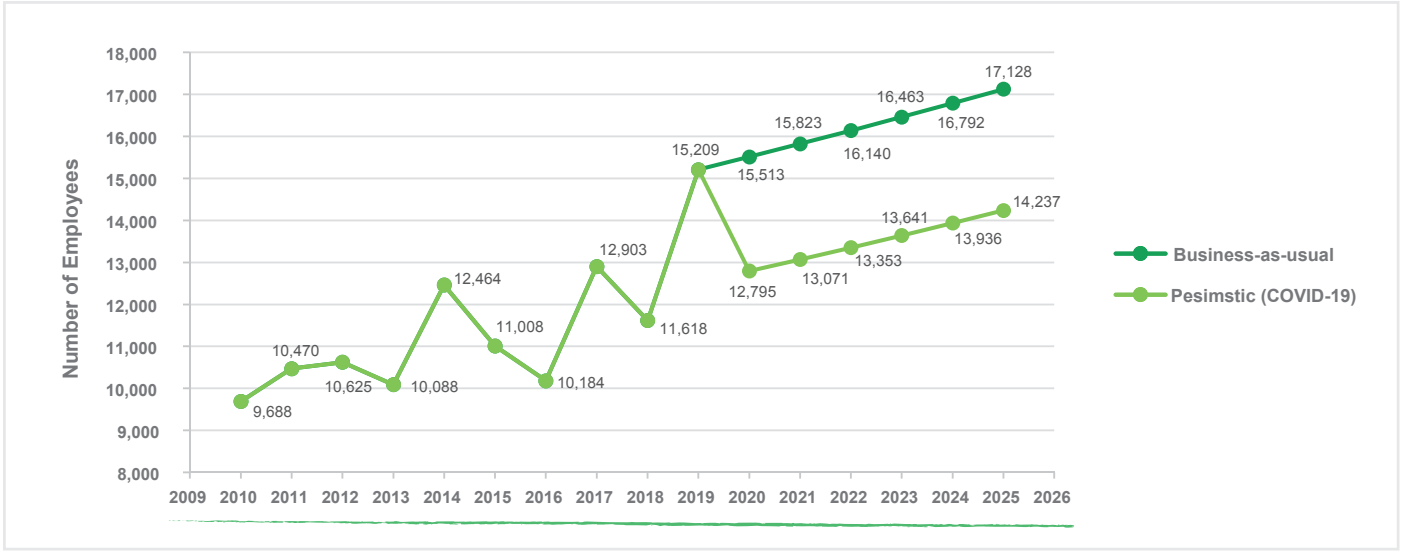
In addition, jobs in non-priority occupations for these same sub-sectors are at jeopardy, as factory owners are now expecting skilled-workers to expand their workload and complete a variety of tasks to cut down costs, and they are operating at a much lower capacity than in a "business-as-usual" scenario. As result of this information and the conducted primary research the following results:

- The sub-sector Dyes, paints & inks is operating at 30 percent of its capacity, and as such it is estimated that 70 percent of jobs in non-priority occupations will be lost by the end of 2020
- The sub-sector Perfumes, cosmetics, and dead is operating at 25 percent its capacity, and as such it is estimated that 75 percent of jobs in non-priority occupations will be lost by the end of 2020
- In reference to the table above, the following number of jobs are expected to be lost:
  - 1,520 jobs from the Dyes, paints & inks sub-sector (accounting for 70 percent of non-priority occupations)
  - 414 jobs from the Perfumes, cosmetics, and dead sub-sector (accounting for 75 percent of non-priority occupations)
- A such the total number of jobs lost from the sub-sectors that were negatively impacted, in addition, to the decrease in the anticipated vacancies for these same sub-sectors results in a loss of approximately 2434 jobs by the end of 2021.

The Detergents & Disinfectants sector on the other hand is expected to maintain its number of employees, and it is expected vacancies will increase slightly over the numbers projected originally. According to sector representatives, 20 new employees are now working in the sector. Nonetheless, as this may be a “peak” period for this sector that is related to the pandemic, and operations in the medium-term will go back to “business-as-usual”, a conservative extrapolation will be administered to anticipate an additional increase of 20 workers per year to the original anticipated vacancies; that will increase at the same constant of 2 percent annually.

Lastly, in terms of the Fertilizers and Pesticides sub-sector, as exports have been decreased considerably but replaced by a higher local demand, it is safe to assume that the original predications for this sector will remain the same for the short to medium-term. Accordingly, the following figure emerges, covering total projected employment for the sector:

Figure 37: Employment forecast 2020-2024



The dip that occurs on the number of employees in the year 2020, will affect the sector’s growth and hiring potential. Although, operations of the sector are expected to pick-up, and increase gradually at a stable 2 percent annual rise. The sector will not rebound into the potential originally expected before 2019, unless a positive rehabilitation and policies for economic survival are put into place immediately. In the current scenario (COVID-19), approximately 3,000 jobs will no longer exist by the year 2025.

13.2 Exports

The forecast for the exports is based on the same performance indicators per sub-sector that affected the employment projections. For a thorough assessment of exports, it is best to refer to International Trade Centre (ITC) data, and in specific to the main 4 sector categories that were part of the report it prepared in collaboration with the ILO, segregated as follow: (1) Detergents and Disinfectants (HS Code: 34), (2) Fertilizers & Pesticides (HS Code: 31), (3) Paints (HS Code: 32), and (4) Cosmetics (HS: Code: 34), and their contribution to exports.

The data presented in table 21, highlights the four main sub-sectors in question, two of which are some of the highest contributors to exports, and where effected positively to some extent by the COVID-19 pandemic. The assessment into forecasted exports, will consider the historic data per sub-sector, in addition to the current rate of productivity of these sub-sectors, to establish how they will be affected in a 5-year time-span.

Table 21: Exports for the Chemical & Cosmetics Sector 2016 to 2018 [85]

Code	Subsector	2016	2017	2018	2016-2018 CAGR %
31	Fertilisers	612.7	657.7	809.8	9.7%
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, ...	318.3	385.2	401.5	8.0%
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial ...	100.5	101.5	130.1	9.0%
38	Miscellaneous chemical products	62.3	69.3	67.6	2.8%
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring ...	52.7	56.7	59.7	4.2%
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	38.1	39.0	41.3	2.7%
29	Organic chemicals	13.9	17.5	16.2	5.2%
35	Albuminoidal substances; modified starches; glues; enzymes	5.8	6.5	6.1	2.0%
37	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	0.1	0.1	0.1	8.7%
36	Photographic or cinematographic goods	0.5	0.1	0.0	-64.7%
	Grand Total	**1,204.9**	**1,333.7**	**1,532.3**	**8.3%**

As the survey data throughout this report is considered as an accurate sample for market representation, the following percentage output from total firms per sub-sector are estimated to be exported:

- 78 percent of the output of the Fertilizers & Pesticides Sub-Sector
- 51 percent of the output of the Detergents & Disinfectants Sub-Sector
- 75 percent of the output or the Dyes, Paints & Inks Subsector; and
- 80 percent of the output of the Perfumes, Cosmetics, and Dead Sea products Sub-sector

85 ITC Trade Map, 2019

Given the decrease in production capacity of the more affected firms (i.e. 30 percent operational capacity for Dyes, Inks, and Paints, and 25 percent operational capacity for Perfumes, Cosmetics, and Dead Sea Products), and their contribution to the overall export, and assuming an extrapolation from that of 2018, the following decrease in overall exports is to be expected:

- 52 Percent decrease in anticipated exports, approximated in 2020 for the Dyes, Paints, and Inks Subsector
- 60 Percent decrease in anticipated exports, approximated in 2020 for the Perfumes, Cosmetics, and Dead Sea products Subsector

In terms of the better performing sub-sectors, the Detergents & Disinfectants exports have increased greatly, especially to neighbouring countries. All exporting firms have increased their activities, and new firms have started exporting. On this basis, it is estimated that overall exports for the subs-sector in 2020, could increase by 50 percent of anticipated exports based on the original "Business-as-usual" scenario, extrapolated from 2018. Under this assumption the increase in exports may be temporary based on the time-frame of the crisis. Lastly, the pesticides and fertilizers sub-sectors have been unable to export for a period of three months so far. Thus, assuming equal exporting quantities monthly, and extrapolating again from 2018, will result in a loss of exports approximated at 33 percent of total annual exports.

Overall, a drastic dip in exports is anticipated, that will not be lifted even by the better performing sub-sectors, that were considered as highly essential during the crisis. The figure presented below indicates that the amount of exports originally to be reached in 2020 under a business-as-usual scenario are no longer achievable, and the market will not bounce back to the expected scenario prior 2026.

The results are naturally in line to that of the lower anticipated employment, and a loss of USD 222 Mil is expected in export values by 2025; which stresses the importance of immediate action to assist the sector in picking up pace and growing at the anticipated rate.

Figure 38: Export Forecast 2020-2024

14 Conclusions

The chemicals and cosmetics sector is a major driver of Jordan's economy and employed more than 15,000 workers across nearly 700 enterprises in 2018. In the same year, it accounted for 20 per cent of total exports, contributing more than 9 per cent of industrial economic output. The sector's exports have fluctuated greatly in recent years, driven primarily by general economic and political conditions, but it has also faced domestic challenges that may have limited its competitive position. The challenges faced by the sector require an assessment of current policies, and proper planning to ensure its position in an increasingly competitive regional and global environment.

The STED survey reveals important insights about the enterprises operating in the sector and the various challenges they face, particularly regarding skills and trade. The gap between skills supply and demand is very evident when the findings of the academic and training institute survey are compared with those of the industrial survey. It is clear that the existing collaboration between academic and training institutes, and firms operating in the sector is suboptimal and has not helped to close the gap. A structured framework for collaboration is fundamental to ensure that future graduates have the skills and expertise that employers require.

The chemicals and cosmetics sector is anticipated to have more than 800 vacancies in 2019 and 2020 that are not filled due to the challenges in finding workers with the right expertise and skills. These challenges require an assessment of existing policies to evaluate possible ways to unleash the full potential of local manufactures. The chemicals and cosmetics sector continues to be a major driver of the economy. Assuming business remains as usual, and no major exogenous or endogenous shocks occur effecting the Jordanian Industrial sector, exports are expected to grow at a rate of 2 per cent annually reaching approximately USD 1.75 billion by 2025. This is a conservative figure that can be exceed with the right policies in place. However, the endogenous and exogenous shocks created by the COVID-19 pandemic have resulted in constraints on both exports and employment. A major hurdle for the sector has been the drastic decrease in exports, and the crippling in the operations of two major sub-sectors, those of Dyes, Inks, & Paints, and of Cosmetics, Perfumes, and Dead Sea Products. Although the remaining two sectors (Detergents & Disinfectants, and Fertilizers and Pesticides) have performed relatively well during the crisis, due to their necessity during the time, it was not enough the counteract the negative pressures exerted on total sector exports and employment. As such under a COVID-19 pessimistic scenario, for the same time period, exports are expected to drop by USD 222 Mil, and 3,000 vacancies will no longer exist within the sector; which makes long-term sector strategies and support much more essential to implement at this time.

15 Next Steps

Multiple next steps need to be considered, and assessed further, to enable sector survival in the current situation, and development on the medium to long-run. For all of the sub-sectors under Chemicals & Cosmetics, operational and running costs (i.e. electricity, water, transportation…etc.) need to be urgently addressed. In parallel, capacity building in terms of product line diversification and quality up-grades needs focus, in addition, to providing the access-to-finance needed. Given the diversity of products produced by the sector, in addition to the different market demands emerging as a result of the COVID-19 pandemic, sub-sector foresight and planning exercises are needed to map out a road map for the sector's future.

Specifically, in terms of the labour force, huge effort should be exerted to formalize employment. There should also be a strong focus on training, specifically for Jordanian workers – as they lack more specialized skills – on three fronts: first, the skills required for the chemical technician occupations in general; second, the skills required to enable higher digitization of processes, including but not limited to communications skills; and third core employability skills, including a particular focus on the occupational health and safety skills and practices required due to the pandemic.

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17 Appendices

17.1 Appendix 1: ISIC categories for the manufacture of chemicals and chemical products

International Standard Industrial Classification (ISIC) Revision 4 categorizes the chemical manufacturing industry as Division 20 (Manufacture of chemicals and chemical products) of Section C (Manufacturing) and it consists of the following subdivisions:

Table 22: Manufacture of chemicals and chemical products, ISIC Rev. 4

Group	Class	Description
201		Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms
	2011	Manufacture of basic chemicals
	2012	Manufacture of fertilizers and nitrogen compounds
	2013	Manufacture of plastics and synthetic rubber in primary forms
202		Manufacture of other chemical products
	2021	Manufacture of pesticides and other agrochemical products
	2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
	2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
	2029	Manufacture of other chemical products n.e.c.
203	2030	Manufacture of man-made fibres

Source: United Nations, 2008, International Standard Industrial Classification of All Economic Activities Rev 4.

For the purposes of this report, the following product classes are not covered because of the minimal value added performed locally:

- Manufacture of plastics and synthetic rubber in primary forms (ISIC 2013)
- Manufacture of man-made fibres (ISIC 2030)

17.2 Appendix 2: ISCO and ASCO duties by occupation

Section C	Manufacturing		
Division 20	**Manufacture of chemicals and chemical products:** This division includes the transformation of organic and inorganic raw materials by a chemical process and the formation of products. It distinguishes the production of basic chemicals that constitute the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry classes.		
Group	**Description of Group**	**Class**	**Description of Class**
201 Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms	This group includes the manufacture of basic chemical products, fertilizers and associated nitrogen compounds, as well as plastics and synthetic rubber in primary forms.	2011	**Manufacture of basic chemicals** This class includes the manufacture of chemicals using basic processes, such as thermal cracking and distillation. The output of these processes is usually separate chemical elements or separate chemically defined compounds. **This class includes:** manufacture of liquefied or compressed inorganic industrial or medical gases: elemental gases, liquid or compressed air, refrigerant gases, mixed industrial gases, inert gases such as carbon dioxide, isolating gases. - manufacture of dyes and pigments from any source in basic form or as concentrate - manufacture of chemical elements - manufacture of inorganic acids except nitric acid - manufacture of alkalis, lyes and other inorganic bases except ammonia - manufacture of other inorganic compounds - manufacture of basic organic chemicals: • acyclic hydrocarbons, saturated and unsaturated • cyclic hydrocarbons, saturated and unsaturated • acyclic and cyclic alcohols • mono- and polycarboxylic acids, including acetic acid • other oxygen-function compounds, including aldehydes, ketones, quinones and dual or poly oxygen-function compounds • synthetic glycerol • nitrogen-function organic compounds, including amines • fermentation of sugarcane, corn or similar to produce alcohol and esters • other organic compounds, including wood distillation products (e.g. charcoal) etc. - manufacture of distilled water - manufacture of synthetic aromatic products - roasting of iron pyrites **This class also includes:** - manufacture of products of a kind used as fluorescent brightening agents or as luminophores - enrichment of uranium and thorium ores and production of fuel elements for nuclear reactors
		2012	**Manufacture of fertilizers and nitrogen compounds** **This class includes:** - manufacture of fertilizers: • straight or complex nitrogenous, phosphatic or potassic fertilizers • urea, crude natural phosphates and crude natural potassium salts - manufacture of associated nitrogen products: • nitric and sulphonitric acids, ammonia, ammonium chloride, ammonium carbonate, nitrites and nitrates of potassium **This class also includes:** - manufacture of potting soil with peat as main constituent - manufacture of potting soil mixtures of natural soil, sand, clays and minerals

Group	Description of Group	Class	Description of Class
202 Manufacture of other chemical products	This group includes the manufacture of chemical products other than basic chemicals and man-made fibres. This includes the manufacture of a variety of goods such as pesticides, paints and inks, soap, cleaning preparations, perfumes and toilet preparations, explosives and pyrotechnic products, chemical preparations for photographic uses (including film and sensitized paper), gelatines, composite diagnostic preparations etc.	2021	**Manufacture of pesticides and other agrochemical products** **This class includes:** - manufacture of insecticides, rodenticides, fungicides, herbicides - manufacture of anti-sprouting products, plant growth regulators - manufacture of disinfectants (for agricultural and other use(- manufacture of other agrochemical products n.e.c
		2022	**Manufacture of paints, varnishes and similar coatings, printing ink and mastics** **This class includes:** - manufacture of paints and varnishes, enamels or lacquers - manufacture of prepared pigments and dyes, opacifiers and colours - manufacture of vitrifiable enamels and glazes and engobes and similar preparations - manufacture of mastics - manufacture of caulking compounds and similar non-refractory filling or surfacing preparations - manufacture of organic composite solvents and thinners - manufacture of prepared paint or varnish removers - manufacture of printing ink
		2023	**Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations** **This class includes:** - manufacture of organic surface-active agents - manufacture of soap - manufacture of paper, wadding, felt, etc. coated or covered with soap or detergent - manufacture of crude glycerol - manufacture of surface-active preparations. • washing powders in solid or liquid form and detergents • dish-washing preparations • textile softeners manufacture of cleaning and polishing products: • preparations for perfuming or deodorizing rooms • artificial waxes and prepared waxes • polishes and creams for leather • polishes and creams for wood • polishes for coachwork, glass and metal • scouring pastes and powders, including paper, wadding etc. coated or covered with these manufacture of perfumes and toilet preparations: • perfumes and toilet water • beauty and make-up preparations • sunburn prevention and suntan preparations • manicure and pedicure preparations • shampoos, hair lacquers, waving and straightening preparations • dentifrices and preparations for oral hygiene, including denture fixative preparations • shaving preparations, including pre-shave and aftershave preparations • deodorants and bath salts • depilatories

Group	Description of Group	Class	Description of Class
		2029	**Manufacture of other chemical products n.e.c** **This class includes:** - manufacture of propellant powders - manufacture of explosives and pyrotechnic products, including percussion caps, detonators, signalling flares, etc. - manufacture of gelatine and its derivatives, glues and prepared adhesives, including rubber-based glues and adhesives - manufacture of extracts of natural aromatic products - manufacture of resinoids - manufacture of aromatic distilled waters - manufacture of mixtures of odoriferous products for the manufacture of perfumes or food - manufacture of photographic plates, films, sensitized paper and other sensitized unexposed materials - manufacture of chemical preparations for photographic uses - manufacture of various chemical products: • peptones, peptone derivatives, other protein substances and their derivatives n.e.c. • essential oils • chemically modified oils and fats • materials used in the finishing of textiles and leather • powders and pastes used in soldering, brazing or welding • substances used to pickle metal • prepared additives for cements • activated carbon, lubricating oil additives, prepared rubber accelerators, catalysts and other chemical products for industrial use • anti-knock preparations, antifreeze preparations • composite diagnostic or laboratory reagents - **This class also includes:** - manufacture of writing and drawing ink - manufacture of matches

Section H	Transportation and Storage		
Division 52	**Warehousing and support activities for transportation** This division includes warehousing and support activities for transportation, such as operating of transport infrastructure (e.g. airports, harbours, tunnels, bridges, etc.), the activities of transport agencies and cargo handling.		
Group	**Description of Group**	**Class**	**Description of Class**
521 Warehousing and storage	Warehousing and storage	5210	**Warehousing and storage** **This class includes:** - operation of storage and warehouse facilities for all kind of goods: • operation of grain silos, general merchandise warehouses, refrigerated warehouses, storage tanks etc. **This class also includes:** - storage of goods in foreign trade zones - blast freezing

Section G	Wholesale and retail trade; repair of motor vehicles and motorcycles		
Division 46	**Wholesale trade, except of motor vehicles and motorcycles**		
Group	**Description of Group**	**Class**	**Description of Class**
Wholesale of household goods	Wholesale of household goods	4649	**Wholesale of other household goods** **This class includes:** - wholesale of household furniture - wholesale of household appliances - wholesale of consumer electronics • radio and TV equipment • CD and DVD players and recorders • stereo equipment • video game consoles - wholesale of lighting equipment - wholesale of cutlery - wholesale of china and glassware - wholesale of woodenware, wickerwork and corkware etc. - wholesale of pharmaceutical and medical goods - wholesale of perfumeries, cosmetics and soaps - wholesale of bicycles and their parts and accessories - wholesale of stationery, books, magazines and newspapers - wholesale of photographic and optical goods (e.g. sunglasses, binoculars, magnifying glasses) - wholesale of recorded audio and video tapes, CDs, DVDs - wholesale of leather goods and travel accessories - wholesale of watches, clocks and jewellery - wholesale of musical instruments, games and toys, sports goods

- **Source: United Nations, 2008, International Standard Industrial Classification of All Economic Activities Rev 4.**

17.3 Appendix 3: Relevant academic and training programmes by occupation

			Occupations														
Programme	University	NQF from Raw Data	Mechanical engineering technician/ maintenance of equipment and chemical machinery (fertilizers and pesticides)	Warehouse warden/ chemicals (fertilizers and pesticides)	General production supervisor of a transformative plant (chemical engineer)	Quality control engineer/ quality engineer and systems application (fertilizer and pesticide factories)	Industrial engineer/ ERP systems specialist	Warehouse warden / paints, inks and pigments	Quality control engineer/ quality engineer systems application (paint factories, ink, and pigments)	Mechanical engineering technician/ chemical equipment maintenance	Quality control engineer/ engineer quality assurance and systems application (perfume factories, cosmetics and Dead Sea products)	(Industrial engineer/ ERP systems specialist) perfume, cosmetics and Dead Sea products	Mechanical engineering technician/ chemical equipment maintenance (perfumes, cosmetics and Dead Sea products)	Chemical laboratory technician/ analysis of perfume products, cosmetics and Dead Sea products	Quality control engineer/ quality engineer and systems application (detergent, disinfectant and chemical factories)	Chemical laboratory technician / analysis and examination of detergent products, chemical disinfectants and polishing materials	Warehouse warden/ detergents and chemical disinfectants
Supply Management	Luminus Technical University College	Diploma		X				X									X
Operations and Supply Management	Luminus Technical University College	Bachelor's Degree		X				X									X
Electronics and Electronic Engineering	Luminus Technical University College	Diploma	X										X		X		
Mechanical Engineering	Luminus Technical University College	Diploma	X										X		X		
Industrial Engineering	University of Jordan	Bachelor's Degree							X								
Production and Design Engineering	University of Jordan	Master's Degree							X								
Maintenance and Quality Management	University of Jordan	Master's Degree							X								
Engineering Management	University of Jordan	Master's Degree							X								

			Occupations														
Programme	University	NQF from Raw Data	Mechanical engineering technician/ maintenance of equipment and chemical machinery (fertilizers and pesticides)	Warehouse warden/ chemicals (fertilizers and pesticides)	General production supervisor of a transformative plant (chemical engineer)	Quality control engineer/ quality engineer and systems application (fertilizer and pesticide factories)	Industrial engineer/ ERP systems specialist	Warehouse warden / paints, inks and pigments	Quality control engineer/ quality engineer systems application (paint factories, ink, and pigments)	Mechanical engineering technician/ chemical equipment maintenance	Quality control engineer/ engineer quality assurance and systems application (perfume factories, cosmetics and Dead Sea products)	(Industrial engineer/ ERP systems specialist) perfume, cosmetics and Dead Sea products	Mechanical engineering technician/ chemical equipment maintenance (perfumes, cosmetics and Dead Sea products)	Chemical laboratory technician/ analysis of perfume products, cosmetics and Dead Sea products	Quality control engineer/ quality engineer and systems application (detergent, disinfectant and chemical factories)	Chemical laboratory technician / analysis and examination of detergent products, chemical disinfectants and polishing materials	Warehouse warden/ detergents and chemical disinfectants
Industrial Engineering	Hashemite University	Bachelor's Degree				X	X		X		X	X			X		X
Crisis Management	Hashemite University	Master's Degree				X	X		X		X	X			X		X
Chemical Engineering - Medicinal	German Jordanian University	Bachelor's Degree			X												
Industrial Engineering (production and management)	German Jordanian University	Bachelor's Degree				X			X		X	X			X		
Chemical Industries Engineering (general not specialized)	Balqa Applied University	Bachelor's Degree			X												
HVAC Diploma	Balqa Applied University	Diploma															
Production Diploma	Balqa Applied University	Diploma															
Vehicle Maintenance Diploma	Balqa Applied University	Diploma															
Electromechanical Engineering/ Bachelor's	Balqa Applied University	Bachelor's Degree												X		X	
Industrial Engineering	Yarmouk University	Bachelor's Degree	X		X	X											
Industrial Engineering	Yarmouk University	Bachelor's Degree	X	X	X	X											

			Occupations														
Programme	University	NQF from Raw Data	Mechanical engineering technician/ maintenance of equipment and chemical machinery (fertilizers and pesticides)	Warehouse warden/ chemicals (fertilizers and pesticides)	General production supervisor of a transformative plant (chemical engineer)	Quality control engineer/ quality engineer and systems application (fertilizer and pesticide factories)	Industrial engineer/ ERP systems specialist	Warehouse warden / paints, inks and pigments	Quality control engineer/ quality engineer systems application (paint factories, ink, and pigments)	Mechanical engineering technician/ chemical equipment maintenance	Quality control engineer/ engineer quality assurance and systems application (perfume factories, cosmetics and Dead Sea products)	(Industrial engineer/ ERP systems specialist) perfume, cosmetics and Dead Sea products	Mechanical engineering technician/ chemical equipment maintenance (perfumes, cosmetics and Dead Sea products)	Chemical laboratory technician/ analysis of perfume products, cosmetics and Dead Sea products	Quality control engineer/ quality engineer and systems application (detergent, disinfectant and chemical factories)	Chemical laboratory technician / analysis and examination of detergent products, chemical disinfectants and polishing materials	Warehouse warden/ detergents and chemical disinfectants
Industrial Engineering	¬	Master's Degree	X	X	X	X											
Specialized training	Jordan University for Science and Technology	Certificates of Attendance	X	X	X	X											
Systems Engineering	Jordan University for Science and Technology	Bachelor's Degree					X										
Systems Engineering	Mutah University	Master's Degree					X										
Total			**6**	**5**	**6**	**7**	**4**	**2**	**7**	**0**	**3**	**3**	**2**	**1**	**5**	**1**	**2**

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