



International
Labour
Organization

► Ghana's oil and gas sector



► Ghana's oil and gas sector

Copyright © International Labour Organization 2021

First published 2021

Publications of the International Labour Office enjoy copyright under Protocol 2 of the Universal Copyright Convention. Nevertheless, short excerpts from them may be reproduced without authorization, on condition that the source is indicated. For rights of reproduction or translation, application should be made to ILO Publications (Rights and Licensing), International Labour Office, CH-1211 Geneva 22, Switzerland, or by email: rights@ilo.org. The International Labour Office welcomes such applications.

Libraries, institutions and other users registered with a reproduction rights organization may make copies in accordance with the licences issued to them for this purpose. Visit www.ifrro.org to find the reproduction rights organization in your country.

Ghana's oil and gas sector

ISBN 978-92-2-035723-1 (Print)

ISBN 978-92-2-035724-8 (Web PDF)

The designations employed in ILO publications, which are in conformity with United Nations practice and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the International Labour Office concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its frontiers.

The responsibility for opinions expressed in signed articles, studies and other contributions rests solely with their authors and publication does not constitute an endorsement by the International Labour Office of the opinions expressed in them.

Reference to names of firms and commercial products and processes does not imply their endorsement by the International Labour Office and any failure to mention a particular firm, commercial product or process is not a sign of disapproval.

Information on ILO publications and digital products can be found at: www.ilo.org/publns.

► Foreword

Transforming the Technical and Vocational Education and Training (TVET) sector is one of government's strategy to particularly reduce unemployment and generally enhance the livelihoods of Ghanaians. So the Commission for TVET (CTVET), together with the Ministry of Education on their part developed the five year Strategic Plan for TVET Transformation 2018–2022 and among the goals are enhancing the governance and management of TVET and improving upon the quality of TVET delivery under which the establishment of Sector Skills Bodies (SSBs) also known as Sector Skills Councils (SSCs) is one of the strategies.

The SSBs are a group of related industry players and training service providers that come together under a common structure to drive growth and competitiveness across the sector. Fundamentally, sector skills bodies focus on exploration of business opportunities and capacity needs within the sector and on how they can remain competitive through the development and implementation of skills development measures. The need for sector skills bodies in Ghana has become very crucial. If a sector is to maximise its full potential then it needs a skilled workforce that can meet its current and future needs.

The Sector Skills Strategy is a critical document that articulates the needs and galvanises a sector together with its key partners to address specific challenges and ensure that the Technical and Vocational Education and Training system functions well.

The skills strategy for the oil and gas sector intends to facilitate the integration of skills development into sector development policies, thereby ensuring that the supply of skills is tailored not only to meet the skills demand of the oil and gas sector, but also to engineer the necessary growth in productivity which when sustained, will produce sustained decent employment. It builds on the sector's vision of a viable oil and gas sector with relevant infrastructure, skilled workforce and high service quality delivered safely by Ghanaians, as well as safeguarding the environment.

The Oil and Gas SSB was set up by CTVET in collaboration with the ILO/SKILL UP Project funded by the Norwegian Agency for Development Cooperation. The strategy developed by the SSB brings together available research and data with sectoral analysis and provides a comprehensive overview of the employment structure in the sector and key trends affecting the demand for skills and labour using ILO's Skills for Trade and Economic Diversification (STED) methodology. It also sets out the supply of TVET for the sector; the current challenges facing the sector and the actions that need to be taken forward to ensure that the TVET system is fully responsive.

We hope this strategy does not only stimulate collective action, but also galvanises employers as they invest in their workforce, inform TVET institutions in their curriculum development and policy makers as they devise and implement policy.

The impact of COVID-19 has reinforced the urgency of action to address sectoral skills and labour market needs and it is more important than ever that each sector have skilled workforce to compete as they recover from the pandemic. We hope this strategy provides a ready blueprint to start that recovery.

Dr. Fred Kyei Asamoah
 Director General – CTVET

► Acknowledgements

This document was prepared by Dr. Hod Anyigba with support from Ilca Webster, Theophilus Zogblah, Dr. Alexander Preko and Frank Kwasi Adetor. It draws on inputs from the STED Background Study on the sector¹, the Rapid STED Technical and Policy Workshop conducted in Dodowa on 1–2 December 2020, and on follow-up consultations. Bolormaa Tumurchudur Klok and Cornelius Gregg provided technical inputs and oversight.

Thanks and appreciation are due to the members of the Ghana Oil and Gas Sector Skills Body chaired by Dr. Douglas Zormelo who participated actively in the Technical and Policy workshop, and to the companies that gave of their time and expertise in discussions and also to all the sector stakeholders consulted individually.

The contributions of Sergio André Iriarte Quezada, Milagros Lazo, Adame and Traore of the “SKILL UP” project are also acknowledged.

Thanks are due for the support of Dr. Fred Kyei Asamoah, Director General of CTVET, Ms. Vanessa Phala, Country Director of ILO Office for Nigeria, Ghana, Liberia and Sierra Leone and Liaison Office for ECOWAS, and to Srinivas Reddy, Branch Chief of ILO Skills and Employability Branch, Employment Policy Department.

Financial support from the Norwegian Agency for Development Cooperation is acknowledged with gratitude.

¹ “Skills Gap Analysis and Audit of Seven Sectors in Ghana”, Ford Foundation and Council for Technical and Vocational Education and Training.

► Contents

Foreword	III
Acknowledgements	IV
1. Introduction	2
1.1 The need for a sector skills strategy	2
1.2 Sector definition and scope	3
1.3 Sector skills strategy aims and scope	3
2. Sector profile and situation analysis	4
2.1 Economic and employment profile	10
2.2 Drivers of change, enablers and key major trends and their likely impact on employment	12
3. Profile of major occupations and key skills in the sector	15
4. The supply of skills	17
4.1 Recruitment practices	17
4.2 Key institutions, formal programs and qualifications relevant to the sector	18
4.3 Enrolments and completion data for relevant courses by region	21
4.4 Work based learning and informal/non-formal sources of skills	22
5. Supply side challenges and constraints	23
5.1 National skills policy and strategy	23
5.2 Governance and stakeholder coordination	24
5.3 Funding	25
5.4 Relevance of curriculum and qualifications	25
5.5 Delivery and assessment practices	25
5.6 Access to training	26
5.7 Industry-institute linkages and support for workplace learning	27
5.8 Gender and disability equality	27
6. Vision for the future of the sector	28
7. Gaps in the capabilities and skills needed to achieve the vision for the future	29
7.1 Labor shortages	29
7.2 Skill shortages	29
7.3 Skills gaps	30
8. Recommendations on meeting priority skills needs and gaps	32
8.1 What skills are needed and where and who should deliver them?	32
9. Recommendations for meeting system-level priorities for the sector	33
9.1 National skills policy and strategy	33
9.2 Governance and stakeholder coordination	33
9.3 Funding	34
9.4 Delivery and assessment practices	34
9.5 Access to training	35
9.6 Industry-institute linkages and support for workplace learning	36
9.7 Gender and disability equality	36
10. Timescales	38
10.1 Immediate actions	38
10.2 Appendices	41

1. Introduction

1.1 The need for a sector skills strategy

The oil and gas sector is regarded as one of the important sectors of the Ghanaian economy that offers and attracts foreign investments and provides employment opportunities to both locals and foreigners. This suggests that the sector is a catalyst for the country to move up into the upper-middle income category.

In general, the oil and gas sector demands specialized skills and one of the major problems facing Ghana's petroleum industry is a shortage of skilled labour, especially engineers, drillers and production operation workers. Evidence from the sector shows that occupations with specialized technical tasks, such as geoscientist, petroleum engineers, and drillers, need years of formal education, training and industry experience.

In response to difficulties in filling job vacancies in the sector, nations have introduced what is referred to as a "demand-driven skills development approach", which aims, among others, to improve the involvement of relevant stakeholders and target groups in the planning and designing processes of Technical Vocation Education and Training. As part of this approach, the ILO supported the Council for TVET (CTVET) in applying ILO's Skills for Trade and Economic Diversification (STED) method in order to better align skills development to labour market needs. This document defines a skills strategy for the oil and gas sector and its accompanying action plan, and was developed with the Oil and Gas SSB members.

1.2 Sector definition and scope

The oil and gas sector provides petroleum goods and services to both indigenous and foreign markets for consumption purposes. The operations of the sector are mainly sub-divided into upstream, mid-stream and downstream.

► Figure 1. Oil and gas subsectors



1.3 Sector skills strategy aims and scope

This sector skills strategy, designed by the Oil and Gas SSB members, identifies and anticipates skills needs in the sector. In all, it envisions the supply of skills to meet the current and future skills demand, by developing a Ghanaian workforce with the required skills for the sector and including for international mobility.

2. Sector profile and situation analysis

Ghana's oil and gas exploration attempts dates back to 1896, when West Africa Oil and Fuel Company drilled onshore wells in the Tano Basin (Western Region). By 1957, a total of 17 onshore wells had been drilled by oil and gas giants such as French Oil Company, Société Française de Pétrole, African and Eastern Trade Corporation (AETC), and Gulf Oil Company. In the 1960s, a team from the Gold Coast Geological Survey (now Geological Survey Department) and Soviet Union geologists drilled 10 hydrogeological wells to study the hydrodynamics of the basin. Two of these wells, Nasia and Prang, were drilled to an average depth of about 700m. The team encountered traces of hydrocarbons and natural gas. These wells became Ghana's first offshore wells and marked the beginning of Ghana's oil and gas exploration.

Ghana's oldest producer of crude oil, Saltpond Offshore Producing Company (SOPCL) began operations in 1970 in the Saltpond Oil Field. This oil field was discovered in 1970 by Signal-Amoco Consortium. However, it was only after 2010 that production began in commercial quantities at the Jubilee fields and subsequently in other fields such as Tweneboa Enyenra Ntomme (TEN) and Sankofa Gye Nyame (SGN) field. The Sankofa Gye Nyame field has taken center stage as the government of Ghana brokered a USD 7 billion deal for the development of Cape Three Points to supply the country's energy and power security needs and develop exports. The project is being undertaken by Eni Spa and Vitol Energy together with Accra-based Springfield Exploration and Production Ltd. and will provide input gas to fuel Ghana's thermal plants within a period of 20 years. As of February 2021, the field was estimated to produce 1,500,247.40 (bbl) of oil and associated gas production of 4,190.78 (MMscf).

The oil and gas sector is organized in the upstream, midstream and downstream and sectors. The upstream sector focuses on five economic units, namely:

- | | | |
|-----------------|---------------------|---------------------|
| (a) exploration | (c) development | e) decommissioning. |
| (b) appraisal | (d) production, and | |

The business or commercial activities of the downstream industry in respect of crude oil, gasoline, diesel, liquefied petroleum gas, kerosene and other designated petroleum products are:

- | | | | |
|--------------------|--------------------|------------------|--------------------------|
| (a) importation | (d) shipment | (g) refining | (j) marketing, and |
| (b) exportation | (e) transportation | (h) storage | (k) sales ² . |
| (c) re-exportation | (f) processing | (i) distribution | |

² National Petroleum Authority. NPA Act 2005 Act 651 Retrieved from <http://www.npa.gov.gh/images/npa/documents/npa-act-2005.pdf>.

The midstream sector includes the transportation of crude oil into the refinery, refining of the crude oil into its components and the storage and transportation of the refined product within the refinery. However, the transportation of refined petroleum product from the refinery or vessels (imported into the country) to other storage depots and the subsequent operations falls under the downstream operations.

The upstream and downstream sectors are regulated by a number of laws. The main economic activities in Ghana's downstream oil and gas industry are marketing and distribution of crude oil and crude products as well as the development and sale of natural gas. Ghanaian oil marketing companies have largely dominated the downstream oil and gas industry particularly in bulk storage, transportation and the retail of petroleum products. A detailed business environment analysis, market trends, SWOT and PESTLE analysis of the upstream, midstream and downstream subsectors are presented in Appendices 1-8. Primarily, private oil marketing companies market and distribute oil products. These companies include: Goil, Shell, Total, Engen, Allied Oil and other operators. Cirus Oil Services and Vitol SA are companies in charge of marketing Ghana's crude oil abroad. The petroleum refinery space is highly underdeveloped with funding and infrastructural challenges as the main bottlenecks for the sector's development.

Ghana's energy needs are largely reliant on oil (approximately 70 per cent) rather than other sources of energy. The February 2019 Renewable Energy Master Plan has set a target to hike renewables' penetration (not including hydroelectric power) in the national generation mix from a 2015 baseline of only 42.5MW to 1,363.63MW by 2030 when grid-connected systems should total 1,094.63MW³ ([Ghana Power Report 2019/20](#)). Petroleum products such as gasoil, gasoline, kerosene, Liquefied Petroleum Gas (LPG), and natural gas are highly utilized for power generation, manufacturing and transportation. The consumption of petroleum products for all regions in Ghana is presented in Tables 1 and 2:

► **Table 1. Regional Consumption, 2020**

	AGO	PMS	LPG - Butane	AGO MINES	MGO Local
Ashanti	366,338,500	285,159,650	51,636,320	44,616,500	–
Brong Ahafo	124,342,500	132,658,400	34,037,907	42,779,000	–
Central	133,876,950	139,799,300	24,698,449	–	4,369,500
Eastern	176,757,550	149,516,600	32,608,261	29,259,500	–
Greater Accra	503,815,406	671,843,600	113,343,417	26,561,200	47,286,157
Northern	99,108,200	135,088,450	7,496,500	–	–
Upper East	52,169,450	110,409,500	4,271,490	–	–
Upper West	39,465,850	61,618,000	2,744,810	–	–
Volta	222,258,500	171,450,700	39,719,761	13,500	–
Western	235,399,050	164,821,450	21,813,455	189,197,600	2,875,500
Grand Total	1,953,531,956	2,022,365,650	332,370,370	332,427,300	54,531,157

3 Ghana Power Report 2019/20 - Ghanaian Governance, Policy Implementation & Investability.

► Table 2. Regional Consumption, 2020

	AGO	PMS	LPG - Butane	AGO MINES	MGO Local
Ashanti	–	913,500	13,500	3,182,000	–
Brong Ahafo	–	99,000	4,981,500	–	–
Central	–	450,000	19,426,500	245,000	–
Eastern	–	612,000	12,001,500	727,000	108,000
Greater Accra	159,223,300	3,109,500	17,739,000	44,628,500	1,732,500
Northern	356,000	189,000	4,279,500	–	–
Upper East	–	63,000	–	–	–
Upper West	–	27,000	–	–	–
Volta	–	418,500	24,786,000	–	486,000
Western	36,000	270,000	18,522,000	–	–
Grand Total	159,615,300	6,151,500	101,749,500	48,782,500	2,326,500

Source: National Petroleum Authority, 2020

Tema Oil Refinery (TOR) is the premier and only refinery in Ghana. The refinery was among the first eight refineries in Africa as at 1963. TOR has 45,000 barrel per stream day (bpsd) capacity Crude Distillation Unit and supplies this quantity out of the national demand of 65,000 bpsd⁴.

In terms of policies to regulate economic activities, the Ministry of Energy provides leadership and direction. The Ministry of Energy is also responsible for the formulation and implementation of policies in the energy sector.

A number of agencies under the Ministry of Energy are specialized in the petroleum subsector:⁵

- i. Bulk Oil Storage and Transportation Company (BOST) - Public
- ii. Petroleum Commission (PC) - Public
- iii. Ghana Cylinder Manufacturing Company (GCMC) - Public
- iv. Ghana Oil Company Limited (GOIL) - Public
- v. Ghana National Petroleum Commission (GNPC) - Public
- vi. National Petroleum Authority (NPA) - Public
- vii. Tema Oil Refinery (TOR) - Public
- viii. Ghana National Gas Company (GNGC) - Public

⁴ Tema Oil Refinery. Company Profile. Retrieved from [https://www.tor.com.gh/about-tor/company-profile/#:~:text=Tema%20Oil%20Refinery%20\(TOR\)%20is,national%20demand%20of%2065%2C000%20bpsd](https://www.tor.com.gh/about-tor/company-profile/#:~:text=Tema%20Oil%20Refinery%20(TOR)%20is,national%20demand%20of%2065%2C000%20bpsd).

⁵ <https://www.energymin.gov.gh/brief-history> viewed March 23, 2021.

In 2006, the Ministry of Energy of Ghana launched the Strategic Energy Plan (SNEP)⁶. SNEP outlines the Government of Ghana's policy direction regarding the current challenges facing the energy sector. The document provides a concise outline of the Government's policy direction in order to contribute to a better understanding of Ghana's energy policy framework. The policy covers the broad spectrum of issues and challenges relating to the following areas:

- i. Power subsector;
- ii. Petroleum subsector;
- iii. Renewable energy subsector;
- iv. Waste-to-energy;
- v. Energy efficiency and conservation;
- vi. Energy and environment;
- vii. Energy and gender; and
- viii. Managing the future of the sector.

SNEP reiterates the sector ministry's vision, which is to develop an 'energy economy' that would ensure sustainable production, supply and distribution of high quality energy services to all sectors of the economy in an environmentally friendly manner for Ghana's future while making significant contribution to the country's export earnings.

In responding to the energy vision, the following ten (10) broad objectives of the sector are addressed by the SNEP energy policy:

- **Objective 1**
Stimulate economic development by ensuring that energy plays a catalytic role in Ghana's economic development.
- **Objective 2**
Consolidate, improve and expand existing energy infrastructure.
- **Objective 3**
Increase access to modern energy services for poverty reduction in off-grid areas.
- **Objective 4**
Secure and increase future energy security by diversifying sources of energy supply.
- **Objective 5**
Accelerate the development and utilization of renewable energy and energy efficiency technologies.
- **Objective 6**
Enhance private sector participation in energy infrastructure development and service delivery.
- **Objective 7**
Minimize environmental impacts of energy production, supply and utilization.
- **Objective 8**
Strengthen institutional and human resource capacity and R & D in energy development.
- **Objective 9**
Improve governance of the energy sector.
- **Objective 10;**
Sustain and promote commitment to energy integration as part of economic integration of West African states.

⁶ Energy Commission. Strategic National Energy Plan (2006-2020). Retrieved from <http://www.energycom.gov.gh/files/snep/MAIN%20REPORT%20final%20PD.pdf>.

As outlined in the Strategic National Energy Plan, key challenges facing the sector are:

- i. Rapidly growing demand for energy by all sectors of the economy and a growing population.
- ii. Risk of a fundamental imbalance between energy production and indigenous resource, which is evident for all the major energy forms.
- iii. Risk of over reliance on imports to meet local shortfalls of conventional fuels, which could threaten the country's supply security, making it vulnerable to external pressures.
- iv. High levels of end-use inefficiency culminating in waste of final energy forms.
- v. Inefficient pricing of energy services resulting in poor financial positions of the energy providers but also inadequate incentives to conserve, which do not encourage optimum use of energy for wealth creation. This threatens the country's growth in prosperity and a modern way of life.
- vi. Operational inefficiencies of the utilities leading to high losses and consequently increasing cost of supply and distribution.
- vii. Over reliance on wood fuels, which could threaten the country's forest cover.
- viii. Solar energy, which is relatively abundant, is barely exploited to supplement the commercial energy requirements of the country.
- ix. Inadequate investments to match the growing demand due to lack of capital.

Strategic targets particularly set for the energy sector by the energy commission are:

- i. Ghana achieves 10% penetration of liquid fuels by renewable and alternative fuel complementation by 2015 expanding to 20% by 2020.
- ii. Ghana becomes self-sufficient in petroleum products by 2015 and net exporter by 2020.
- iii. Replace manganese³⁰ additive with ethanol as performance enhancer in gasoline by 2015.
- iv. Reduce sulphur content in gas oil (automobile diesel) from the prevailing 2000 ppm to
 - a. 1000 ppm by 2015
 - b. 500 ppm by 2020.

The full impact of COVID-19 on these strategies is yet to be assessed but it is highly likely that some targets would be missed.

The National Energy Plan, launched in 2010, sought to provide a concise outline of the Government's policy direction in order to contribute to a better understanding of Ghana's Energy Policy framework.

Regarding the upstream and midstream sectors, the primary goal of the policy was to sustain and optimize the exploitation and utilization of Ghana's oil and gas endowment for the overall benefit and welfare of all Ghanaians, present and future. Key challenges in the oil and gas industry identified include:⁷

- (i) Sustaining interest in exploration activities;
- (ii) Providing security of the oil and gas installations;
- (iii) Becoming environmentally sustainable;
- (iv) Maximizing local content and participation in petroleum industry; and
- (v) Prudent management of revenue from oil and gas exploitation.
- (vi) Fast and Safe transportation of oil and gas products
- (vii) Safe storage of oil and gas products

Similarly, the downstream sector faces some challenges. The policy goal for the downstream sector was to facilitate the universal access to adequate, reliable and cost effective petroleum products such as Liquefied Petroleum Gas (LPG). However, key challenges pertained to the sector.

⁷ Abudu, H., & Sai, R. (2020). Examining prospects and challenges of Ghana's petroleum industry: A systematic review. *Energy Reports*, 6, 841-858.

The challenges facing the downstream subsector include⁸:

- i. Inadequate refining infrastructure
- ii. Inadequate infrastructure for the transportation of petroleum products
- iii. Inadequate storage infrastructure
- iv. Inadequate and inefficient distribution of petroleum products
- v. Inadequate sales outlets
- vi. Ineffective implementation of petroleum pricing mechanism
- vii. Weak institutional and regulatory environment

In formulating the policies and laws regulating a specific subsector such as petroleum operations, due regard is given to this broad regulatory and strategic framework. The specific laws that have been promulgated to regulate the upstream oil industry include:

- The Ghana National Petroleum Corporation Act, 1983 (PNDCL 64);
- The Petroleum (Exploration and Production) Act, 2016 (Act 919) – it is the primary legislation regulating the country's upstream petroleum sector;
- The Petroleum Commission Act, 2011 (Act 821);
- Petroleum (Local Content and Local Participation) Regulations, 2013 (LI 2204)⁹;
- Petroleum (Exploration and Production) (General) Regulations, 2018 (LI 2359) as amended – to provide for the procedures and conditions for the grant of a petroleum agreement;
- The Petroleum Exploration and Production-Data Management Regulation, 2017 (LI 2257) – to strengthen the management of petroleum data;
- The Petroleum (Exploration and Production) (Health, Safety and Environment) Regulations, 2017 (LI 2258) – to prevent the adverse effects of petroleum activities on health, safety and the environment;
- Petroleum (Exploration and Production) (Measurement) Regulations, 2016 (LI 2246);
- Petroleum Commission Fees and Charges Regulations, 2015 (LI 2221);
- Environmental Protection Agency Act 1994 (Act 490);
- Environmental Assessment Regulation 1999 (LI 1652) as amended (2002); and
- Maritime Authority Act, 2002 (630).

Most importantly, guidelines for the management of the petroleum upstream sector are:¹⁰

- Energy Sector Strategy and Development Plan;
- Gas Master Plan;
- Gas Pricing Policy Guidelines to the Petroleum (Exploration and Production) (Measurement) Regulations;
- Guidelines for the formation of joint venture companies in the upstream petroleum industry of Ghana (March 2016); and
- Oil and Gas Insurance Placement for the Upstream Sector.

⁸ Ministry of Energy, National Energy Policy, 2010 Retrieved from <http://www.energycom.gov.gh/files/snep/MAIN%20REPORT%20final%20PD.pdf>.

⁹ L.I. 2204. Petroleum (Local Content and Local. Participation) Regulations, 2013.

¹⁰ Ministry of Finance (2019). Ghana Extractive Industries Transparency Initiative report 2017 & 2018 . Retrieved from <https://www.gheiti.gov.gh/site/>.

Internationally, within the overall goal of decarbonizing economies, there is already a well advanced trend towards removing or reducing carbon from energy systems where it is not economically or technologically needed. Part of this trend is that there has already been considerable progress towards removing oil from power generation, partly because it is more carbon-intensive than gas, and much more carbon-intensive than strategies which combine renewables with gas, and partly because there are alternative economic uses in areas like transport and petrochemicals. Ghana has committed to safeguarding the environment by adopting the February 2019 Renewable Energy Master Plan which sets to target renewables' penetration (not including hydroelectric power) by 2030 – which is in line with the Sustainable Development Goal (SDG) seven (7).

2.1 Economic and employment profile

Ghana's economy has significantly improved since the 1980s reforms. The country has seen a steady gain in the Gross Domestic Product (GDP), which has translated into a steady increase in the per capital GDP. These improvements have translated into human development gains that the Sustainable Development Goals sought to achieve. According to the OEC, Ghana was ranked in 2019 as the number 73 economy in the world in terms of GDP (current US\$), the number 81 in total imports, the number 141 economy in terms of GDP per capita (current US\$) and the number 143 most complex economy, according to the Economic Complexity Index (ECI).

In 2019, Ghana exported a total of \$21.7 billion, making it the number 72 exporter in the world. During the last five reported years Ghana's exports have changed by \$4.25B from \$17.5B in 2014 to \$21.7B in 2019. Export proceeds from oil was \$4.37B for total export volume of 63,869,864 barrels in 2018 compared with \$3.103 of a volume of 57,020,474 barrels in 2017 (see Table 3). The most recent exports are led by gold (\$10.8B) representing 49.8% of total exports, crude petroleum (\$4.68B) representing 21.5% of total exports, cocoa beans (\$1.61B) representing 7.39% of total exports, cocoa paste (\$504M) representing 2.32% of total exports, and manganese ore (\$489M). The most common destination for crude petroleum exports of Ghana are China (\$2.05B), South Africa (\$646M), United States (\$556M), India (\$327M), Canada (\$201M), France (\$181M), Italy (\$168M), United Kingdom (\$164M), The Netherlands (\$126M), and Thailand (\$181m).

► **Table 3. Total oil and gas production and sales**

Production	2016	2017	2018
Oil Vol (bbl)	32,298,638	58,658,063	62,135,435
Average Price \$/bbl	44.01	54.43	68.457
Oil Value (\$)	1,421,463,058	3,192,758,369	4,255,469, 536
Gas Vol (MMScf)	44,952.49	77,294.44	91,459.30
Average Price	3,074	3,073	2,518
\$/MMScf			
Gas Value (\$)	138,183,954	237,525,814	230,294,517

Exports	2016	2017	2018
Oil Vol (bbl)	30,762,507	57,020,474	63,869,864 ¹¹
Average Price \$/bbl	44.01	54.43	68.457
Oil Value (\$)	1,353,857,933	3,103,624,399	4,372,339,279 ¹²
Gas Sales Vol (MMScf)	21,579.60	30,831.72	33,831.15
Price \$/Unit	3,074	3,073	2,518
Gas Sales Value (\$)	66,336,678.00	94,776,691.00	85,214,825
	15	97	0.34

Source: GHEITI (2019)

A total of 91,459.30 MMSCF of raw gas was produced from the Jubilee, TEN, and SGN Fields in 2018 compared to 77,294.44 MMSCF in 2017. The Jubilee Field produced the highest volume of 44,841.94 MMSCF while the TEN and SGN Fields produced 39,472.78 MMSCF and 7,144.58 MMSCF, respectively, in 2018. Non-Associated Gas (NAG) production from Offshore Cape Three Points (OCTP) commenced in June 2018, ramping up significantly in November 2018 to a yearly total of 7,144.58 MMSCF¹³ (see Table 4).

► **Table 4. Production and sales (export) of gas**

Field	2017		2018	
	Production (MMSCF)	Sales (MMSCF)	Production (MMSCF)	Sales (MMSCF)
Jubilee	42,261.35	30,540.00	44,841.94	19,330.18
TEN	26,818.33	296	39,472.78	8,390.98
SGN	7,214.76	0	7,144.58	6,104.58
Total	77,294.44		91,459.30	

Source: GHEITI (2019)

The list of oil and gas entities required to report in 2017/2018 are GNPC, Kosmos Energy Ghana Ltd, Tullow Ghana Ltd, Anadarko, PetroSA Ghana Ltd, ENI Ghana Exploration & Production Ltd, Eco Atlantic Oil & Gas Ghana Ltd, UB Resource Ltd, Medea Development Ltd, and Hess Ghana Exploration Ltd.

Currently, the country operates the upstream and downstream sectors only. The midstream sector is under-developed, therefore, the upstream and downstream sectors regulate components of the midstream sector that aligns with either the upstream or the downstream sectors. The downstream sector is made up of 41 bulk distribution companies (BDCs), 169 oil marketing companies (OMCs), 42 LPG marketing companies (LPGMCs), 12 bulk oil storage depots, one lake transport companies and 72 bunkering companies. There are currently 17 operators in the upstream sector¹⁴, but only 2 are active.

11 This figure includes re-exports from neighboring countries for example Nigeria.

12 This figure includes re-exports from neighboring countries.

13 GHEITI (2019), Final report for 2017 & 2019 oil and gas sector.

14 Petroleum Commission. Retrieved from <https://www.petrocom.gov.gh/upstream-operators/>.

There are no employment figures for 2021 as the last census was completed by the Labour Force Survey (LFS) in 2015. By that guidance, the total employed above 15 years in the mining and quarrying sub-sector which includes oil and gas was 74,663. The survey (LFS) estimates 257,606 people are engaged in household enterprises in the mining and quarrying sub-sector.

Oil and Gas specific data is, however, unavailable

Table 5 indicates the total estimates compared with the national total.

► **Table 5. Employed population 15 years and older sex**

Category	Both Sexes	Male	Female
Total Employment	9,263,346	4,281,393	4,981,953
Mining & Quarrying (incl. Oil and Gas)	74,663	63,236	11,427
Transportation and Storage (incl. Oil and Gas activities)	252,215	238,161	14,054
Administrative and support service activities (incl. Oil and Gas activities)	46,677	33,328	13,349

Source: MoF(GHEITI), 2018

2.2 Drivers of change, enablers and key major trends and their likely impact on employment

A number of factors will contribute to the overall demand for skilled labor in the oil and gas sector. Since most of them are homogenous across the downstream, midstream and upstream subsectors, a spillover effect on subsectors, and perhaps on allied sectors operating in the oil and gas ecosystem is expected. Inherently, climate change/greening is considered as one of the main drivers of change in the sector.

The impact of technological advances, digitization and automation on jobs

In an ever-dynamic oil and gas industry, managing growing costs and optimizing time to obtain the best value out of products and services are fundamental. Companies must harness available technologies to achieve operational excellence. Oil and gas automation, which comprises a number of processes and digital technologies provide technicians and operators with on-demand access to sophisticated and vital information for quick fix operational solutions, including speedy troubleshooting and decision-making that ultimately enhance the performance of operations. Due to fast changes in business processes and technological outputs, process automation is a growing trend in the oil and gas sector.

Drilling operations: Drilling is a major area where automation can be used effectively, but involves considerable safety considerations as per the industry standards. Pipe handling and pressure drilling can be augmented with automation; for example, to reduce safety concerns and risks. Drilling automation can speed up the drilling process.

Diagnostics, inspection and tracking: Artificial intelligence for sophisticated diagnostics and inspection, for example the use of drones and tracking devices for land, sea and air transportation can increase productivity.

Monitoring of pipelines: With increased attempts by criminals to steal pipelines or divert products, the need for monitoring of pipelines is paramount. Autonomous underwater vehicles and unmanned vehicles can unearth these vulnerabilities, attacks and risks. Similarly, monitoring is required for scheduled and unscheduled maintenance of the pipelines.

Weather monitoring: Oil and gas companies rely on weather information for their operations. Leading oil and gas companies are using weather sensors to detect changes in seismic activity, atmospheric and ocean levels.

Pressure and flow: Pressure measurement and flow can be enhanced through automation. Sensors transmit data to a monitoring software, not requiring on-site crew presence.

In general, automation is in very high demand in the oil and gas industry, from individual handheld equipment to sophisticated and integrated systems with diverse functions. There is an increasing need of collaboration between Oil and Gas companies and automation solution providers to understand how information technology can support the production, storage, transportation and distribution of oil and gas products through enhanced supply chain lines and markets.

The fourth industrial revolution, known as Industry 4.0, is changing traditional supply chains. The main changes in the oil and gas supply chain are as follows:

Maintenance and safety: Drones can be used to inspect and facilitate early detection of oil and gas leaks in very remote and difficult to reach areas across the country leaks quickly and reliably. Among others, they can be used to monitor vulnerabilities along the West African pipelines connecting to the pipelines managed by Ghana Gas.

Increased connectivity: Increased data integration and information can help oil marketing companies (OMCs) and bulk oil distributors (BDCs) to adjust supply chain supplies, which will in turn affect prices based on the price calculation formulae in real time, using inventory data from storage facilities, rate of distribution and forecasted demand.

Exploration: Exploration and production companies are exploring and experimenting with 4D models that integrate data to map changes of seismic imaging in real time. This technology specifically aims at predicting more precisely the quantity and lifespan of the resources to be extracted. Other innovations such as remote drilling are being explored by companies.

Production: Oil services are digitizing drilling processes by collecting data from smart sensors in drilling equipment and processing it to ascertain the optimum mixture of sand, water and chemicals required for a well's output. Key benefits include decreasing costs and increased production.

Storage and Transportation: Data management tools are being used to track inventory levels. Monitoring systems control the temperature of stock in storage. Trucks and future railcars (under construction by government) can be tracked with the use of smart sensors and thermal detectors for real-time geolocations, which will minimize safety concerns.

Refining and distribution: Smart sensors enhance monitoring the safety and functionality of all processes in refining. In distribution, companies use data management protocols and analytics to forecast the demand with greater accuracy and effectively communicate it through the appropriate supply chain for optimum quality service delivery.

Oil and Gas producing blocks and Operators

Ghana's three oil producing blocks have attracted wide attentions from global players in hydrocarbons and opened up a new era for continued partnerships in oil and gas exploration. Large global companies such as Eni, ExxonMobile, Shell, BP, Texaco, Tullow and Tap Oil have all expressed significant interest in projects in the oil and gas sector.

In 2019, Springfield E&P, together with its local partner GNPC and EXPLORCO, became the first independent Ghanaian – and indeed, the first African energy company to drill deep water and find hydrocarbons. Springfield is currently the majority shareholder and operator of West Cape Three Points Block 2, where discovered oil reserves stand at 1.5bn barrels.

Ghana Gas Company is the state agency responsible for operating the infrastructure required for the gathering, transportation and marketing of natural gas resources. It plays a key role in the gas sector, however, capacity issues refrains it from scaling up its operations.

Strategic need of a local skills supply

Ghana's oil and gas growth is largely manpower driven. A plan therefore is required to skill and reskill the workforce required to operate effectively and compete internationally in the O&G industry. An effective plan should lead to a comprehensive national framework for oil and gas training, especially by both public and private institutions. The core of the plan should be a road map to how, exactly, the SSBs and TVET institutions should collaborate to use the countries hydrocarbons to industrialize and diversify. Skills are needed at both professional and technical levels.

The Ghana Local Content and Local Participation Bill 2013, passed in November 2013 by the Ghanaian government, establishes that Ghanaians should be prioritized in terms of employment in the petroleum industry. Jobs at the technical level, such as control room technicians, engine room operators, chemists, sample catcher, marine technical leads, floor men, rope access technicians, API inspectors, deckhand officers, fitters, mechanics, production technicians, welder & fabricators, pipe fitters, scaffolders, ROV operators, instrumentation technicians, crane operators, riggers/banksmen, telecom technicians, cutters, wellhead pumpers, pump operators, soldering operators, and plumbers should be carried out by Ghanaians. To bring this to fruition, TVET institutions must build the technical skills to meet the growing demand for such jobs in the industry.

3. Profile of major occupations and key skills in the sector

Given the size and scope of the oil and gas sector, there are a large variety of core occupations. They can be organized into the three main domains – upstream, midstream and downstream subsectors. According to the International Standard Classification of occupations, the major occupations in the oil and gas sector relate to occupations in Major Group 2: Physical, Mathematical and Engineering Science Professionals; Major Group 3: Technicians and Associate Professionals; Major Group 7: Craft and Related Trades Workers; and Major Group 8: Plant and Machine Operators and Assemblers¹⁵. There are, however, major occupations that are of high demand in Ghana's Oil and Gas sector, peculiar to the upstream, midstream and downstream subsectors. These occupations are drawn from the major groups according to the major, sub-major, minor and unit group titles of ILO's International Standard Classification of occupations.

Upstream sector

General occupations across the upstream sector are the following: medical doctors, health, safety, security & environment (HSSE) officers, Non-Destructive Testing (NDT), Application Programming Interface (API) specialist, and crane operators. Occupations with major skills gaps are welder & fabricators, pipe-fitters, production technicians, instrumentation & control technicians, subsea engineers, development geophysicist and reservoir engineers¹⁶.

Key occupations in accordance with the respective economic units are listed below:

Exploration: geoscientist, geophysicist, driller, geologist, surveyors, seismic engineer, civil & structural engineer, and hydrologist engineer.

Appraisal: geoscientist, geophysicist, driller, surveyors, reservoir engineer, petro physicist, petroleum engineer, asset integrity, health, safety, security & environment officer, civil & structural engineer, and hydrologist engineer. Technician jobs - ROV technicians.

Development: maintenance engineer, marine engineer, automation engineer, instrumentation engineer, geophysicist, drillers, well & completions engineers, mud engineer, rig mechanics, materials engineers. Technician jobs – derrick officers, fabricators, welders.

¹⁵ ILO - International Standard Classification of occupations Retrieved from <https://www.ilo.org/public/english/bureau/stat/isco/isco88/major.htm>.

¹⁶ SSB Report (2020), Skills for trade and economic diversification (STED) Rapid foresight workshop (Oil and Gas sector).

Production: production engineers, petrochemical engineers, maintenance engineers, drilling engineer, subsea engineers, logistics engineers, marine engineers, electrical engineers, physical instrumentation, hydrologist engineer, and materials engineers. Technician jobs - engine room operators and cargo room operators.

Decommissioning: decommissioning engineers, surveyors, mechanical engineers, subsea engineers, geoscientist, geophysicist and materials engineers. Technician jobs – cutting technicians.

Skills level 3 and 4 (high) such as Managers, Professionals, Technicians and associate professionals¹⁷ are important but of low demand. For example, each Floating Production Storage and Offloading (FPSO) in Ghana does not host more than 250 professionals at a time. The majority of these occupations require university degrees and professional certifications.

Midstream sector

Ghana's midstream energy sector is relatively undeveloped. Tema Oil Refinery (TOR) is unable to fill in job vacancies in the sector. TOR is unable to employ all the qualified people available in the sector. The company is also not able to meet its full production capability. Some key occupations in the sector are: managers, professional operators, technicians, petrochemical engineers, clerical support officers, Occupational Health, Safety and Compliance (OHSC) officers, Government & community relationship managers, labourers, logistics officers, and catering professionals.

Downstream Sector

The main occupations in the downstream sector are marketing managers, inspection officers, ICT personnel, legal officers, accountants, finance managers, purchasing and supply chain managers, Health, Safety, Security & Environment (HSSE) officers, economists, procurement specialists, human resource personnel, clerks, and attendants.

¹⁷ ILO, Employment by Occupations. Retrieved from https://www.ilo.org/ilostat-files/Documents/description_OCU_EN.pdf.

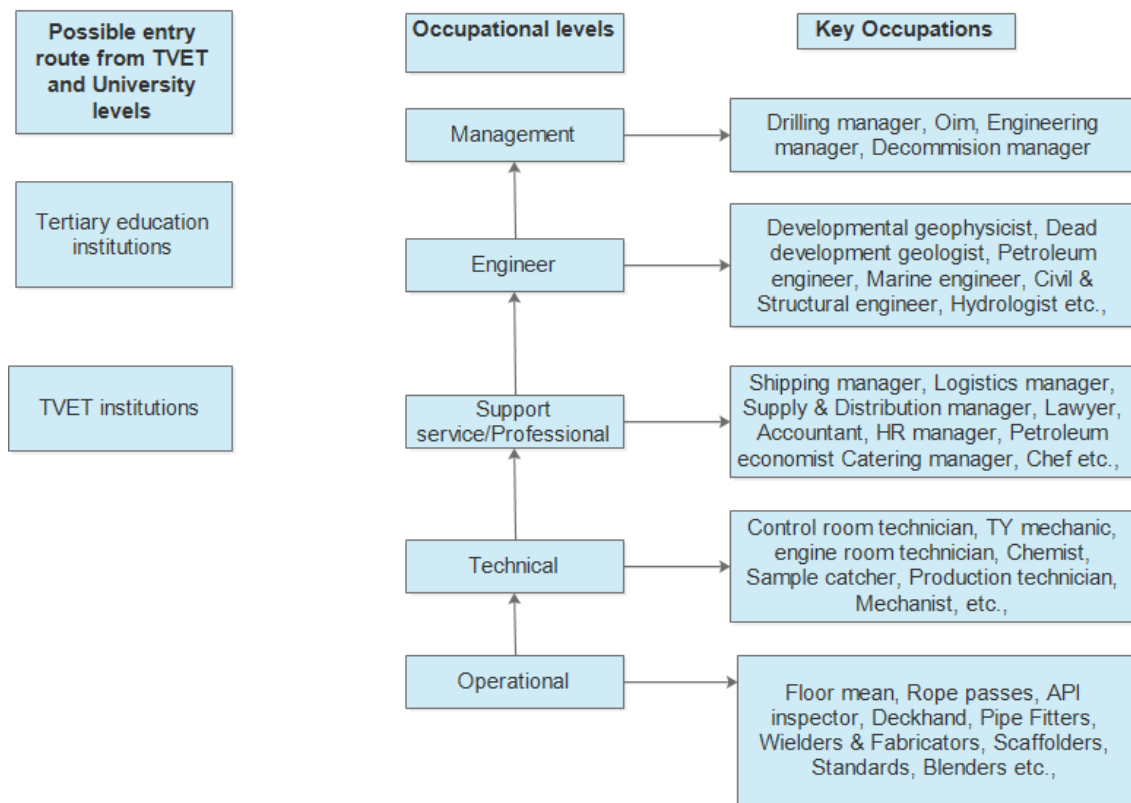
4. The supply of skills

4.1 Recruitment practices

It is noted that opportunities to progress on the career pathways are primarily based on performance skills, knowledge and experience. Career pathways are opportunities for mobility, such as from an operation to a technical level and then to an engineering and managerial level. The oil and gas sector present varied career pathways in the three main sub-sectors: upstream, mid-stream and down-stream. For example, figure 2, present possible pathways with focus on the entry routes, occupational levels and related job roles in the sub-sectors.

Foregoing, the vacancies for managerial and engineering positions in formal enterprises are generally occupied by selected candidates with technical and university education. In most cases, expatriates are employed to occupy these positions, when the skills required for a job are not found or available in the Ghana's labor market. Job vacancies for operational level occupations such as welders, fabricators, scaffolders, mechanist, deckhand, fitters, demand technical knowledge are recruited from the TVET institutions. In addition, firms in the sector can also recruit workers for managerial and engineering levels which includes development geophysicists, dead development geologist, drilling engineers from other employers who have acquired skills informally. Available vacancies for operational levels of occupations can also be occupied by experienced employees who are already working in the sector. The sector welcomes the recruitment of employees of the operational levels (welders, fabricators, scaffolders) with little or no prior experience in the workforce who have completed secondary or secondary technical or vocational institutions.

► Figure 2. Career pathways and key occupations in the oil and gas sector



4.2 Key institutions, formal programs and qualifications relevant to the sector

The oil and gas sector has four main sources of supply of skills and training services. These includes public universities, private universities, technical universities, private and public training institutions at the secondary level. The traditional universities, which consist of both the public and private universities, offer undergraduate and post-graduate level of program in the oil and gas sector. These institutions are comprised of public universities, namely: Kwame Nkrumah University of Science and Technology (KNUST); University of Mines of Technology (UMat); University of Energy and Natural Resources (UENR); University of Cape Coast (UCC); Regional Maritime University; and Ghana Communication for Technology University (GCTU).

The technical universities include Accra Technical University and Takoradi Technical University. The private universities are BlueCrest College and All Nations University. Finally, the training institutions, being the National Vocational Training Institute, Technical Institute under the Ghana Education Service, Oilfield training center, GODAC, Ghana Oil Drilling Academy & Consultancy, Rigworld International Service, and Mobile Crane Limited, provide training and certifications at the secondary level of the sector. Table 6 below shows the institutions and the type of certification offered.

► **Table 6. Oil and gas programs by offered by institutions**

Universities/Colleges	Programs
University of Ghana	MSc Petroleum Geoscience BSc Geology
Kwame Nkrumah University of Science and Technology	BSc Petroleum Engineering BSc Petrochemical Engineering BSc Geological Engineering BSc Geomatics Engineering BSc Marine Engineering
University of Mines and Technology (UMaT)	BSc Geomatics Engineering BSc Geological Engineering BSc Petroleum Engineering BSc Mineral Engineering BSc Mining Engineering Diploma in General Drilling Certificate in Geological Assistantship Certificate in Occupational Health and Safety Certificate in Drone Operations and Application Certificate in Drilling Fluid Technology Certificate in National Gas Technology Certificate in Oil Well Cementing
University of Cape Coast (UCC)	MBA Oil and Gas Management MPhil Oil and Gas Resource Management MA Communication in Oil and Gas Management
University of Energy and Natural Resources (UENR)	BSc Petroleum Engineering
Regional Maritime University	MA in Ports and Shipping Administration BSc Electrical /Electronic Engineering BSc Marine Engineering Sc. Ports and Shipping Administration BSc Logistics Management Diploma in Electrical/Electronic Engineering Diploma in Ports and Shipping Management Diploma in Marine Engineering
Ghana Communication and Technology University (GCTU)	MSc Oil and Gas Management MBA in Petroleum Economics and Finance
University of Professional Studies Accra	MBA Petroleum Accounting
Accra Technical University	MSc Production Engineering BSc Technology Electrical and Electronic Engineering HND Mechanical Engineering HND Electrical & Electronic Engineering HND Power Engineering BTech Electrical & Electronic Engineering Electrical Engineering Technician Part I&II

Takoradi Technical University	HND Mechanical Engineering option Production Professional Diploma in Welding & Fabrication Professional Diploma in Mechanical Engineering Professional Diploma in Electrical & Electronics Engineering Technical and Vocational Education Training (TVET) Electrical Engineering Technician (EET) Part I&II Mechanical Engineering Technician (MVT) Part Professional Programs in Oil and Gas Health and Safety Instrumentation Engineering Electrical Engineering Process Engineering City and Guilds Certification Certification in Engineering option Mechanical & Electrical & Electronic Certificate in Engineering option Maintenance Technology Certificate in Engineering option Maintenance Installation and Commissioning Advanced Diploma in Oil and Gas Operations (Mechanical Maintenance Technician)
BlueCrest College	Certificate Programs Project Start-up & Analysis Introduction to Production Management Petroleum Exploration Risk Analysis and Management
ALL Nations College	BSc of Engineering Electronics and Communication Engineering BSc of Engineering Oil and Gas Engineering
Rigworld Training	Certificate courses in the following areas: HSE Training First aid Training Lifting Training Maritime Training DNV GL Training General Industry Training IRCA Lead Auditor Training IMIST Training NEBOSH & IOSH Training Lock out tag Training Triton Training Chemical Handling Training Permit to work Training

4.3 Enrolments and completion data for relevant courses by region

There is no data on students admitted to pursue oil and gas courses in TVET and academic institutions in Ghana. Information on student enrollments are general and not specific. For example, the University of Ghana runs the MSc in Petroleum Geoscience program, but available statistics from the University is very holistic in nature as presented in Tables 7 to 9.

► **Table 7. Total Enrolment by Gender**

	No.	Percentage
Male	27543	51.3
Female	26100	48.7
Total	53643	100

► **Table 8. Graduate Enrolment by Gender**

	No.	Percentage
Male	3869	52.6
Female	3484	47.4
Total	7353	100

► **Table 9. Graduate and Undergraduate Enrolment**

	No.	Percentage
Undergraduate	44474	82.9
Masters	6339	11.8
PhD	1014	1.9
Sub-Degree	1551	2.9
Visiting Students	265	0.5
Total	53643	100

► **Table 10. Student Enrolment by Nationality**

	No.	Percentage
Ghanaian Students	53015	98.83
International Students	628	1.17
Total	53643	100

4.4 Work based learning and informal/non-formal sources of skills

The oil and gas sector embraced the concept of work-based learning (WBL). This type of learning takes place in the working environments where employees are giving some form of formal or informal apprenticeships or internships/traineeships and on-the-job training to refresh skills and knowledge. Presently, the sector provides opportunity to gain skilled experience through informal apprenticeship, with focus on coaching and mentoring in providing practical training to employees with informal education in occupations like electrical maintenance, mechanical maintenance, process operation, instrumentation and control maintenance. In addition, the larger organizations organize periodic training delivered by skilled and experienced staff or in-house trainers. One of the major problems associated with the WBL in the sector is the inconsistency of theory and practice in the training program. This signifies that there are differences in theory presented by academics and the current work activity. The inconsistency arises in the lack of practical and relevant curricula in academic and TVET institutions, to bridge the gap between academia and industry.

5. Supply side challenges and constraints

In general, the sector is challenged by an insufficient supply of skills in specialized and non-specialized areas. The major sources of labor supply to the sector are graduates from universities, TVET institutions, students' internships and a labor force that has received training from both private and public learning institutions. Some of the challenges faced in supplying labor with the required skills for the sector are:

1. Relevance of the curriculums and qualifications for the sector
2. Policy on national accreditation of programs of the training institutions
3. Effective engagement and utilization of student internship programs
4. Career guidance for the potential labor force in the institutions

5.1 National skills policy and strategy

In Ghana, Technical and Vocational Education and Training (TVET) is offered at both secondary and tertiary levels. The Ghanaian TVET system counts on 200 public TVET institutions, including 45 technical training institutions and 116 vocational institutions. These institutions spread across the 16 administrative regions of Ghana. Even though there is no known national skills policy and strategy in the oil and gas sector, the government of Ghana through its ministries and agencies has committed to improving Science Technology, Engineering and Mathematics (STEM) programs to prepare students for the job market right after school. These programs include oil and gas sector courses in academic and TVET institutions.

Ghana's literacy attainment varies across regions, the more literate found in the urban south of the country to the less literate in the rural north. The national statistics showed an average of 58% literacy among the population in the Ghana (2018)¹⁸. Further, the data showed that four out of every 10 Ghanaians are illiterate. The statistics between literacy and age groups showed that Ghanaians¹⁹ in the age bracket

¹⁸ Education Sector Analysis, Ministry of Education, Ghana (2018).

¹⁹ Education Sector Analysis, Ministry of Education, Ghana (2018).

of 15-24 years recorded 92.5% and ages below 15 years old has 79.0% (2018). Research has showed that literacy attainment has a direct impact on supply of labor in a given economy²⁰.

Ghana's statistics on enrollment at the secondary level indicated that since September 2017, when free senior high education was introduced, net enrolment had increased from 52.7% in 2017 to 57.24% in 2019²¹. A report by COTVET (2020) showed that the council has launched skills gap audit, with a call on the learning institutions to make use of these results in the development of appropriate programs for the industry²². Furthering, the Strategic Plan for TVET Transformation (2018-2022) by CTVET outlines key challenges:

- There is a poor collaboration between training institutions and the industry expectations;
- There is a fragmented training landscape where training offer does not respond to the demand of key economic sector and lack of coordination among multiple TVET delivery agencies;
- TVET lacks uniformity in standards, testing and certification systems;
- There is inadequate instructors for training, lack of instructional support and TVET infrastructure; and
- TVET education is perceived as only being good for the academically weak students.

However, the strategic plan of CTVET has adopted five specific aims that seek to find solutions to the above listed challenges that will witness transformation of Ghana's labor force, which include:

1. Governance and management of TVET: to provide a coherent legal and institutional framework for the TVET sector that is accountable and responsive to the demands of the private sector and other stakeholders;
2. Increased access: to ensure equitable access and promote gender mainstreaming in TVET;
3. Improving quality: to ensure quality assurance in TVET according to internationally accepted standards;
4. TVET financing: to develop a sustainable source of financing for TVET;
5. Environment sustainability: to green TVET for environmental sustainability.

5.2 Governance and stakeholder coordination

There is a council of governors of respective TVET institutions that oversee the smooth operations of the private and public post-secondary level TVET institutions. Stakeholder engagement among the oil and gas public and private institutions, TVET institutions and Ghana Tertiary Education Commission is not well-defined with respect to solving the supply-side challenges for the sector. This has resulted in minimal oversight supervision of curriculum scope, context, delivery mode and assessment of a program. In some cases, opinions of employers are asked on proposed courses but not often taken into account in the development and delivery of courses. Presently, there is no employer representative of the oil and gas sector in the universities and TVET institutions running oil and gas programs.

20 Furia, D., Castagna, A., Mattoscio, N. & Scamuffa, D., (2010). *Education and labour market in the age of globalization: Procedia Social Behavioral Science*, Volume, pp. 1140-1444.

21 Unesco Institute for Statistics, School enrollment, secondary (% gross) Ghana, Data as of September, 2020.

22 COTVET launches Skills Gap Analysis and Audit Report (2020), <https://www.gbcbghanaonline.com/news/cotvet-launches-skills-and-gap-analysis-and-audit-report/2020/>.

5.3 Funding

TVET institutions are funded by government budgetary allocations and interventions; and sponsorship from development partners or agencies. The contribution from government covers the costs of paying lecturers' salaries and other administrative expenditure. Students in the pre-tertiary institutions received free tuition; it implies that they are not requested to pay school fees. The students also enjoy other benefits such as free meals for all and free accommodation for those in boarding facilities. TVET institutions (e.g. Secondary-technical schools) in the pre-tertiary category are being affected by this government policy. Thus, TVET institutions are challenged with adequate funding. However, the government provides minimal financial support for students' practical assignments. Overall, the government provides minimal financial support for students' practical assignments.

5.4 Relevance of curriculum and qualifications

It is observed that the current curriculum used by pre-tertiary and tertiary institutions of the oil and gas sector have not received the necessary input from the industrial players. This might bring about disparity in the lack of comparison of curricula for a same training program in different institutions, which might reflect in the standardization of national occupation and qualifications in the sector. Often, the curriculum is developed with a focus on theoretical aspects rather than the practical component of the course. This has hindered the practical opportunities that students have, and this affects them acquiring the required practical skills for the sector. This is especially so for students in the tertiary institutions that are theoretically-oriented, meaning they have less of the hands-on-practical skills needed for the sector. In the case of the upstream sector, engineering students, for example, are put through highly theoretical training when their compatriots in best practice situations may have combined the theory with practical attachments/intentions before graduation. This is because the Universities in Ghana awarding qualifications in oil and gas, unlike in other jurisdictions, do not own their own rigs or ships etc., therefore, are not able to involve their students in practical real-world scenarios. Additionally, these hands-on-practical for students would have earned practical certifications that are required for work in the sector. Another major problem is that the supply-side has outstripped the demand for graduates emanating from these oil and gas programs. In other words, there are no jobs for most graduates from the universities.

According to oil and gas experts (SSB technical committee), the current curricula for most of the sectors including the oil and gas sector is largely outdated and theoretically skewed. Also, there is a lack of career mentorship for young people who intend to study for a job in the oil and gas sector.

5.5 Delivery and assessment practices

The oil and gas sector is replete with insufficient or below-par infrastructure, laboratories, tools and equipment for effective training of personnel for the industry, especially for the upstream sector. Trainers and lecturers usually lack up-to-date experience in the sector. The educational environment itself does not promote research into practical issues that require industry collaboration and effort.

The downstream sector, however, has seen significant gains in development professionals in areas such as project management, accounting and finance, and marketing. This is because these workers have professional certifications in addition to the formal training from professional institutions such as Project

Management Institute (PMI), Institute of Chartered Accountants (ICCA-Ghana), and Chartered Institute of Marketing (CIM-Ghana). These professional certifications from these professional institutions recognize demonstrated knowledge and expertise in a specialized area.

The Institutions currently responsible for delivery and assessment of TVET in Ghana are:

- Ghana Tertiary Education Commission (formally, National Accreditation Board (NAB)-Tertiary Level & National Board for Professional and Technician Examination (NABPTEX)– Pre-Tertiary (Diploma and Higher National Diploma));
- Technical Examination Unit (TEU)- Pre-Tertiary (Below Diploma);
- National Vocational Training Institute (NVTI)- Pre-Tertiary (Below Diploma and Informal Apprenticeship).

5.6 Access to training

The oil and gas industry places high value on training, personal and professional development, partly because the sector is highly regulated by the government. There is a wide range of training available, ranging from short flexible courses through to full time academic education. The academic institutions focus on diploma and degree programs relevant for the sector while the TVET institutions focus on technical courses. The youth in the sector have the opportunity to use the TVET or academic route as prescribed in the Ghana's National Technical and Vocational Education and Training Qualifications Framework (NTVETQF). Youth who choose to use the TVET route will first have to complete the National Proficiency I&II, then the National Certificate I&II, Higher National Diploma, Bachelor of Technology, Master of Technology and then progress to the Doctor of Technology stage. Similarly, individuals can go straight to do a Bachelor program after completing the mainstream Senior High School program.

The recent introduction of the Free Senior High School policy program by the government has given a lot of youth the opportunity to complete secondary education for free, hence improving their chances at attaining tertiary education. Oil and Gas courses can be found in both private and public institutions. Engineering programs are however, predominantly run by the public institutions. Tertiary education is largely self-sponsored with no support from government. The Ghana Education Trust Fund (GETFUND), however, provides part and full scholarship to very few applicants each year for various programs of study in Ghana and abroad, including oil and gas related courses. GETFUND's mandate is to provide funding to supplement government effort for the provision of educational infrastructure and facilities within the public sector from the pre-tertiary to the tertiary level. Other scholarship opportunities exist through the Scholarship Secretariat, Citi FM/TV's Citi Opportunity Project on Education (COPE) and other small funds.

The oil and gas industry predominantly thrives on training. Key areas that highlight the essence of training in the sector include improved performance, employee engagement, career enhancement and security, improved wages and nurturing young talents. The industry has a lot to learn from the upstream operators who in some instances move employees abroad, for example to Aberdeen in Scotland, to undertake various short term training programs – required for a specific job function or role. Since certification and accreditation is the lifeblood of the oil and gas industry, in a bid to have seamless processes and work outputs, the upstream sector invests in on-the job training programs so that employees are able to get the appropriate international and local certification (accreditation) required for various job functions. Examples of such certifications are International Technical Operational Safety-NEBOSH; Certified Petroleum Geologist by APPG; Certified API 510 Pressure Vessel Inspectors; Certified Energy Professional CEP- EMI; Certified Energy Trading Professional (CETP); Certified Energy Procurement Professional (CEP); IWCF Drilling Well Control Certified Programme; and 580 Risk Based Inspection Certification- API. As a matter of urgency, first, all institutions running oil and gas courses must have the right accreditations

from government to run the programs. Second, government should partner with training institutions to support them to form partnerships with international institutions that run internationally recognized professional certificates. These partnerships will provide the right framework to host internationally recognized certificate programs in the country. They will allow more technical expertise to be developed in Ghana.

The downstream sector is unfortunately fragmented, and there are very few formal on the job training modules designed for staff in Ghana. For example Ghana Oil Drilling Academy and Consultancy (GODAC), BlueCrest College, Regional Maritime University, Jubilee Technical Training Center (JTTC) at Tekoradi Technical University Rigworld, Work Health and Safety Organization (WHSO) and Ghana Institute of Management and Public Administration (GIMPA) are few training institutions providing short training programs in the oil and gas field.

5.7 Industry-institute linkages and support for workplace learning

Short-term training courses can be developed by TVET institutions, but at present these are not available for the oil and gas sector. Apart from Maritime University and Takoradi Technical University which provide training in some key specialized areas such as welding, there are few training institutions that provide practical training at the technical level. Most organizations in the oil and gas sector rely on in-house training programs. The organizations in many ways, form partnerships and collaborations with educational institutions and training centers, both in Ghana and abroad. Training institutions through short-term contracts partner with organizations to deliver on-demand programs. Although there are limited opportunities for internships, some students are able to secure internships with multinational and local organizations.

5.8 Gender and disability equality

The upstream oil and gas sector continues to be a male-dominated sector²³. Invariably, there are fewer female engineering students in tertiary institutions. The same applies for the ratio of females to men in engineering in pre-tertiary institutions. More needs to be done to encourage women into the sector. There are currently examples of women who are successfully working in the sector and this provides an opportunity to promote career opportunities for women in sector-specific career campaigns in order to change the perception of the sector and attract more women to work within the sector.

²³ Scott, J., Dakin, R., Heller, K., & Eftimie, A. (2013). *Extracting lessons on gender in the oil and gas sector: A survey and analysis of the gendered impacts of onshore oil and gas production in three developing countries*.


6. Vision for the future of the sector

After considerable consultation with the oil and gas sector, key stakeholders devised a vision that aligns with the Ministry of Energy's vision for the country:

▶▶ A viable oil and gas sector with relevant infrastructure, skilled workforce and high service quality delivered safely by Ghanaians, as well as safeguarding the environment”.

It is therefore imperative that the sector develops a vibrant, robust and knowledgeable workforce that will meet the demands of the sector's vision and that of the TVET ecosystem. The vision seeks to foster development across upstream, midstream and downstream in a manner that will develop skills of their future workforce.

To realize the vision, the SSB will develop appropriate key performance indicators, organized according to its mission and objectives, to assess progress and ensure it remains within scope of its terms of reference.



7. Gaps in the capabilities and skills needed to achieve the vision for the future

Over the years there has been a scarcity of quantitative information on current trends in the number of jobs of different types demanded and supplied by the Ghanaian labor market. Developing an established system for timely data gathering on labor market information for the oil and gas sector is relevant for the sector to meet its labor demand. Due to the lack of current labor market information on labor shortages, skill gaps and skill shortages, CTVET and its partners of the SSB have examined and compiled information on recent skills gaps in the oil and gas sector.

7.1 Labor shortages

Recent engagement with the SSB members identified that the oil and gas sector suffered labor shortages for the following occupations:

- ▶ Blenders;
- ▶ Technicians (Gas experts).

7.2 Skill shortages

Similarly, whilst there is robust labor market information, members of the SSB consistently reported unfilled or hard-to-fill vacancies for technical and operational jobs in the Ghanaian labor market as a consequence of a lack of qualified candidates. Vacancies at the occupations levels, such as management and engineering (see figure 2) are primarily filled by foreign workers, in order to overcome the skills shortages in the country. The SSB members identified skills shortages in the oil and gas sector for the following occupations:

- Decommission manager;
- Development geophysicist;
- Dead development geologist;
- Marine technical lead;
- Marine engineers;
- Petro-chemist /technicians;
- Welders & fabricators and pipefitters;
- Production technician;
- Deckhand;
- Instrumentation & control technician;
- Subsea engineers; and
- Reservoir engineers.

7.3 Skills gaps

Given the information above on skills shortages for managers, engineers, technician and operational level jobs, skills gaps in the upstream and downstream persist to be a problem because the workers in the oil and gas sector lack the skills necessary to perform their current job. This might be attributed to lack of practical training facilities require by the employees to acquire the necessary skills. For example, during the Skills for Trade and Economic Diversification (STED) rapid foresight workshop on the sector it was evident that in the upstream sector there are skill gaps for welders & fabricators, pipefitters, and production technician, control room technicians, engine room operators, chemists, sample catcher, marine technical leads, floor men, rope access technicians, API inspectors, deckhand officers, fitters, mechanics, production technicians, scaffolders, ROV operators, instrumentation technicians, crane operators, riggers/banksmen, telecom technicians, cutters, wellhead pumpers, pump operators and soldering operators and others. Tables 11 and 12 provide further details.

► **Table 11. Gaps in the capabilities and required skills within the sector**

Key business capability gaps	Skills implications of gaps for type of skills needed
Accreditation of academic/training institutions for sector employees	Partnering with international accrediting agencies and instructions to accredit programs or courses that offer practical skills, certification of competency - for example welding certification or NCCCO Drill Rig Operator certification
Information technology application in all the sector	ICT skills for all the occupations, this includes basic computer knowledge for all employees
Human resource management	Safety, health and hazard education and skills, decent work knowledge and skills, career education and skills, performance management skills, internship for skills acquisition, work-based-learning for skills acquisition
Sales, marketing and service quality	Customer service skills, communication skills, handling of complaint skills, selling skills
Supply chain management	Inventory skills, procurement skills, negotiation skills
Research and development	Analytical skills, data collection skills, decision making skills

Source: Authors' compilations

► **Table 12. Skills gaps for key occupations**

Occupations/Job title	Type of skills gaps identified
Decommission manager	Experience in project planning, cost control, offshore construction, fabrication, skills in basic offshore induction and emergency training
Development geophysicist	Knowledge in remote sensing methods to study the earth's structure, experience interpreting of seismic and other geophysical data
Development geologist	Experience in planning programs for exploration of sites for oil and gas, surveying and mapping geologically promising sites
Petroleum geologist	Skills in identifying oil and gas deposit or executing drilling program or location, knowledge in determining amount, maturity and movement of oil and gas underground
Marine technical lead	Skills in the implementation of planned maintenance systems, liaising with clients, crew and local stakeholders, appoint and manage subcontractors for vessel maintenance and services
Marine engineer	Skills in building, installing, inspecting and maintaining the propulsion systems, engines, pumps and other pieces of technical equipment that make boats and other maritime vessels function effectively
Petro-chemist	Experience in developing and improving oil-based products e.g., fuel products or polymers
Welder & fabricators, pipefitters	Skills in fabricating and manufacturing metal parts for later assembly, test output to ensure strength and tolerance of welds, creating pipe installation plans, conducting quality control and fixing pipe systems
Instrumentation & control technician	Experience in conducting instrumentation evaluation and troubleshooting for electrical, pneumatic, electronic as well as programmable logic control (PLC) systems
Production technician	Experience in supervising the control processes, performing various tests on products, writing up reports, diagnosing and resolving problems with product

Source: Authors' compilations

8. Recommendations on meeting priority skills needs and gaps

8.1 What skills are needed and where and who should deliver them?

There are four key skills priorities that need to be addressed in the oil and gas sector:

1. Upstream: Upskilling and reskilling are required at technical and operational occupational levels. Appropriate certification for engineering and managerial levels of the current workforce, aligning with TVET efforts to develop the workforce are also required.
2. Midstream: Developing the skills and knowledge of existing workers in the midstream relating to widely accepted principles of transportation and modern approaches to storage.
3. Downstream: Raise the professionalism of the sector by addressing refining production capacity, marketing, distribution, and sales of petroleum products as well supporting career progression of employees in the sector.
4. Ensure that students from TVET and tertiary education institutions enter the sector with the required technical skills and knowledge as well encouraging apprenticeship (formal and informal) in order to gain the relevant skills for the sector.

All four priorities demand strong public-private partnerships and collaboration with key stakeholders such as ministries, industry associations, employers, employee representatives, academic and TVET institutions.

9. Recommendations for meeting system-level priorities for the sector

9.1 National skills policy and strategy

There is need to engage top level officials in the Ministry of Energy to secure their commitment to the skills strategy and ensure alignment across policy development and implementation.

9.2 Governance and stakeholder coordination

Proposed actions:

- ▶ SSB to ensure collaboration with the Ghana Tertiary Education Commission to provide the relevant accreditation and certification occupations needed for the sector;
- ▶ SSB to ensure private-public partnerships in the provision of internships for students in TVET training institutions, technical secondary schools and the tertiary education institutions;
- ▶ SSB to adopt and the execute skills strategy and develop MOUs with key stakeholders in the sector that will show how its activities can support and align with the TVET system;
- ▶ SSB to hold sensitization programs with senior members of the Ministry of Energy to ensure that they are aware of implications of the new CVET organization and the role and responsibilities of SSB, and commit to holding regular review meetings;
- ▶ SSB to ensure that all TVET training institutions on courses or programs on oil and gas have a representative from the sector on the TVET board;
- ▶ SSB to put in place mechanisms to collect and monitor the supply of sector-specific jobs in technical secondary schools, TVET institutions and tertiary institutions; and
- ▶ SSB to conduct periodic market research that will be relevant to the strategy implementation.
- ▶ The downstream is undoubtedly the largest employer in the oil and gas industry sector in Ghana. SSBs can ensure greater productivity by joining hands with TVET institutions to train front service workers and technical specialists to enhance productivity in the sector. The sector SSB should also advocate for greater integration across the upstream, midstream and downstream. That way, for example, the petroleum engineer can easily play a role in the downstream sector.

9.3 Funding

TVET training institutions, technical secondary and the tertiary institutions continue to have funding challenges that hinder smooth and practical delivery in these learning centers, which may result in increasing skills gaps in various occupations needed for the industry. The problem of funding can be addressed when there is a strong collaboration and coordination with all the sector stakeholders and other donor partners.

Proposed actions:

- SSB to organize commercial activities (e.g., organized seminars and conferences, joint grant application etc.) with TVET and the training institutions that will generate income to enhance and increase practical delivery and the application of modern application of equipment in the industry;
- SSB to identify current initiatives and funding opportunities available to TVET institutions that can be used in funding in the sector skills action plan;
- SSB to engage senior managers in TVET and tertiary education institutions to explore sources of funding. For example, an oil and gas training levy where part of such levy could be used to fund practical training and support the SSB secretariat as well;
- SSB to develop proposals for funding that will be used to support the secretariat; and
- SSB to organize paid conferences, workshops and seminars as well as develop and publish content rich sector information (e.g., yearly reports) where industry players can advertise.

9.4 Delivery and assessment practices

There is the need to engage CTVET and TVET institutions that provide training for the oil and gas sector in revitalizing the training offer, curricula and courses and their delivery across the entire country. The courses should emphasize and adopt approaches that ensure practical skills development or work-based-learning that will have direct positive impact on the current skills needed in the sector. This will ensure that the Ghanaian labor force in the sector is relevant to the oil and gas labor market.

Proposed actions:

- SSB to outline core technical and non-core technical occupations and job titles in the sector and develop or propose career pathways through progression mapping and all the entry level requirements in accordance with the National TVET qualification framework for the sector;
- SSB to identify the core skills shortages and gaps in the sector and provide a comprehensive career strategy that will encourage young Ghanaians to take up vacancies in the oil and gas sector;
- SSB to explore the development and delivery of oil and gas specific contents in secondary technical schools, technical universities, and public and private universities that will raise the awareness through public education as to what the oil and gas sector holds and its relevance to the entire economy of Ghana;
- SSB to develop or update occupational standards for priority occupations and students' internships for skills acquisition for the sector; and
- SSB to review periodically the curriculum delivered in the TVET institutions and the universities and propose remedies to meet the current international trends.

9.5 Access to training

Importantly, there is the need to assess the skills, provide relevant training and certify the existing workforce in order to upskill and professionalize the employees in the sector, to support the provision of apprenticeships and internships, and to enable an ongoing process of lifelong learning, skills updating and career development. Academic and TVET institutions should make available courses targeted SSB at the sector to boost continues learning whether in-company, at TVET colleges or universities, or in the community. This will ensure that people at high risk of underinvesting in skills are not left behind. The SSB will have a crucial role in performing its responsibilities to work with sector partners and TVET training institutions to pilot structured internships in the sector.

Proposed actions:

- SSB to roll out work-based-learning (apprenticeships (formal and informal), internships/traineeships and on-the-job training) for students;
- SSB to formalize internship with existing oil and gas companies that will enhance skills update; and
- SSB to work with TVET institutions and partners to develop a variety of short courses or programs to upskill the workforce, especially around specific skills that are in high demand in the sector.

In order to increase local participation of in the upstream sector, SSBs will have to advocate for the enhancement of core employable skills by sector players. The ILO defines core skills as "... the skills, knowledge and competencies that enhance a worker's ability to secure and retain a job, progress at work and cope with change, secure another job if he/she so wishes or has been laid off and enter more easily into the labour market at different periods of the life cycle. Individuals are most employable when they have broad-based education and training, basic and portable high-level skills, including teamwork, problem solving, information and communications technology (ICT) and communication and language skills. This combination of skills enables them to adapt to changes in the world of work²⁴." Core jobs, as well as core skills should be the main agenda for transformation by the SSB for oil and gas. Development of core skills, awareness of workers' rights and an understanding of entrepreneurship are the building blocks for lifelong learning and capability to adapt to change. According to the ILO, core employability skills build upon and strengthen those developed through basic education, such as reading and writing, the technical skills needed to perform specific duties, and professional/personal attributes such as honesty, reliability, punctuality, attendance and loyalty²⁵. Core work skills are often not certified nor formally recognized. The broad skill categories of the necessary core skills for employability are learning to learn, communication, teamwork, and problem solving²⁶.

Proposed action:

- SSB to advocate for the core skills training in TVET institutions. SSB to identify the core skills for employability in the sector which would be shared at different forums with key stakeholders.

24 HRD Recommendation 195, 2004; this was reinforced in the Resolution on Youth Employment 2005.

25 ILO, 2003; Enhancing youth employability: What? Why? and How? Guide to core work skills.

26 See footnote 8.

9.6 Industry-institute linkages and support for workplace learning

There is a general need to develop both short term and long term professional courses for industry practitioners²⁷. This will mean that academic institutions will have to form stronger collaborations with industry.

Proposed actions:

- SSB to form strong (vertical and horizontal) network ties (collaboration and partnerships) with industry and institutions: this newly formed partnership will moderate and fill the gaps and challenges mostly coming from academia's inability to catch up with industry in terms of technology and skills;
- Curriculum development that bridges the academia-industry divide should be facilitated by the sector SSB;
- SSB to increase advocacy among TVET institutions to provide cutting edge solutions that would be appealing to industry, which will in turn encourage work place learning;
- SSB to set standards for continuous learning of the industry's workforce.

The emergence of industry 4.0 is heralding the next era of supply chain management in the oil and gas sector. The oil and gas SSB must focus on building a platform that enhances exchanges and drives knowledge sharing through research. In order to benefit from knowledge sharing activities, SSBs must train its members through workshops on the benefits and uses of industry 4.0 stressing on the need for collaborations to achieve efficiency. The SSB must, therefore, concentrate on areas that foster greater integration and collaboration in the sector. SSBs to lobby government to invest heavily in the education and training of personnel, who will advance research and teaching in this domain.

- SSBs to guide the industry on job projections so that the training institutions have up to date information on the kind of specialists to train and the quantities required for industry absorption. Key technical jobs require special training in TVET and tertiary education institutions.
- The government, through the SSB, should invest in institutions in Ghana to deliver and certify professionals in the upstream oil and gas sector. The model could range from train the trainer programs, partnership models with existing training centers around the globe and developing Ghana's unique standards in the long term, taking into cognizance global certification center approaches and best practices.
- SSBs should work together with industry to form better linkages so that educational institutions can develop ready-market curricula and build on networks for student internships and on-the-job experiences for trainers and lecturers.
- SSB to advocate for the need to train trainers who will train other professionals in organizations.

9.7 Gender and disability equality

As the industry undergoes rapid change (including the need to incorporate new skills in advanced analytics, machine learning, and robotics), there is great potential to both increase female participation and to realize its benefits. Technology is important in analyzing the role of gender and disability equality because some roles can now be done remotely, for example well simulations with the aid technology.

²⁷ Industry practitioners are individuals with substantial working experience in industry. They are mostly key players in the industry, specifically in the oil and gas industry. For example oil and gas sector employees and employers.

According to Stig Sund, Digital Operations Manager, Aker BP, remote survey should, where feasible, become the new base case in the offshore oil and gas industry after COVID-19 travel restrictions are lifted²⁸. This new normal provides a unique opportunity to industry players to employ more women and other minority groups to work in the oil and gas sector. Three inflection points are widely relevant: at the entry level (and before) and at the first and second promotion hurdles women and people living with disabilities face - promotions from lower to middle management and then to top management.

Although the upstream sector is male dominated, a number of actions could be taken to alleviate this trend.

Proposed actions:

- SSB, through advocacy, should negotiate with government to introduce policies to encourage young women's participation in STEM education;
- The SSB to organize a nationwide education campaign to lobby for female participation in the sector as workers: the notion of seeing O&G as a male dominated sector should be reassessed;
- SSB to increase public awareness in schools and TVET institutions on the need for specific education and training for individuals interested in participating in oil and gas sector;
- SSB need to articulate a positive narrative to graduates and entry-level hires on how the sector can promote economic development and help manage the transition to the energy system of the future i.e. An energy matrix fuel-fossil based;
- The SSB to advocate and speak against discrimination against women in the mainstream media;
- SSB to identify qualifications and skills needs and promote the practice of hiring young women to HR companies in the sector. To make this work, the SSB will collect CVs from citizens (both males and females) looking for job opportunities. Employers can then request for specific CVs from the SSB for interviews and job roles.
- SSB to advocate for companies to develop alternative career paths that do not require moving to remote environments, which may not favor women with children for example²⁹;
- SSB to advocate for a quota system for male/female candidates considered for early promotion – which should be representative of the employment pool;
- SSB to create and communicate to young workers in the O&G industry the possibility of flexible career paths³⁰. Developing such pathways will benefit both men and women, but women probably a bit more, setting them up for future success;
- SSB to collaborate and advocate for a quota system for people with disabilities in the oil and gas sector; and
- SSB through advocacy, should be able to convince government to introduce interventions that will encourage females to participate in the sector and make it lucrative for them to do so. The sector SSB should be also be involved in educating the Ghanaian female teen and youth to participate in the oil and gas sector. The sector SSB should also promote Science, Technology, Engineering and Mathematics (STEM) to the girl child.

28 Remote survey: A new normal for oil and gas, 2020. Retrieved from <https://www.dnv.com/oilgas/perspectives/remote-survey-a-new-normal-for-oil-and-gas.html>.

29 This may not be possible for some subsectors, such as oil-field services, but it fits in well with broader changes to industry operating models that are already occurring. For example, several companies are rethinking what activities can and should be centralized; there are also more ways to monitor operations remotely. Being physically present in the field may no longer need to be a rite of passage for everyone. This is one way to protect against unintended bias. Research has found that in industries and companies that have adopted these practices, more women get promoted.

30 Flexible career paths are careers that support remote working and flexible workplace and timing. For example economic analysts.

10. Timescales

The following sets out the actions required to implement the strategy outlined in this document in a two tier system. Tier one is for the first 12 months, and Tier two is the next 12 months. In all, the strategy envisages a two year implementation period. Note that implementation of Tier 1 activities can continue into Tier 2.

10.1 Immediate actions

Tier 1

Category	Actions
First 12 months from launch of strategy	
Governance and stakeholder coordination	CTVET to ensure collaboration with the Ghana Tertiary Education Commission in providing the relevant accreditation and certification occupations needed for the sector.
Governance and stakeholder coordination	<ul style="list-style-type: none"> • SSB to adapt and execute skills strategy and develop (sign) MOUs with key stakeholders in the sector. • Develop a MOU with the training institutions to have an SSB representative to sit on committees related to curriculum development, internships and counseling; • Develop a MOU with labor unions on decent work for sector employees; • Develop a MOU with employers in the sector for work-based learning activities; and • Develop a MOU with government agencies (e.g. Ghana Statistical Service) and regulators to create a platform for information sharing (e.g. labor market updates).
Governance and stakeholder coordination	CTVET to hold sensitization programs with senior members of the Ministry of Energy to ensure they are aware of implications of the TVET Bill and the role and responsibilities of SSB and commit to holding regular review meetings.
Governance and stakeholder coordination	SSB to work with the Ministry of Energy and the Ministry of Youth and Employment to conduct a skills audit of related required skills or relevant skills needed for the labor market.
Funding	SSB to organize commercial activities with TVET and the training institutions that will generate income to enhance and increase practical delivery and the application of modern application of equipment in the industry
Funding	SSB to engage senior managers in TVET and tertiary education institutions to explore sources of funding. For example, an oil and gas levy where part of such levy can be used to fund practical training and support the SSB secretariat as well.
Delivery and assessment practices	SSB to outline core technical and non-core technical occupations and job titles in the sector and develop or propose career pathways progression development and all the entry level requirements in accordance with National TVET qualification framework for the sector.
Delivery and assessment practices	SSB to identify the core skills shortages and gaps in the sector and provide a comprehensive career strategy that will encourage young Ghanaians to take up vacancies in the oil and gas sector.
Delivery and assessment practices	SSB to explore the development and delivery of oil and gas specific contents in secondary technical schools, technical universities, public and private universities that will raise the awareness through public education on what the oil and gas sector holds and its relevance to the entire Ghanaian economy.
Delivery and assessment practices	SSB to review periodically the curriculum delivered in the TVET institutions and the universities and propose remedies to meet the current international trends.
Training	SSB to roll out work-based-learning and internship programs.
Industry-institute linkages	Curriculum development that bridges the academia-industry divide should be facilitated by the sector SSB
Gender and disability equality	SSB to identify what degrees and skills are needed, and aggressively promote girls to HR companies in the sector. To make this work, the SSB will develop a CV bank for both males and females, and promote, where necessary, females to form industry networks for possible employment.

Tier 2

Category	Actions
Begins after Tier 1 for 12 months	
Governance and stakeholder coordination	CTVET to ensure private-public partnerships in the provision of internships for students in TVET training institutions, technical secondary schools and the tertiary education institutions.
Governance and stakeholder coordination	SSB to engage the Ministry of Energy in adopting a mechanism that will support the transition plan for transfer of TVET system to the Ministry of Education.
Governance and stakeholder coordination	SSB to develop the needed key performance indicators that will be used to evaluate the progress and impact of the SSB on the sector.
Governance and stakeholder coordination	SSB to advocate for all TVET training institutions and tertiary institutions to put in place tracer studies to monitor impact and the impact of the sector skills strategy developed.
Governance and stakeholder coordination	SSB to develop the needed key performance indicator that will be used to evaluate the progress and impact of the SSB on the sector
Governance and stakeholder coordination	SSB to put in place mechanisms to collect and monitor the supply of sector-specific jobs in technical secondary schools, TVET institutions and tertiary institutions.
Governance and stakeholder coordination	SSB to conduct periodic market research that will be relevant to the strategy implementation.
Funding	SSB to organize commercial activities with TVET and the training institutions that will generate income to enhance and increase practical delivery and the application of modern application of equipment in the industry.
Funding	SSB to identify current initiatives and funding opportunities available to TVET institutions that can be used in funding in the sector skills action plan.
Funding	SSB to organize paid conferences, workshops, seminars as well as develop and publish content rich sector information (e.g. yearly reports), where industry players can also advertise.
Delivery and assessment practices	SSB to develop or refresh occupational standards for priority occupations and students' internships for skills acquisition for the sector.
Training	SSB to work with TVET institutions and partners to develop a variety of short courses or programs to upskill the workforce, especially around specific skills that are in high demand in the sector.
Training	SSB to formalize internships with existing oil and gas companies, which will enhance skills update.
Industry-institute linkages	SSB to form strong (vertical and horizontal) network ties (collaboration and partnerships) with industry and institutions. This newly formed partnership will moderate and fill the gaps and challenges mostly coming from academia's inability to catch up with industry in terms of technology and skills.
Industry-institute linkages	SSB to increase advocacy among TVET institutions to provide cutting edge solutions that will be appealing to industry that will, in turn, encourage work place learning.
Industry-institute linkages	SSB to set standards for continuous learning of the industry's workforce.
Industry-institute linkages	SSB, through advocacy, should negotiate with government to introduce policies to encourage girl-child participation in STEM education.

Industry-institute linkages	The SSB is to embark on a nationwide education campaign to lobby for female participation in the sector. The notion of seeing O&G as male dominated sector should be assessed.
Industry-institute linkages	SSB needs to articulate a positive narrative to graduates and entry-level hires on how the sector can promote economic development and help manage the transition to the energy system of the future.
Industry-institute linkages	The SSB should be equipped with the right resources to collaborate with the right authorities to resolve issues of discrimination against women in the oil and gas sector.
Industry-institute linkages	SSB to evaluate and research into whether remote assignments are critical. Outcomes of this study will be presented to industry stakeholders at forums, workshops and conferences. To retain more young women, and indeed to provide more flexibility to everyone, the SSB may want to consider advocating to the companies to develop alternative career paths that do not require moving to remote environments.
Industry-institute linkages	SSB is to advocate for a quota system for male/female candidates considered for early promotion; and this should be representative of the employment pool. This is one way to protect against unintended bias. Research has found that in industries and companies that have adopted these practices, more women get promoted.
Industry-institute linkages	SSB to create and communicate to young workers in the O&G industry the possibility of flexible career paths. Developing such pathways will benefit both men and women (but women probably a bit more) setting them up for future success.
Industry-institute linkages	SSB is to provide early-tenure women access to female role models in their established database. Seeing women succeed is encouraging in itself.
Industry-institute linkages	SSB is to collaborate and advocate for a quota system in the oil and gas sector for people with disabilities.

10.2 Appendices

The appendices presented below were compiled by the SSB technical committee members in December 1-2, 2020.

Appendix 1. Upstream business environment

Pestel analysis	Key issues
Political	Change of government, political interference, lack of political will, political interventions.
Economic	International business and economic projection, extension of business to smaller companies, opens the economy for direct and local investment, international recognition of local & national diversification of the economy, capacity to increase the GDP of the country.
Social	Employment opportunities, helps to form capacity of local content, redevelopment of areas, introduction to new things, change in attitude to work, increase in standard of living, and culture change.
Technological	Technological transfer of business.
Environmental	Pollution because of drilling, cutting of trees, impart on the fishing industry.
Legal	Local content law to boost participation, conflicts in gaps, overlaps in regulatory dynamics, better law for redress.

Appendix 2. Market trends for the upstream sector

	Domestic market	Regional market	Key developed country markets	Global market
Growth	Increase in the growth of local market	Steady growth	Steady growth	Reduction
Competition	Not able to compete	Not able to compete	Not able to compete	Not able to compete
Margins	There are not good margins	There are not good margins	There are not good margins	There are not good margins
Change in products & services	No noticeable changes	No noticeable changes	No noticeable changes	No noticeable changes
Routes to market	Not active routes	Not active routes	Not active routes	Not active routes

Appendix 3. SWOT summary for upstream subsector

Strengthens Some human resources (well educated workforce) Training institution Favorable political climate Security and peace Good tax regime for investors	Opportunities Good global outlook Good national outlook Skills transfer to other industries More discoveries Export of skilled workforce to other oil producing countries
Weakness Lack of technical skills Lack of capacity of local businesses Conflict and gaps in regulations Weak or inadequate infrastructure Lack of political will	Threats Lack of political will Changes in government Uncertainties with oil prices Downturn in the economy

Appendix 4. Midstream business environment

Pestel analysis	Key issues
Political	Politicians liaise with industry players to understand the industry for the right policies to be implemented.
Economic	Government should empower indigenous companies to build their capacities and come out with policies to give opportunities to indigenous companies to play or render their services.
Social	Community engagement and consultations by IOCs must be strengthen on CSR. CSR is not local content. Regional Maritime University (RMU) as part of the alternative livelihood should have a discussion with the RMU in the same marine environment.
Technological	Educate the youth to broaden their knowledge in skills to engage in other activities. Update industry players when there is a change in efficiency. The industry has to keep abreast with every technological update.
Environmental	Strengthen the regulatory body of local content to be an independent body from the regulatory authorities e.g., Nigerian Content Development & Monitoring Board (NCDMB). Balance activities to avoid or minimize impart on the environment.
Legal	Monitoring evaluation of the policy to minimize impart. Train environmental and safety officers to be resourced.

Appendix 5. Market trends for the midstream subsector

	Domestic market	Regional market	Key developed country markets	Global market
Growth	Slow growth Does not attract the needed development	More opportunities Attractive policies to invest Mobility	Gradual growth because of lapses in both domestic & regional markets	Gradual growth
Competition	Minimal competition	A little competition	More competition	More competition
Margins	Smaller due to lack of knowledge of the industry	Slightly higher because it is a bigger market and populating	Bigger margins because they understand the business access to global markets	Bigger margins
Change in products & services	No change	Changes. New products upcoming	Changes	Changes
Routes to market	Less developed, doesn't reach any where	Slightly developed – West Africa gas pipeline from Nigeria	Bigger access i.e., pipeline & sea transport	More developed routes, LNG market

Appendix 6. SWOT summary for the midstream subsector

Strengthens Stable environment Strategic location of Ghana Favorable political environment	Opportunities Access to expand to regional markets, Africa & global. Transport products to these markets by expanding pipelines into these countries and by vessels via sea through a national carrier or private carrier. Access to more indigenous or local oil & gas resources both offshore & onshore that we are developing and exploring at the moment.
Weakness Political interference No strong policies	Threats Pirates Local fishermen interference

Appendix 7. Downstream business environment

Pestel analysis	Key issues
Political	Inconsistency in policy Political interference Political intervention
Economic	Forex issues Strong linkage in the financial sector Fuel economic activities Smuggling
Social	Pricing & subsidies Tax regime
Technological	Fuel market ERDMS Vehicle technology Rigging system
Environmental	Pollution i.e., air quality and carbon emissions Lubricant contaminated implications of heavy oils
Legal	Local opportunities Strong regulator yet No strong local content

Appendix 8. Market trends in downstream sector

	Domestic market	Regional market	Key developed country markets	Global market
Growth	Increase growth			
Competition		Dangote-Nigeria Togo	Integration of down steam with other streams	
Margins	Competitive	Better than most countries	Integration of down steam with other streams	
Change in products & services	Improved services & products	Better adoption		
Routes to market	Good but important	Need pipelines		

International Labour Organization
Route des Morillons 4
CH-1211 Geneva 22
Switzerland
ilo.org

I S B N 978-92-2-035723-1



9 789220 357231