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Gender Justice in the Energy Transition Era: Exploring Gender and Technology in the Extractives Sector

Alaka Lugonzo and Kennedy Chege

Video interview by the author discussing this book chapter can be accessed at, https://www.youtube.com/watch?v=pcIIxucbDOg&t=851s. Last accessed on 1st September 2020.

12.1 Introduction

Although the energy industry is predominantly thought to refer to the electrical power sector (i.e. sources of electricity, electricity generation, distribution, etc.), it is an all-encompassing term that comprises different other industries, including the extractives sectors, being the mining and minerals sectors. Oil and gas resources, for example, are components of

A. Lugonzo (✉)
University of Dundee, Dundee, Scotland, UK

K. Chege
University of Cape Town, Cape Town, South Africa
e-mail: Kennedy.chege@uct.ac.za

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energy, and account for the majority of global energy consumption.\(^1\) Similarly, minerals play a significant role in the energy industry, for example, cobalt is increasingly becoming essential, as it is used in the manufacturing of electric vehicles, and other vital elements of the global efforts to transition to cleaner sources of energy.\(^2\) The focus of this chapter is on gender and technology issues specifically in the oil and gas, and mining industries, as elements of the energy industry, in line with the global developments in energy transitions.

It is becoming increasingly evident that the world is continuously transitioning as a result of different factors, including the growing influence of technology in different areas, especially the advent of the so-called Fourth Industrial Revolution (referred to henceforth as “the 4IR”). The 4IR refers to a phenomenon that is characterized by technological innovations as well as the growing utilization of new technologies, which include among other things: Artificial Intelligence (“AI”), cloud computing, blockchain technologies, Virtual Reality (VR), robotics, 3D printing, among others.\(^3\) These innovations have ushered in an era of digital transformation and globalization in the twenty-first century that has revolutionized the global economy, including the energy and extractives sector. The influence of the 4IR on the energy and extractives sector is the focus of this chapter, particularly the position of women amid the 4IR.

The growing influence of the 4IR has been acknowledged around the world. For example, in 2019 last year, the 4IR was the focus of the World Economic Forum (WEF) annual meeting in Davos, Switzerland.\(^4\) The theme for the meeting was: ‘Globalisation 4.0: Shaping a Global

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\(^1\) OECD, ‘Energy’ (2011) OECD Green Growth Studies, 17, [https://www.oecd.org/greengrowth/greening-energy/49157219.pdf](https://www.oecd.org/greengrowth/greening-energy/49157219.pdf), accessed March 16, 2020.

\(^2\) A new World Bank report reveals that over 3 billion tons of metals and minerals will be needed to utilize geothermal, solar and wind power (i.e. alternative and cleaner sources of energy), in order to replace carbon-intensive technologies. For further discussion, see, The World Bank, ‘Mineral Production to Soar as Demand for Clean Energy Increases’ (2020), [https://www.worldbank.org/en/news/press-release/2020/05/11/mineral-production-to-soar-as-demand-for-clean-energy-increases](https://www.worldbank.org/en/news/press-release/2020/05/11/mineral-production-to-soar-as-demand-for-clean-energy-increases), accessed March 16, 2020.

\(^3\) David Peetz, *Digitalisation and the Jobs of the Future* (ANU Press 2019), 93.

\(^4\) World Economic Forum, ‘Globalisation 4.0 Shaping a New Global Architecture in the Age of the Fourth Industrial Revolution’ (2019) World Economic Forum White Paper, [http://www3.weforum.org/docs/WEF, Globalization 4.0 Call for Engagemen.pdf](http://www3.weforum.org/docs/WEF, Globalization 4.0 Call for Engagemen.pdf) accessed April 14, 2020.
Architecture in the Age of the Fourth Industrial Revolution’. Global economies take into account the fact that the 4IR is changing how we live, work and relate to one other.\textsuperscript{5} Since the meeting, 4IR and especially Artificial Intelligence (AI) have remained prominent and have sparked multidisciplinary research and scholarship, as will be shown below.\textsuperscript{6} This prominence emphasizes the relevance of the discourse today.

The global market is adapting to new trends and faster turnaround times.\textsuperscript{7} Mining companies are embracing data, analytics and connectivity in order to compete favourably. It has often been alleged that ‘Data is the new gold’, and digitization, as well as automation, are redefining the accelerated pace of change. Digital technologies could be leveraged to achieve socio-economic growth and development generally for developing countries, and specifically for women.\textsuperscript{8} Innovation has become an imperative today, but the question is where the adoption of technology leaves women, particularly in the extractives sector, which is infamous for having a gender diversity problem. Additionally, technology is also key in ensuring that African countries transition to a low-carbon economy. The United Nations Sustainable Development Goal 5 focuses on gender equality while SDG 7 advocates for energy access. Ensuring gender equality has been highlighted by scholars as being crucial in tackling the energy access challenges on the African continent.\textsuperscript{9} The continued role of the extractive industries including oil, gas and mining on the African continent clearly indicates that some countries might not be ready to fully transition to a low-carbon economy, especially considering the fact that oil and gas is capable of tackling the energy access challenges; while critical minerals such as cobalt are key in the energy transition.\textsuperscript{10}

\textsuperscript{5}Ibid.
\textsuperscript{6}Ibid.
\textsuperscript{7}See Peetz (n 3).
\textsuperscript{8}McKinsey & Company, ‘The Future of Women at Work: Transitions in the Age of Automation’, \url{https://www.mckinsey.com/featured-insights/gender-equality/the-future-of-women-at-work-transitions-in-the-age-of-automation}, accessed April 14, 2020.
\textsuperscript{9}Nalule, V.R., 2018. \textit{Energy Poverty and Access Challenges in Sub-Saharan Africa: The Role of Regionalism}. Springer.
\textsuperscript{10}Nalule, V.R., 2020. Transitioning to a Low Carbon Economy: Is Africa Ready to Bid Farewell to Fossil Fuels?. In \textit{The Palgrave Handbook of Managing Fossil Fuels and Energy Transitions} (pp. 261-286). Palgrave Macmillan, Cham.
Women are historically excluded from contributing effectively to the economies in different sectors. The International Labour Convention (ILO) of 1935 prohibited the employment of women in underground mining.\(^{11}\) Although many countries that were initially signatories to this Convention have since denounced it, it depicts the attitudes that existed at the time, relating to the participation of women in mining. Some of these attitudes may have been transmitted to societies today. It is common cause that there is a disproportionate number of women, as compared to men, as active participants in the global economy, for example in the extractives sector.\(^{12}\) Women are presently at further risk of being left behind in the global digital revolution.

Additionally, women were barred from entering the mining industry, particularly in the upstream sector.\(^{13}\) This exclusion was as a result of inter alia, legislative restrictions, gender restrictions and superstition, stemming from traditional cultural practices that designated gender roles that have created the perception of women’s maternal function, particularly in traditional African societies that culturally relegate women’s roles to domestic household duties.

The disparity is attributed to the lack of requisite skills to engage properly with these new technologies, which would hamper any attempts to become active contributors in the 4IR era. The growth of technology is an opportunity to overcome these inequalities, as it provides avenues to upskill women, to address the displacement curve, thereby evening the gender disparity. The segregation of men and women into differentiated sectors of the economy contributes to lower innovation levels in professions that lack gender diversity.\(^{14}\)

\(^{11}\)C045—Underground Work (Women) Convention No. 45, 1935.

\(^{12}\)Adam Smith International, ‘Women in Mining: Can a Mining Law Unlock the Potential of Women?’ (2017) Adam Smith International, 13, https://issuu.com/adamsmithinternational/docs/asi___iwim_2017, accessed April 10, 2020.

\(^{13}\)Halo Media, ‘The Barriers That Barred Women from the Mining Industry’ (Mining Review Africa, 2019), https://www.miningreview.com/gold/the-barriers-women-faced-in-the-mining-industry-in-south-africa/, accessed April 13, 2020.

\(^{14}\)World Economic Forum, ‘Global Gender Gap Report 2020’ (2020) World Economic Forum Inside Report, 42, http://www3.weforum.org/docs/WEF_GGGR_2020.pdf, accessed March 29, 2020.
This chapter therefore seeks to address the influence of the 4IR on the extractives sector, especially the position of women amid the 4IR in this energy transition era. The chapter explains why it is crucial to include women in global economies. It then focuses on the position of women historically and presently in both the mining and oil and gas sectors globally, to show that there is a disproportionate number of women as compared to men in these sectors, hence the need to address such gender disparity. Emphasis is drawn towards AI technologies as a critical form of technology that has the widest influence and application in these sectors of the economy, and how its continued use could have an adverse effect if efforts to upskill women in using such technologies, are not made. The chapter concludes with a brief synopsis of the proposed solutions to the aforementioned gender disparity problem in the mining and oil and gas sectors of the global economy.

12.2 Why It Is Imperative to Include Women in the Global Economy

The reasons for the disparity, as compared to men, are numerous, and mostly relate to the circumstances where the technology field has often been perceived as appropriate for men, thus explaining why it is male dominated. To address this myth, the digital revolution ought to prioritize training and upskilling women in digital competencies, for example, in the oil, gas and mining sectors.

For women, the oil, gas and mining sectors can provide for better livelihoods by creating jobs, access to financing, business ownership and the reduction of poverty within communities. In the last decade, there has been a myriad of research revealing the participation of women in the extractives sector. Such research prioritizes their economic empowerment to become critical economic drivers especially for developing countries with mineral resource wealth, through access to finance; access, use and control of land; licenses and permits to mine; skills development, education and training, etc.
Investing in gender equality, for companies improves workforce performance and enhances better Company-to-community relations.\textsuperscript{15} It also provides access to financing and secures supply chains along the extractives value chain, among other benefits that will be explained in this chapter.\textsuperscript{16}

The demand for new kinds of skills in AI, digitalization and machine learning is eliminating many jobs involving low and middle-skill routine functions and tasks through automation. The BBC notes that an estimated 200 million people will lose their jobs as a result of the present Covid-19 pandemic, and the financial burden often falls on the most vulnerable categories of people in society, mostly women.\textsuperscript{17} Digitalization and such pandemics have adversely affected the availability of jobs for people.

It is vital to understand the shift and impacts of modern-day trends as we advance the narrative of gender equality in the extractives sector. Our ability to mitigate the impact on the workforce and the most vulnerable, i.e. women, is the conundrum facing most industries and countries. This predicament warrants more attention as well as a speedy resolution.

In the African context, women account for more than half of the total population; therefore, it is imperative to consider women in the implementation of policies. In 2019, African countries undertook to establish the African Continental Free Trade Area (AfCFTA) Agreement.\textsuperscript{18} This Agreement, once implemented, is set to establish Africa as the largest free trade area in the world, by creating a single market for goods and services,

\textsuperscript{15}PwC Norway, ‘Investing in Gender Equality’ (2019) PwC Norway Report, 7, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwiv6YmFtrjpAhWyUURUIHZoKC2wQFjAegQJARAB&url=https%3A%2F%2Fwww.storebrand.no%2Fasset-management%2Fpublikasjon%2F_tatt%2Fdownload%2F4ac78ed2-b927-4612-a2fe-80cbebbf610b%3A595ed273080c%622af216b95%1f0959af438888%2FInvesting_in_Gender_Equality_20190628.pdf&usg=AOvVaw3Z9eqdO7Jvzajr_nxpD44, accessed April 28, 2020.

\textsuperscript{16}Ibid.

\textsuperscript{17}BBC, ‘Coronavirus: Four Out of Five People’s Jobs Hit by Pandemic’ (2020), https://www.bbc.com/news/business-52199888, accessed April 10, 2020.

\textsuperscript{18}Kennedy Chege, ‘OPINION: Challenges to Promoting Intra-African Trade in the Petroleum Industry in the Wake of the AfCFTA Agreement: Africa’s Insufficient Petroleum Refining Capacity’ (2019), http://www.mlia.uct.ac.za/news/opinion-challenges-promoting-intra-african-trade-petroleum-industry-wake-afcfta-agreement, accessed November 28, 2019.
and ensuring more interconnectedness between African countries, thus limiting their dependence on other countries outside the continent.

The intention of the Agreement is: to increase intra-African trade by expediting the establishment of regional value chains, to reduce over-reliance on other countries outside the continent, and to allow African states to retain the value that they create, within the continent. The Agreement would have positive benefits, particularly for the extractives industries within the continent.

Women are a crucial cog in the wheel to ensure the proper implementation of the AfCFTA Agreement, i.e. the Agreement will not be successful without the participation of women. The role of women in driving general consumption patterns cannot be overstated. According to statistics, women reinvest 90% of their income back into their households, while men reinvest only 30–40%. Therefore, women have a critical part in promoting the requisite demand that would support the exchange of goods and services among countries throughout the AfCFTA Agreement.

The agricultural sector, for example, is historically the key driver of the majority of economies in Africa. Women contribute significantly to this sector through labour. Such contribution emphasizes the assertion that the Agreement would be unsuccessful without the equal participation of women. Other industries like the extractives ought to take the necessary steps to include women in order to ensure the success of the AfCFTA Agreement. With this realization that women are essential to in promoting economic activities between countries, it is expected that this Agreement would act as an incentive for governments to promulgate targeted policies and legislation that is female-focused, to boost productivity for the continent, to enable it to be an equal participant in the global economy.

19 Chege (n 16).
20 IFC, ‘Assessing Private Sector Contributions to Job Creation and Poverty Reduction: Findings on Gender’ (2013) IFC Jobs Study, https://www.ifc.org/wps/wcm/connect/2125f97c-da65-4fb0-aba7-1d554bfe55bb/full-study-gender.pdf?MOD=AJPERES&CVID=jRvG5JC, accessed April 14, 2020.
Increased diversity has been associated with greater creativity and organizational performance and improved problem-solving mechanisms.  
Hence further emphasizing the need to promote gender equality in the workplace.

The above are some of the reasons why it is crucial to involve women in the global economy in all sectors, including the extractives. These are in no way an exhaustive list of justifications for the equal participation of women. Several others will be discussed further in this chapter, specifically in the context of the extractives industries.

12.3 The Need for Automation in the Extractives Industries

At the time of writing, the Covid-19 pandemic has claimed the lives of more than 300,000 people around the world, yet it has not peaked in many countries. Hence the numbers are expected to rise exponentially. The pandemic has revealed the urgent need for automation in the different sectors of the economy, including in the oil and gas, and mining sectors. Many countries are fighting the prospect of economic collapse as a result of the pandemic.

In South Africa, president Ramaphosa on March 27, 2020, announced a national lockdown, as an attempt to curtail the spread of the Coronavirus. The lockdown commenced for an initial duration of a month. Midway through that period, the Minerals Council, union heads and other stakeholders in the extractives sector impressed upon the government to allow operations in the sector to continue in order to prevent

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21Marie-Anne Birken and Gian Piero Cigna, ‘Gender Diversity on Boards: A Cause for Multilateral Organisations’ (2018) AIIB Yearbook of International Law 2018, 29.
22Worldometer, ‘COVID-19 Coronavirus Pandemic Latest Update’ (May 16, 2020), https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1%22%20%5Cl%20%22c
countries, accessed May 16, 2020.
23Nelson Mandela University, ‘UPDATE 11: Lockdown Update—27 March 2020’ (March 27, 2020), https://www.mandela.ac.za/News-and-Events/Coronavirus-Information/COVID-19-Memos/UPDATE-11-Lockdown-Update-%E2%80%93-27-March-2020, accessed March 27, 2020.
permanent and potentially irreversible damage, having already made record losses amounting to billions.24

The various stakeholders emphasized to the Department of Mineral Resources and Energy (DMRE) how important it was for operations to continue. The economic damage of the lockdown to the country is profound. The Minerals Council estimates a drastic decline in mining production for the year.25 This decline excludes the costs incurred to place operations under ‘care and maintenance’ during the lockdown,26 as well as the amounts spent on wages over the lockdown period. Mining companies such as Impala Platinum,27 have hitherto lamented the fact that they will be unable to continue to pay workers in the event that the lockdown period is extended.

The circumstances explained above are not unique to South Africa. A massive plunge in global oil prices has hampered all economies in the world, including the major economies like the USA and in Europe. The oil and gas industry is projected to experience up to 20% reduction in labour and workforce over to 2021.28

The pandemic highlights that we need automation/mechanization in the extractives industries around the world. It shows the importance of digital readiness to allow businesses to continue as much as possible despite the challenging circumstances. Mines ought to be operational even in circumstances of a lockdown, where workers are unable to physically go into a mine. The pandemic has made this realization more apparent. Thus, there is an urgent need to accelerate efforts to promote automation in the energy industry, including the mining and oil and gas

24BusinessDay: BL Premium, ‘Mines Must Return to Work on April 17 or Face Permanent Damage’ (April 6, 2020), https://www.businesslive.co.za/bd/companies/mining/2020-04-06-mines-must-return-to-work-on-april-17-or-face-permanent-damage/, accessed April 6, 2020.

25Ibid.

26A mine is considered to be under ‘care and maintenance’ when production has ceased for various technical, environmental, financial or labour-related reasons. The mine does not necessarily declare the intent to close indefinitely.

27Impala Platinum Holdings Limited (Impalas), is a South African holding company that owns several companies that operate mines producing platinum and other platinum group metals, as well as nickel, copper and cobalt.

28See Matthew Farmer, ‘How Will the Offshore Industry Recover After Covid-19?’ (March 27, 2020), https://www.offshore-technology.com/features/coronavirus-covid-19-offshore-cost-opec/, accessed April 14, 2020.
sectors, through for example adopting AI and other measures to ensure the smooth running of operations without necessitating human agency. Many have referred to the current circumstances as the ‘new normal’.

12.4 Sector Outlook: The Position of Women in the Extractives Sector

Building the necessary infrastructure to support a digitalized world will be essential for any business to remain competitive even after the pandemic, as they realign and adjust to embracing measures to cut costs in a move to automate operations. According to a recent survey by The Hoxby Collective, a virtual firm in the United Kingdom (UK), more than two-thirds of business owners opine that remote working is ‘the future’ for their organizations.29 It was found that workers were more productive and positive while working at home, as opposed to when confined to their workplaces.30 A post-COVID world is bound to see many remote working practices, as organizations shift their businesses remotely, pursuant to the lockdown/remote working measures that governments are instituting across the world.

This section will analyse the position of women in the mining and oil and gas sectors, amid the gradual adoption of technology into these in industries.

a. The Mining Sector

Despite mounting pressure on the mining sector to maximize diversity, women still make up less than 20% of the workforce in the industry, and the percentage is less in executive positions.31 There are numerous reasons for the meagre inclusion of women in mining including legislative and gender restrictions; superstitions deeming women as not quite ready for the top roles; minimal formal training for women on specialized

29 CharlieHR, ‘Why 95% of Jobs Will Eventually Be Remote Working’ (2020) the workspace by Charlie, https://www.charliehr.com/blog/the-advantages-of-remote-working/, accessed May 10, 2020.
30 Ibid.
31 Adam Smith International (n 10).
technical skills required by the sector; lack of fair employment and career advancement policies, coupled with limited career progression opportunities, owing to the large number of men that occupy senior positions in the industry. Safety and security concerns could also be inhibitors for women participating in mining.

South Africa, for example, has made great strides in recent years to address gender disparity. In 2002, the South African Mining Charter was promulgated to ensure that mining companies included 10% of women in their total workforce by 2009. Subsequent Mining Charters and other policies have ensured the sustainable participation of women in the economy, e.g. requiring greater representation of women in boards and senior management positions in companies, as ‘Previously Disadvantaged South Africans’.

Today in South Africa, there are many mining companies that have close to 20% female participation in the workforce, whereas there are other countries that still do not permit women to be involved in mining, especially in underground operations. South Africa is now regarded as a global leader in terms of employing women in the mining and minerals sectors.

The extractives industry generally classifies the mining sector into two broad categories; Large Scale Mining (‘LSM’) and Artisanal and Small-scale Mining (ASM). On the one hand, LSM refers to capital-intensive operations that are carried out by large mining conglomerates who apply heavy-duty and advanced technological know-how to mine. On the other hand, ASM refers primarily to informal miners and those who operate for subsistence as well as those who mine commercially on a small scale.

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32 Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry 2002 (‘Mining Charter I’).

33 See Amendment of The Broad-Based Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry 2010 (‘Mining Charter II’), and Broad-Based Socio-Economic Empowerment Charter for the Mining and Minerals Industry 2018 (‘Mining Charter III’).

34 Francis Kariuki, Geoffrey Kerecha and James O. Kirwa, *Handling Extractives Related Grievances in Kenya. A Judicial Guide for Officers* (Strathmore University, Extractives Industry Centre 2019), 3.
Women tend to gravitate towards the provision of goods and services, as opposed to seeking to work on mine sites.\textsuperscript{35} The challenge in bridging the gap is how to attract female skills to the mining sector, and retaining them.

ASM attracts a fair number of women. By 2017, 40.5 Million people were directly involved in artisanal and small-scale mining around the world, with 150 million solely dependent on mining activities.\textsuperscript{36} Women account for 30\% of the workforce, and in some regions such as South East Asia women make up to 50\%.\textsuperscript{37} Though the numbers are significant, the contribution by women relates to subservient and supporting roles such as panning, washing, transporting material and cleaning. Their participation in the high income earning mine activities such as owning license, drilling and extraction of minerals, value addition/beneficiation, trading, etc., is insignificant.\textsuperscript{38} Efforts must be made by all stakeholders in both the public and private sectors to incentivize women to become more involved in the mining industry. Several initiatives have been put forward as will be discussed in this chapter.

b. The Oil and Gas Sector

Similarly, the oil and gas sector has historically been male-dominated, and there is now surmounting pressure on companies to attract and retain highly skilled women to the workforce. According to recent research by McKinsey, the sector struggles to recruit, retain and promote women.\textsuperscript{39} This struggle could be because of the various reasons outlined above, including outdated perceptions that women either cannot or do

\textsuperscript{35}Andreas Kotsadm and Anja Karolina Tolonen, ‘African Mining, Gender and Local Employment’ (2015) Policy Research Working Paper; No. WPS 725, http://documents.worldbank.org/curated/en/199161468187785282/pdf/WPS7251.pdf, accessed May 14, 2020.

\textsuperscript{36}Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF), ‘Global Trends in Artisanal and Small-Scale Mining (ASM): A Review of Key Numbers and Issues’, https://www.iisd.org/sites/default/files/publications/igf-asm-global-trends.pdf, accessed March 24, 2020.

\textsuperscript{37}Ibid.

\textsuperscript{38}Ibid.

\textsuperscript{39}Kassia Yanosek, Sana Ahmad, and Dionne Abramson, ‘How Women Can Help Fill the Oil and Gas Industry’s Talent Gap’ McKinsey & Company, https://www.mckinsey.com/industries/oil-and-gas/our-insights/how-women-can-help-fill-the-oil-and-gas-industrys-talent-gap, accessed February 19, 2020.
not want to handle physical labour such as working in mines or on pipelines. Such myths and hurdles must be dispensed with, as they are experienced across the board globally.

In developed oil and gas civilizations like the USA, women represent a paltry 38% of the workforce, but only 22% of the wage earners work in the oil and gas sector.\(^{40}\) Diversity decreases in senior positions whereby at entry-level, women account for 17% of senior management positions. Female chief executives make up only 1% of industry leadership.\(^{41}\)

Change is inevitable as the sector addresses the workforce deficiencies and acknowledges that the world is changing, as has been expressed above, with the advent of the 4IR. Also, as the world focuses on the transition from fossil fuels to cleaner sources of energy, i.e. decarbonizing, this would be facilitated by using wind, solar and other modern technologies. Companies that will succeed in upskilling will be those that appreciate the advantages of having a diverse workforce. This realization would see more women recruited into the industry.

The untapped female talent is rampant as it cuts across all regions and types of establishments. Women in international oil and gas companies account for 26% of the workforce while in national oil companies, the number is 13%. In both oilfield services and equipment companies, the number of women is up to 16%.\(^{42}\)

As experienced in the mining sector, women are most visible in the business support functions at a corporate level such as in legal, human resource and finance services. Even where women are employed in technical roles, they are likely to hold office jobs than purely technical and field jobs.\(^{43}\) Their representation on all job groups decreases over time, as a result of the low numbers during recruitment at entry levels.

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\(^{40}\) Ibid.

\(^{41}\) Katharina Rick and others, ‘Untapped Reserves: Promoting Gender Balance in Oil and Gas’, [https://www.bcg.com](https://www.bcg.com), 2020 accessed April 13, 2020.

\(^{42}\) See Yanosek, Ahmad, and Abramson (n 37).

\(^{43}\) Ibid.
12.5 Artificial Intelligence and the Future of Extractives

AI, machine learning, the use of robots in mining, etc., are changing the extractives industry landscape around the world. AI especially has seen more uptake by entities in the extractives sectors, as compared to other forms of technology, and this is the reason for its emphasis in this chapter.

The most critical components in the extractives are efficiency, effectiveness and environmental and human safety concerns. Extraction and production of resources from the ground involves different processes, to the point that the products reach the final consumer in the downstream stage of the cycle. Minute improvements in the execution speed, the efficiency of operations, safety and reduced turnaround times, separate a profitable venture from an unsuccessful one in the extractives.

AI has widely been adopted by mining companies in recent times to improve the efficiency of operations in mines as well as to reduce costs, in a capital-intensive industry by its very nature. Mining companies are only beginning to appreciate the potential of AI in mining, and it is expected that AI will become more commonplace, as we move towards fully adopting the 4IR into many of our economic activities in various sectors of our economies.

AI is instrumental in the making of decisions, by analysing algorithms, especially when discovering deposits in the prospecting phase of the mining cycle. AI automates decisions that were previously made by human beings, which were influenced by inherent biases and were prone to costly mistakes. Additionally, AI assists in extracting minerals from hard-to-reach areas, and in harsh weather conditions. Therefore, minerals are extracted from previously inaccessible areas, without endangering the lives of workers and with little to no human error.

Many companies are beginning to adopt technology in their operations. For example, Canada’s GoldSpot Discoveries Corporation utilizes AI and other new technologies like machine learning, to improve mineral

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44 Gerlind Wisskirchen and others, ‘Artificial Intelligence and Robotics and Their Impact on the Workplace’ (IBA Global Employment Institute 2017).
exploration by reducing capital risk and increasing efficiencies to enhance success rates in resource exploration and investment. This constitutes one of the companies that are renowned for revolutionizing the mining industry. It uses AI to extract almost 90% of gold with the help of detailed geological, topographical and mineralogical data.

Another major company incorporating new technologies is Rio Tinto, an Anglo-Australian multinational and the world’s second-largest metals and mining corporation. It recently started using autonomous vehicles/trains and haul trucks that run without a driver for hundreds of kilometres. Such innovation comes in handy for transportation of minerals, especially in harsh weather conditions. There are many more examples of companies that recognize the future of mining in their operations to solve problems that human beings cannot solve, thus explaining the inevitability of the adoption of 4IR into the extractives industries.

This automation age, women will encounter new barriers shrouded on the existing long-established ones. Women will be required to progress, shift or upskill between occupations by the year 2030, reducing the wage gap considerably.

12.6 Proposed Solutions to the Challenge of Gender Inclusivity in the Extractives Sectors

Collaborative and innovative parameters will be needed to allow women to transition into the mechanical space. This metamorphosis will not be cheap. Approximately 150 million jobs will we added to existing occupations and majority towards emerging economies in developing countries. We would have to be adaptable, reinvent ourselves and unlearn traditional ways of doing things, to prepare adequately for the changes in the global market.

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45 Goldspot Discoveries, https://goldspot.ca/, accessed May 13, 2020.
46 Ibid.
47 Rio Tinto, https://www.riotinto.com/about/innovation, accessed May 13, 2020.
48 Mc Kinsey & Company (n 8).
Governments, the education sectors, industry stakeholders, development partners and Non-Governmental Organizations (‘NGOs’) will be required to spearhead the transition for women in the extractives sector, as will be shown below. For instance, adopting AI into modern mines will not be easy, as it requires much planning, research and assessment, and establishing well-defined infrastructures and platforms, clear communication practices and effective change management. These elements require policies to be set up to provide guidelines/a framework for adoption of these and other technologies.

The concerted effort by the public, private and social sectors in the extractives sector will have to heed the clarion call of automation in the following ways:

**a. Governments Role**

Automation-driven changes in the labour market will attract new entrants into the workforce. The seasoned barriers override new challenges to develop highly skilled technological savvy workers that can adapt to the changing times.

The Kenyan government, through the Ministry of Energy, for example, has taken steps to institute a gender policy that aims to promote gender awareness, to change negative stereotypes and to inculcate an engendered work culture in the energy, and related sectors. This policy is the first of its kind in Africa on a national level, though there exists similar policies on a regional level from the AU, the New Partnership for Africa’s Development (NEPAD) and the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE).

Other African countries ought to borrow a leaf from Kenya in this regard and promulgate such policies to further the goals of ensuring equal opportunities for all persons irrespective of gender. Such a policy establishes a framework for both the public and private sectors to prioritize gender issues in the policies and other programmes in the energy sector.

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49. The Draft Digital Transformation Strategy for Africa (2020–2030).
50. Kenyan Ministry of Energy Gender Policy in Energy 2019.
51. Ibid.
i. Women Will Need to Be Reskilled

We must take cognizance of the social, cultural and traditional norms that inform the different ways in which men and women work. Women are deemed too risk-averse and lack the conviction to take up opportunities.

Governments in developing and frontier oil and gas economies should consider these social, cultural differences when creating regulations. Initiatives through the education sector should advocate for skill-based courses that will increase the uptake of women in technical careers. These initiatives may be conducted through partnerships with schools, colleges, vocational centre and universities. In frontier economies such as Kenya and Uganda that have recently discovered oil reserves, governments should ensure that the transfer of skills and knowledge should incorporate elements of AI.

ii. Subsidies

Although most efforts to address the gender disparity between men and women have focused on the supply side, there have been several demand-side efforts to create incentives for women and girls to enrol in Science, Technology, Engineering and Mathematics (“STEM”) education programmes. Such efforts are intended to enable and provide women with the requisite skills in the highest-growth roles of the future, especially those that apply STEM skills.

The provision of subsidies for technical courses and programmes in STEM would allow women to reskill. Such initiatives can be spearhead by governments to aid in skills development in developing countries. Countries such as Singapore have developed a national movement called ‘Skills Future’. This initiative provides a platform whereby people access training to develop skills and technical expertise at any stage in

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52 Colleges and Institutes Canada, ‘Kenya Education for Employment Program (KEFEP)’, https://www.collegesinstitutes.ca/what-we-do/international/education-for-employment/kenya/, accessed May 5, 2020.
53 UNESCO, ‘Girls’ and Women’s Education in Science, Technology, Engineering and Mathematics (STEM)’, https://en.unesco.org/stemed, accessed May 13, 2020.
54 Ibid.
55 Skillsfuture, https://www.skillsfuture.sg/AboutSkillsFuture, accessed April 14, 2020.
their careers of business as the economy braces the transition to 4IR. Skills Future actively engages women in the technical space at entry-level, mid-career and even women looking to return to the workforce, in a bit to create an inclusive workforce.

The private sector can also play a vital role by creating Company policies that aid the absorption and retention of women. Safaricom, a telecommunications company in Kenya, boasts up to 51% of the workforce being women. Its pioneer ‘Bring your child to work policy’ has demonstrated commitment to the female personnel in the Company. Such initiatives reduce the risks of new mothers leaving the workforce, hence can act as catalysts for women to actively pursue careers and eventually ascending to executive and leadership positions.

As emerging economies anticipate the future of automation, such in-country incentives both by government and industry stakeholders, allow the public to access the skills and knowledge that will equip them for the revolution.

**iii. Advocate for Women in Science Technology Engineering and Mathematics (STEM)**

The evolving labour market and the increasing number of opportunities will require an emphasis on STEM-related expertise. STEM incorporates and allows for the application of math and science to create technological solutions to solve real-time global problems by using and engineering design approach. Women are underrepresented in this area.

Governments can play a pivotal role in the education system by initiating the interest in STEM subjects at an early age to allow for girls to access equal professional opportunities. Equipping the teachers with

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56 Skillsfuture (n 55).
57 Ibid.
58 IFC, ‘Tackling Childcare: The Business Case for Employer-Supported Childcare’ [www.ifc.org](http://www.ifc.org) accessed May 13, 2020.
59 Ibid.
60 Rebecca Davis, ‘Women in STEM and Human Information Behavior: Implications For LIS Educators’ (2014) Vol. 55 No. 3 *Journal of Education for Library and Information Science* 225, 258.
61 Michael A. Fletcher, ‘Women Continue to Be Underrepresented in STEM Industries’ (2015) Vol. 14 No. 1 *Women of Color Magazine* 22–23.
proper tools and equipment and providing a proper learning environment from the onset that is critical to the socialization and engagement of young girls.\footnote{UNESCO (n 51).}

Policy regulations, coupled with financial incentives and partnerships with the private sector, can play a significant role in increasing the participation of women in STEM-related courses and careers.\footnote{Colleges and Institutes (n 50).} Governments can also incentives companies and as a result, offer internships, training and mentorships to bridge the gender disparity in employment.

\textbf{b. Private Sector}

The private sector is imperative to supplement efforts taken by governments to promote gender inclusivity in the workplace. These efforts could be in the form of, among others, investments in measures to reskill women through ensuring their access to training facilities.

\textbf{i. Digital Learning Platforms}

Access to learning tools and technology permits people to develop cognitive and effective skills. The learner is in a position to identify the exact resource and apply the information to solve a specific problem and even get feedback through evaluation.

A digital learning platform with sector-specific programmes, training manuals and information can enable women to enhance their skill levels, particularly in emerging economies.\footnote{Sui Cheung Kong and Others, ‘E-Learning in School Education in the Coming 10 Years for Developing 21st Century Skills: Critical Research Issues and Policy Implications’ (2014) Vol. 17 No. 1 \textit{Journal of Educational Technology \& Society} 70, 72.} Engagements on digital platforms sharpen critical thinking skills and allow the student to be analytical as opposed to the traditional memorizing of a textbook.

The role of the private sector is to facilitate access to information from any corner of the world, breaking geographical and financial barriers that sometimes hinder learning.\footnote{See Cheung Kong and Others (n 62) 75.} Industry stakeholders can contribute to the body of learning by partnering with companies to invest in digital learning platforms. Online courses should be made accessible to personnel in order for them to reskill.
ii. Skills and Technological Transfer

International oil and gas and mining companies should be at the forefront of spearheading the need to address the skills gaps that could ensue due to automation, as such efforts would aid in fulfilling their local content requirements.

Companies can prepare curriculums that are sector focused and infuse them into STEM-based courses. Upon completing, the students can be attached to the companies for the experience. Such tailor-made training courses will encourage the uptake of women, who in turn will acquire the skills and knowledge, and levels the playing field to access the highly competitive technology-based jobs. Investing in training and reskilling programmes for women in technical and vocational training will allow for professional and business development and reignite return to work.

iii. Investing in Internet and Mobile Infrastructure

Unlimited, reliable and low-cost internet connectivity is the backbone to technological advancements. The internet has created an explosion of new possibilities through free and open content, creating a global learning environment.

For people in developing countries, the cellphone is the main getaway to the internet. This has enabled the growth of complex mobile ecosystems of services and applications which has improved access to educational platforms.

Private sector participation in internet infrastructure will provide women with easy access to a myriad of skills and knowledge that will spur innovation and increase productivity. The availability of technology will allow society to address digital inclusion issues and create a skilled woman.

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66Laura DeNardis, ‘Introduction: The Shifting Geopolitics of Internet Access’ in The Shifting Geopolitics of Internet Access: From Broadband and Net Neutrality to Zero-Rating (Centre for International Governance Innovation 2017), 1–4.
67De Nardis (n 66).
68Ibid.
c. Non-Governmental Organizations

NGO’s play a significant role in agitating for change in the decision-making process locally and globally. New policy initiatives, rules and regulations are shaped as a result of extensive lobbying and campaigns on behalf of collective interest to influence a way of life.

Key stakeholders and lobby groups advocate for the reformulation of policy. As the world adjusts to technology as a way of life, work will evolve, and thus NGOs contribute to the identification of information that will empower, educate and inform key policymakers to initiate a new cycle of decision-making.

NGOs agitating for digital inclusion can create awareness on the barriers that impede women from participating equally in the world of work. Tailoring measures such as legislation and policy documents that will address this disparity and will allow women to take up opportunities in this automation era.

The increasing influence of NGOs can be witnessed through drafting. They can provide expert knowledge and evidence on the value proposition on women seizing opportunities in the technological space, they can propose solutions, and they can consult key stakeholder dialogues for input towards creating targeted policy documents.

Draft legislation should be open to input and public participation by different stakeholders, including NGOs. The consultations will allow for varied opinions and views before laws are enacted to allow for transparency and accountability.

One of the key roles of NGOs is the implementation of policy measures that will ensure women access digital platforms to reskill, ascend the career ladder and access the internet to phase into the automation world. Monitoring and evaluation, which is core to implementation, will show progress and whether we adhere to the measures and increase the representation of women in the technology-intensive fields.

12.7 Conclusion

The importance of diversity in the oil and gas and mining industries cannot be overstated. Companies that promote inclusivity/diversity have
been proven to outperform others, and tend to be more creative, innovative and productive. The adoption of ‘new’ technologies in the extractives could accelerate a paradigm shift and a change in working cultures that are already emerging.

Transformative leadership is much needed, not only in the extractives but in every facet of livelihoods. A transformative leader has the following attributes is supportive, flexible, empathetic, caring or nurturing; traits that are more prevalent in women, hence emphasizing the need to bring women on board in these industries. More balanced teams make the best decisions, and women could be instrumental in bringing different leadership skills and behaviour, that is required in the industry. This diversity not only relevant in the workforce but also imperative in the extractives industries that are reliant on new ways of working to boost productivity levels efficiency.

With the advent of the 4IR, the enactment of policies like the AfCFTA, as well as the Covid-19 pandemic, countries are being forced to adapt to challenging circumstances and to devise innovative solutions to ensure inclusive, sustainable and equal development today and for future generations.

The chapter has explored the position of women in both the mining and oil and gas sectors, as subsets of the energy industry, and it is evident that there is a disproportionate number of women, as opposed to men in these sectors, particularly in a senior management position. This situation warrants the measures that have been suggested for different role players like the government/public sector, the private sector and NGOs.

Possible solutions to address the gender disparity challenges include ensure female participation at all levels of the oil and gas processes by introducing incentives to encourage more females to join the industry. Companies also need to reconsider how they retain and promote personnel to senior positions. Promotions ought to be based solely on merit, including at senior management positions. Top talent needs to be attracted, regardless of gender. Companies need to be more aggressive in promoting women in senior management positions, which are male-dominated. Only then would younger women be empowered and motivated to pursue long-term careers in the oil and gas industry. Companies could adopt performance indicators that consider inputs that
could help in the advancement of women. These potential solutions apply for both the mining and oil and gas sectors of the economy, and the other sectors in the energy industry.

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