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[1] **Type**: Use one of the following codes (in cons.istence with the Description of the Action):
R: Document, report (excluding the periodic and final reports)
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DEM: Demonstrator, pilot, prototype, plan designs
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DMP: Data Management Plan
ETHICS
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	development, Certification, Socio-economic analysis, Comparative study.

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HUMAN RESOURCE INVENTORY IN HEALTH, STEM AND CONSTRUCTION: A SURVEY OF SEVEN ORIGIN COUNTRIES

A report submitted by the Scalabrini Migration Center in partnership with the University of Ghana, Association Migration Internationale, University of Ibadan, International Institute of Migration and Development, University of Gadjah Mada and the Ukraine Catholic University

(Prepared by Maruja MB Asis, Geoffrey Ducanes and Maria Andrea Soco-Roda, Scalabrini Migration Center)

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Abstract

This report surveys human resource inventories in health, STEM, and construction sectors across seven countries: Ghana, Morocco, Nigeria, India, Indonesia, the Philippines, and Ukraine. As part of the Horizon Europe Link4Skills project, it evaluates socio-economic and demographic data alongside human capital development metrics in these critical fields. The analysis reveals common challenges, including skill shortages, certification gaps, and brain drain/ brain circulation, particularly among health professionals and construction workers. Variability in educational attainment and employment conditions also emerge, with some countries like India and Indonesia producing a surplus of trained nurses while experiencing simultaneous shortages due to migration trends and internal workforce reallocation. The findings highlight systemic issues like informal employment and insufficient certification programs in the construction sector. Ukraine, unique among the surveyed countries, faces compounded challenges due to war-induced population ageing and reconstruction needs. To address these issues, the report advocates for sustainable development policies that promote retention of skilled labour in origin countries. A balance must be achieved to address global skill shortages without exacerbating developmental disparities.

Keywords: Human resources, STEM, Construction skills, Migration, Skill shortages, Brain drain/ brain circulation, Workforce development, Certification, Socio-economic analysis, Comparative study.

SUMMARY

This report presents a comparative overview and country notes of seven origin countries – Ghana, Morocco and Nigeria in Africa, India, Indonesia and the Philippines in Asia, and Ukraine in Europe—which are part of the Link4Skills research project. Based on existing data, the report reviews and compares data on their socio-economic and demographic background; current and projected stock of human resources in health, science, technology, engineering and math (STEM), and construction skills categories; human capital development in these skills categories; and utilization of human resources in these skills categories across the seven countries. A comparative analysis of the seven countries is hampered by variations in statistical definitions and availability of data.

All seven countries have a long history as net emigration countries, although some of them are both origin and destination countries, such as Ghana and Nigeria, both of which have exchanging migrants with each other, or Morocco, which has become a destination and transit country for aspiring migrants in Africa. Of the seven countries, Ukraine is unique because it has been under war conditions since the invasion of Russia in February 2022. Compared to the other origin countries, Ukraine has an older population and is at a more advanced stage of population ageing. All seven countries have achieved a level of development, but have yet to achieve a sufficient and sustainable development that will provide an option for their nationals to remain. While there is a general trend of rising levels of education in general, and in health, STEM and construction in particular (Nigeria appears to be the exception where there is a low level of post-secondary education and a general shortage of skilled workers), countries could still experience labour shortage in these areas. For example, India, Indonesia and the Philippines have enough to excess supply of domestically trained nurses, but they still experience shortage of nurses, and nurses either aspire to go abroad or work in other fields in their home countries. India produces STEM workers and professionals; many set their sights to working overseas, Indonesia reported a severe shortage of ICT workers while in the Philippines, Construction workers are in demand in the origin countries (in Ukraine, they are needed for defense efforts and reconstruction). While there has been a rise in training programmes for construction-related work, this has not been matched by a corresponding rise in certification. Shortage of certification assessors and the costs of the process are among the reasons preventing more people to undergo the certification process. Majority of workers in construction have low levels of education, and most are employed informally.

In view of employment opportunities and higher incomes in health, STEM and construction overseas, the origin countries will increasingly face the challenge of retaining these workers who are as needed at home. Brain drain is already being felt in the migration of health workers, especially nurses, and the discussion of brain drain is likely to extend to STEM and construction in the future. Both origin and destination countries will have to find ways to find a solution to labour shortages that does not jeopardize the development of origin countries.

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Policy and Practitioners' Recommendations

For Policymakers:

1. **Strategic Workforce Planning:**
   - ✓ Develop national strategies to project and address skill needs in health, STEM, and construction sectors, using evidence-based data and forecasting tools.
   - ✓ Establish a central repository for standardized data collection across sectors to address variations in statistical definitions.
2. **Invest in Education and Certification:**
   - ✓ Increase investment in health, STEM, and construction education, including subsidies or grants to improve access for underserved populations.
   - ✓ Promote certification programs, particularly in construction, by subsidizing costs and expanding the pool of assessors to bridge skill gaps.
3. **Strengthen Retention Policies:**
   - ✓ Implement competitive remuneration and career development opportunities to retain skilled professionals, especially in health and STEM sectors.
   - ✓ Introduce rural retention incentives, such as higher pay or scholarships tied to local service commitments, to address disparities in urban and rural resource distribution.
4. **Ethical Migration Agreements:**
   - ✓ Negotiate bilateral agreements to ensure ethical recruitment practices that include skill return provisions, such as temporary work arrangements or skill-sharing partnerships with destination countries.
5. **Infrastructure for Vocational Training:**
   - ✓ Expand technical and vocational training infrastructure, particularly in construction, to meet domestic demands and enhance workers' employability.

For Practitioners and Industry Stakeholders:

1. **Collaboration with Educational Institutions:**
   - ✓ Partner with local and international academic and training institutions to align curricula with market needs, particularly in emerging areas like digital health and green construction.
2. **Enhance On-the-Job Training:**
   - ✓ Invest in apprenticeship and on-the-job training programs to ensure workers transition smoothly from education to employment.
3. **Adopt Technology-Driven Solutions:**
   - ✓ Use AI-based systems like the proposed "AI-Assisted Skill Navigator" to match skill supply with demand efficiently and to optimize workforce deployment.
4. **Promote Formalization in Employment:**
   - ✓ Encourage formal contracts, benefits, and protections in sectors with high informality, such as construction, to improve job quality and worker satisfaction.
5. **Leverage Diaspora Engagement:**
   - ✓ Utilize diaspora networks for knowledge transfer, investment in training facilities, and initiatives like medical missions or STEM mentorship programs.

Cross-Cutting Recommendations:

1. **Gender and Equity Focus:**
   - ✓ Close gender gaps in labour force participation by supporting women in traditionally male-dominated sectors through targeted scholarships, mentorship, and anti-discrimination policies.
2. **Youth Employment Initiatives:**
   - ✓ Address high youth unemployment by creating targeted programs that include internships, mentorship, and skills matching platforms for new graduates.
3. **Public-Private Partnerships (PPPs):**
   - ✓ Establish PPPs to fund large-scale training programs, infrastructure projects, and research initiatives in STEM and health, ensuring long-term collaboration.

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4. **Promote Circular Migration:**
   - ✓ Facilitate the temporary migration of workers with provisions for skill upgrading and reintegration, ensuring mutual benefits for origin and destination countries.
5. **Monitoring and Feedback Systems:**
   - ✓ Develop monitoring frameworks to assess the effectiveness of workforce strategies and adapt policies to changing labour market conditions.

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HUMAN RESOURCE INVENTORY IN HEALTH, STEM AND CONSTRUCTION: A SURVEY OF SEVEN ORIGIN COUNTRIES

PART I: SYNTHESIS

1. Introduction

This report offers a synthesis and an overview of the human resources in health, STEM (Science, Technology, Engineering and Math) and construction in seven origin countries—Ghana, Morocco and Nigeria in Africa; India, Indonesia and the Philippines in Aisa; and Ukraine in Europe— under the European Union-funded Link4Skills research project. Based on a review of existing data, the report endeavors to provide a comparative and country-level data to shed light on the following aspects: (1) to describe the socio-economic and demographic contexts; (2) to present the current stock and projected supply of skills human resources in the three aforementioned skills categories; (3) to examine human capital development based on enrollment, graduation and passing rates in licensure examinations; and (4) to review the utilization of these skills categories across the seven countries.

This synthesis is based on the country reports prepared by the research teams in seven origin countries in Africa (the University of Ghana in Ghana, Association Migration Internationale in Morocco, and the University of Ibadan in Nigeria); Asia (International Institute of Migration and Development in India, University of Gadjah Mada in Indonesia, and the Scalabrini Migration Center in the Philippines); and Europe (the Ukrainian Catholic University in Ukraine). In addition, the Scalabrini Migration Center reviewed other relevant literature and data in putting together the synthesis report. A template was provided to all countries to guide the collection of data and to allow for comparative analysis. Nonetheless, there are some data gaps due to variations in statistical definitions and data availability in each country. The report offers a preliminary mapping of human resources and human capital development in the seven countries in each of the sectors under study (health, STEM and construction). This report will guide the next phase of the research which will focus on the assessment of human resources and human capital development based on interviews with key stakeholders.

The report is organized into two parts. Part II is a comparative overview profiling the seven origin countries in terms of key background variables (demography, economy, employment and migration); an overview of human resource inventory in health, STEM and construction, human capital development in these three skills and occupations, and utilization of these human resources; and concluding with highlights, general observations, and a call for shared commitment between origin and destination countries to promote mutual development. Part II presents country notes which provide further details to better understand country-specific conditions.

2. Comparing the Seven Origin Countries

Background

1. Demography

The seven origin countries differ widely in population size, with India (1.43 billion) being the biggest and Ghana (34.1 million) the smallest (Table 1). India, Indonesia and Nigeria are, respectively, the most populous, the fourth most populous, and the seventh most populous countries in the world. The countries also vary in how fast their populations have been growing annually since 2000. Nigeria (2.6%) and Ghana (2.4%) have very fast-growing populations, with total fertility rate projected to be way above replacement level (Figure 1).[3] They are followed by the Philippines (1.8% annual population growth)

[3] Nigeria's projected total fertility rate is higher than the average for Western Africa (4.9 in 2020-2025 and 4.6 in 2025-2030), while Ghana's is lower.

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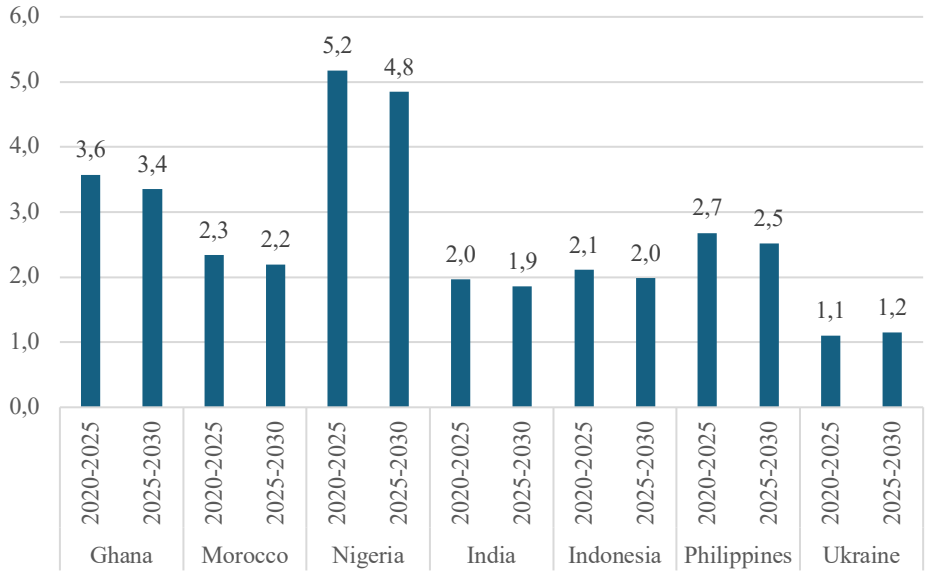
and from a greater distance by India, Morocco, and Indonesia.[4] Ukraine's population has declined from 2000 to 2023. By the UN's classification, Morocco, India, and Indonesia are ageing countries because their share of the population 65 and older now exceeds 7%. Ukraine is a super-aged country given the 20% share of those 65 and older. The other 3 countries (Ghana, Nigeria, and the Philippines) are not yet ageing countries. In these countries, which are not yet ageing, the need to care for elderly people is still relatively low but the need to care for younger kids and infants is relatively high. This affects the capacity of the population to be gainfully employed, especially full-time.

Table 1. Population dynamics in countries of origin

Country	Total population in millions (2023)	Average annual popn growth (2000-2023)	0-14 (% share in total popn)	15-64 (% share in total popn)	65+ (% share in total popn)
Africa					
Ghana	34.1	2.4	37	60	4
Morocco	37.8	1.2	26	66	8
Nigeria	223.8	2.6	43	54	3
Asia					
India	1428.6	1.3	25	68	7
Indonesia	277.5	1.1	25	68	7
Philippines	117.3	1.8	30	64	6
Europe					
Ukraine	37.0	-1.2	15	64	20

Source: World Development Indicators, The World Bank citing the World Population Prospects of the United Nations Population Division.

Figure 1. Total Fertility Rate



Source: Wittgenstein Centre for Demography and Global Human Capital (2023). Wittgenstein Centre Data Explorer Version 3.0.

[4] Morocco's projected total fertility rate is lower than the average for Northern Africa (3.1 in 2020-2025 and 2.9 in 2025-2030). Indonesia's projected total fertility rate is about the average for Southeast Asia (2.1 in 2020-2025 and 2.0 in 2025-2030), while the Philippines' is higher. India's projected total fertility rate is slightly lower than the average for South Asia (2.2 in 2020-2025 and 2.1 in 2025-2030).

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2. Economy

The seven origin countries are a mix of lower-middle-income countries (Ghana, Morocco, Nigeria, India, and the Philippines) and upper-middle-income countries (Indonesia and Ukraine), with GDP per capita (in PPP constant 2021 international USD) ranging from USD5,696 (Nigeria) to USD16,231 (Ukraine). The countries have varying experiences of economic growth in the past two decades or so (Table 2). From 2000 to 2023, India and Ghana have grown rapidly at 6.2% and 5.6% per year, on average, respectively, followed by Nigeria, Indonesia, and the Philippines, all of which have grown by roughly 5% per year. Morocco grew significantly slower in the same period at 3.7%, on average, while Ukraine, which experienced war with Russia during the period, only grew 0.4% annually, on average. From 2025 to 2029, the International Monetary Fund projects strong annual growth for India (6.5%) and the Philippines (6.3%), and even for Indonesia (5.1%) and Ghana (4.8%), but more modest growth for Ukraine, Morocco, and Nigeria. According to the World Bank (2024a), Morocco's weak household consumption, which has not recovered to pre-pandemic levels, and a struggling agricultural sector are expected to drag down future overall growth. Nigeria's economic growth, on the other hand, is said to still suffer the impacts of previous distortionary and unsustainable macroeconomic policies, although major economic reforms have already started with entry of a new administration in 2023 (World Bank, 2024b).

Table 2. GDP per capita level and GDP growth

Country	GDP per capita in PPP (constant 2021 international $)	Average annual GDP growth in % (2000 to 2023)	Projected average annual GDP growth (2025 to 2029)
Africa			
Ghana	6,730	5.6	4.8
Morocco	8,782	3.7	3.4
Nigeria	5,695	5.0	3.2
Asia			
India	9,172	6.2	6.5
Indonesia	14,073	4.9	5.1
Philippines	9,695	4.9	6.3
Europe			
Ukraine	16,231	0.4	4.2

Source: World Development Indicators, The World Bank for GDP per capita and historical GDP growth; International Monetary Fund, World Economic Outlook Database, October 2024 for projected GDP growth.

All seven countries have economies that are currently dominated by the services sector, in varying degrees, especially Ukraine, the Philippines, and Morocco where the services sector account for more than 60% of GDP (Table 3). They differ in the continuing importance of agriculture in economic output, with agriculture still making up about a fourth of GDP in Nigeria and more than fifth in Ghana, but less than 15% in the other countries. In Indonesia, the industrial sector's share in GDP was the highest at 40%.

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Table 3. Sectoral share in gross value added and in employment

	Share in gross value added in 2023 (%)			Share in total employment in 2022 (%)		
Country	Agriculture	Industry	Services	Agriculture	Industry	Services
Africa						
Ghana	22.2	33.3	44.5	39.7	18.9	41.4
Morocco	10.8	27.2	62.0	30.8	24.0	45.3
Nigeria	25.2	18.6	56.2	38.0	14.6	47.5
Asia						
India	14.5	30.8	54.7	42.9	26.1	31.0
Indonesia	12.4	40.3	47.4	29.3	21.9	48.8
Philippines	8.6	29.1	62.3	23.7	18.9	57.4
Europe						
Ukraine	14.3	21.1	64.5	15.1	24.1	60.8

Source: World Development Indicators, The World Bank
Notes: (1) The employment shares are based on ILO estimates; (2) For Ukraine, the employment shares are for 2021.

3. Employment

Comparable labour force participation rate in 2022, which is based on estimates by the International Labour Organization, ranged from a low of 47.7% in Morocco to a high of 70.6% in Ghana (Table 3). In all 7 countries, the labour force participation rate of men was higher than women but the gap was particularly large in Morocco (52.6 percentage-points) and India (49.1 percentage-points). The gender gap in labour force participation rate was lowest in Ghana (only 7 percentage-points). The share in the labour force of those with advanced education, meaning those with at least a short-cycle tertiary education, ranged from 60.6% in Ghana to 81.4% in Indonesia.

Table 4. Labour force participation and share with advanced degrees

	Labour force participation rate (2022)			% of labour force with advanced education
Country	Total	Male	Female	
Africa				
Ghana	70.6	74.1	67.1	60.6
Morocco	47.7	73.8	21.2	68.2
Nigeria	59.1	65.9	52.1	78.1
Asia				
India	55.4	79.0	29.9	65.3
Indonesia	69.1	83.2	54.6	81.4
Philippines	61.7	74.6	48.4	71.1
Europe				
Ukraine	66.8	72.2	61.8	66.5

Source: World Development Indicators, The World Bank.

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Notes: (1) The labour force participation rates (LFPR) are based on ILO estimates; (2) For Ukraine, the LFPRs are for 2021; (3) advanced degrees comprise short-cycle tertiary education, bachelor's degree, or higher; (4) For the % of labour force with advanced education, the figures for India and Indonesia are for 2023, for Ukraine 2021, and 2022 for the rest.

The countries also differed in how tight their labour markets were in 2023. Comparable unemployment rates ranged from only 2.2% in the Philippines to 9.8% in Ukraine. Morocco also had a high unemployment rate of 9.1% in 2023. Except in Ukraine, the unemployment rate was generally higher for those with advanced education (more skilled), but especially in Morocco where the unemployment rate for those with advanced education was 25.9% and India where the unemployment rate for those with advanced education was more than thrice the unemployment rate for the general labour force. In India, the higher unemployment rates for those with advanced degrees has been attributed to the lack of well-paying jobs in non-agricultural sectors to accommodate a growing population of educated workers (Tan, 2024; Banerjee, 2024). In Morocco, this has been blamed on skills mismatch and the inability of the economy to generate jobs (Sawahel,2024).

Table 5. Unemployment rate

Country	Unemployment rate, total (2023)	Unemployment rate of those with advanced education (2022)
Africa		
Ghana	3.1	5.3
Morocco	9.1	25.9
Nigeria	3.1	6.7
Asia		
India	4.2	13.3
Indonesia	3.4	3.6
Philippines	2.2	3.7
Europe		
Ukraine	9.8	9.0

Source: World Development Indicators, The World Bank.

Notes: (1) The unemployment rates (LFPR) are based on ILO estimates; (2) For Ukraine, the total unemployment rate is for 2021; (3) The unemployment rates for those with advanced education are for 2023 in India and Indonesia, and for 2021 for Ukraine.

4. Migration

Based on data from the World Bank, in 2023, all seven origin countries have a negative net migration, i.e., there are more people leaving than entering their countries (Table 6a).[5] The net outflow is especially large for India (given its huge population), Ukraine (considering the war), and the Philippines (a major source country of international migrants). The net outflow for Ukraine in 2023 is smaller than in 2022 – which was -5,699, 445 – reflecting massive emigration in the aftermath of the Russian invasion in February 2022.

[5] See social indicators country data at data.worldbank.org/

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Based on data from the Wittgenstein Centre for Demography and Global Human Capital, from 2020 to 2025, except for Nigeria and Ukraine, the other countries have projected negative net migration flows, meaning they are projected to have more people leaving than entering their countries. The net outflow is projected to be especially large in Morocco, the Philippines, and India (Table 6b).

Meanwhile, when looking only at those with post-secondary education, there is projected to be net outflow for five countries, including Ukraine, and excepting only Ghana and Nigeria. In the case of Ukraine, this means that, among those with higher levels of education, there is projected to be more people leaving the country than entering the country, while the opposite is true for people with lower levels of education. For Ghana, which is the opposite case (negative net migration flow for all education levels and positive for those with post-secondary education), this means that while there is projected to be more people leaving the country than entering the country with lower education levels, the projection is that there will be more people with higher education levels entering the country than leaving the county during the period.

In the case of Nigeria, the positive and higher net migration flow for those with post-secondary education compared to all education levels means migration outflow is expected to be more intensive for those with higher education levels relative to intake during the period. For the other countries, which have negative net migration flows for all education levels and for those with post-secondary education, but less negative for the latter, this means migration outflow is projected to be larger for those with lower education levels relative to intake during the period.

Table 6a. Actual net migration flows, 2023

Country	Net migration flows
Africa	
Ghana	-10,003
Morocco	-39.650
Nigeria	-57.936
Asia	
India	-979,179
Indonesia	-37,501
Philippines	-164,284
Europe	
Ukraine	-299,961

Source: World Bank Group.

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Table 6b. Projected net migration flows, 2020-2025, in thousands

Country	Net migration flows	
	All education levels	With post secondary education
Africa		
Ghana	-17	6.9
Morocco	-197.6	-36.8
Nigeria	7.3	16.5
Asia		
India	-448.5	-183.2
Indonesia	-121.6	-1.6
Philippines	-306.7	-105.2
Europe		
Ukraine	22.1	-22.1

Source: Wittgenstein Centre for Demography and Global Human Capital (2023). Wittgenstein Centre Data Explorer Version 3.0.

3. Human Resource Inventory in the Origin Countries

1. Healthcare

There is a large stock of healthcare workers in the seven origin countries in the origin countries, although in most cases they are not sufficient to meet World Health Organization (WHO) standards on the number of healthcare workers for their given population. According to the WHO (2016), at least 4.45 skilled healthcare workers (physicians, nurses, and midwives) per 1,000 people are needed for adequate primary care interventions. This standard was not met by a large margin by Ghana, Nigeria, Morocco, and India and barely met by Indonesia, based on the latest data available for these countries (Table 7 and Figure 2).

Table 7. Number of Skilled Healthcare Workers per 1,000 people

Country	Nurses and Midwives (per 1,000 people)	Physicians (per 1,000 people)	Physicians, Nurses and Midwives (per 1,000 population)
Ghana (2020)	3.5	0.2	3.7
Morocco (2017)	1.4	0.7	2.1
Nigeria (2021)	1.6	0.4	2.0
India (2020)	1.7	0.7	2.5
Indonesia (2020)	4.0	0.6	4.6
Philippines (2021)	4.8	0.8	5.5
Ukraine (2014)	6.7	3.0	9.6

Source: World Bank's World Development Indicators citing WHO.

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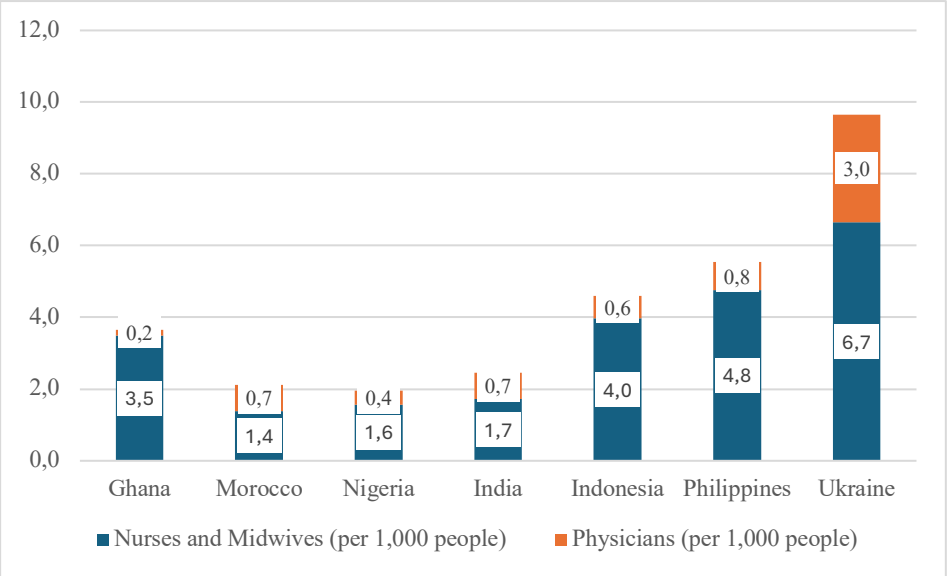
Figure 2. Number of healthcare workers per 1,000 population



Source: World Bank's World Development Indicators citing WHO.
Note: For Ukraine, data was for 2014. For Morocco, data was for 2017. For Ghana, India, and Indonesia, data was for 2020. For the Philippines and Nigeria, data was for 2021.

Based on individual country reports, in absolute number, India had 5.1 million healthcare workers in 2021, counting only physicians, nurses and midwives, and pharmacists. Indonesia had 2.1 million healthcare workers in 2022, but with a broader coverage of healthcare workers that also includes dentists, psychologists, traditional health practitioners, as well as allied health professionals. Nigeria had 2.5 million workers in health-related positions but only about 50,000 doctors and 200,000 registered nurses and midwives. The Philippines reported 1.4 workers with some degree or qualification in a health-related fields and 910,000 actually working as health or associate health professionals in 2023. Still, the Department of Health in the Philippines estimated there is a shortage of about 190,000 healthcare workers in the country. In 2021, Ukraine had 546,000 workers with an associate or undergraduate degree in health-related fields and 520,000 workers employed as health professionals.

2. STEM

There is a lack of comparable statistics on the stock of STEM workers across the seven origin countries based on individual country reports, but the available figures indicate that these are increasing overall although somewhat underutilized in some countries. Indonesia, which reported only on information and communication technology (ICT) workers, noted their rapid increase from 1.08 million in 2021 to 1.50 million in 2023. The Philippines reported 4.1 million workers with STEM degrees (bachelor's, graduate, or associate) in 2023 but that only one million workers in the country were employed as STEM professionals or technicians.[6] India, which had 2.55 million STEM graduates in 2023, is reported to be the second highest producer of STEM graduates in the world, after China. Morocco's stock of engineers is low by global standards and said to be affected by the regular outflow to Europe, the US, and Asia of some of its data engineers, web engineers, system architects, and consulting engineers (Oxford Business Group, 2013). In Nigeria, STEM graduates are reported to comprise 35% of all graduates in 2023, which is higher than the 30% in 2018, The number of examinees and the passing rates in STEM-related licensing exams have also been increasing. But in Nigeria, many STEM professionals are said to be underutilized because of skills mismatch with their actual jobs. Ghana has a relatively small stock of engineers, with less than 10,000 registered with the Ghana Institute of Engineering.

3. Construction

[6] STEM here includes the natural sciences, mathematics, statistics, information and communication technology, engineering and engineering trades, and architecture.

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There is a mixed picture on the stock of construction workers in the seven origin countries. For most countries, the number has been high and growing, but in Ukraine it has declined since the invasion. Indonesia had a reported 9.3 million workers in construction, most of whom had at most junior high school education. This figure has already exceeded the pre-pandemic level of construction workers in the country. The Philippines had 1.26 million workers in construction, but underemployment among them was at 15.2%, meaning 15% of them are still looking for additional hours of work. In India, the share of construction workers in total employment rose to 13% in 2023 from 12.1% in 2021. Most of these workers are in informal employment. Nigeria has 1.75 million workers employed in construction, also mainly in informal employment. But in Nigeria, foreign workers are said to come in to take on some of the specialized construction jobs. In Morocco, 1.2 million workers were employed in construction in 2023, which is higher than the 1 million employed in the same sector in 2015. Ghana reported 517,000 workers, equivalent to 4.3% of total workers in the country, employed in construction.

4. Human Resource Supply in the Origin Countries

1. Healthcare

For countries with data on enrollment, the trend in enrollment in healthcare fields was mainly increasing from the pre-pandemic to the post-pandemic period. In Indonesia, enrollment in nursing increased to 39,114 in 2023 from 31,488 in 2014, and is expected to continue to increase. There is some out-migration of nurses from Indonesia, with a few going via government-to-government programs with Japan and Germany, In India, the number of healthcare graduates (i.e., doctors, nurses and graduates of public health programmes) grew from more than 200,000 to more than 300,000 from 2019 to 2021. But there is also a large out-migration of healthcare graduates from the country, such as the 106,640 nurses and 13,548 physicians who out-migrated in 2022. In the Philippines, the available enrollment data for nursing was less recent, but also showed an increasing pattern from 176,532 in 2017 to 278,9324 in 2020. The supply of nurses is expected to continue to increase in the Philippines, helped by a recent law providing for free tuition and other fees in public tertiary education institutions. However, nurse out-migration has also been picking up, with 9,000 nursing professionals and 13,000 nursing professionals leaving the country in 2022 and 2023, respectively. In Morocco, there was no data on enrollment but the number of graduates in health-related fields (not just nursing) has been growing and was at 5,300 in 2022. The increase has been particularly high for those who graduated in private institutions. In Nigeria, enrollment in nursing increased steadily from 2018 to 2023 by about 15-20% per year. The number of nursing graduates in the country who took professional licensure exam was at about 10,000 in 2022, of whom about 70% passed. The supply of nurses in Nigeria is affected by their out-migration, with Nigerian-trained nurses increasing in the United Kingdom to 7,000 in 2023 from only 2,800 in 2018. In Ghana, the available data is on the registration on new nurses and midwives, which increased from 16,731 in 2019 to 20,835 in 2023. The supply of nurses and midwives in the country is also expected to continue to increase. In Ukraine, the production of healthcare workers is relatively low, but the country attracts foreign students to enroll in health-related programs, although this was reduced during the invasion. In 2023, 75,639 passed the nursing licensure exam in Ukraine, which was up from 66,131 in 2019.

2. STEM

For most of the six origin countries, there appears to be a high and increasing trend of enrollment in STEM, although there is no standard definition of the specific courses that are considered part of STEM in the country reports. In India, STEM enrollment was at 9.85 million in 2021, with 5.72 million in Science and 4.13 million in Engineering and Technology courses. Males dominated enrollment in STEM in India, although the share of females has been increasing. In Indonesia, enrollment data is available only for ICT-related fields, and such enrollment increased to 132,330 in 2023 from 97,458 in 2019. Growth has been particularly significant in emerging fields like data science, cybersecurity, and software engineering technology. In the Philippines, there is data noise because of the introduction of two years of senior high school in the student curriculum in 2016. But taking this into account, the trend in the

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post-pandemic period has been increasing enrollment in STEM. The number of STEM graduates who passed their professional licensure exams was at 26,000 in 2024. The flow of STEM workers in the country is expected to increase further in the coming years, incentivized by free tuition and other fees in public higher education institutions and the tightening labour market. In Morocco, in 2022, there were 40,000 graduates in STEM, of whom 34,000 were from public and 6,000 were from private higher education institutions. The growth of STEM enrollment in private institutions was at 17% per year from 2018 to 2021. Nigeria and Ghana are projected to have steady growth in STEM enrollment and graduation, although precise historical figures are not available.

3. Construction

There is no clear trend in the flow of workers trained in construction in the seven countries of origin. Again, there is a caveat that what comprises 'construction' is not uniformly defined across countries. In Ukraine, there is declining trend in graduates of construction related courses (Architecture and Urban Planning; Construction and Civil Engineering), whether at the bachelor's level (7,084 in 2018 and 3,577 in 2023), the masteral level (6,611 in 2017 and 2,817 in 2023, and the vocational training level (4,878 in 2018 and 2,093 in 2023). In the Philippines, as well, the number of students who were certified for their competency in construction by the relevant government agency declined by more than hundred thousand to 86,000 in 2022 compared to the pre-pandemic level. In Indonesia, enrollment in construction (defined to include building construction, structural engineering, road and bridge technology, water and building technology, and construction management) was reported to be increasing. In 2022, 616,823 26,523 were undergoing vocational training in construction skills. In India, the number of students who completed courses under construction was reported at 984,230 in 2018 and was slightly above this level in 2016 and 2017. In Ghana, the number of graduates in vocational training in construction and public works was estimated at about 24,000.

5. SUMMARY AND CONCLUSION

The seven origin countries in the Link4Skills project are spread across the continents of Africa (Ghana, Morocco and Nigeria), Asia (Indonesia, India and the Philippines) and Europe (Ukraine). Ukraine's situation is unique because of the Russian invasion in 2022 which thrust it into war, humanitarian crisis and population displacement. Despite contextual differences, they share some striking similarities:

- Demographically, except for Ukraine, the six other countries have substantial populations: India is home to the world's largest population, Nigeria is the most populous country in Africa, and Indonesia and the Philippines are among the most populous countries in Asia. With the exception of Ukraine, the six others have a young population, which bodes well in terms of a sufficient working-age population to propel their countries to development and support their dependent population. Ukraine has an ageing population and its long-term population decline has been exacerbated by the war and emigration. Population ageing in the other countries has commenced with the slowing of population growth but is proceeding at a slower pace compared to Ukraine.
- Economically, all seven countries are categorized as either lower-middle income or upper middle-income countries (Indonesia and Ukraine). Although the war has adversely impacted Ukraine's economy, it has shown resilience and it managed to maintain upper income status.
- International migration, especially labour migration, is well-established across all seven countries. All have a negative net migration, indicating that they experience more emigration than immigration. Furthermore, international labour migration across the seven countries is mostly intra-regional. For India, Indonesia and the Philippines, the Gulf Cooperation Countries and the more developed economies in East and Southeast Asia are the major destinations of migrant workers. The volume of international labour migration from these three Asian countries to other countries within Asia eclipses the numbers migrating to other regions. All three Asian countries are major origin countries, with India being the home of the world's largest diaspora, and with Indonesia and the Philippines as having a sizable overseas population. In general, the three Asian countries have established a system to govern temporary labour migration which includes the regulation of private recruitment agencies. In Africa, Ghana and Nigeria have had

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a long history of labour migration between them, facilitated by the freedom of movement among the member countries of the Economic Community of West African States (ECOWAS). While Morocco is largely an emigration country, it has also become a country of immigration and transit for Africans aspiring to migrate to Europe. Since gaining independence in 1991, Ukraine is the primary source country of immigrants to the Russian Federation and to various European destinations, especially after gaining visa-free access to the Schengen area in 2017. The war changed the nature and course of migration from Ukraine towards forced displacement and redirection of migration from Russia to Europe and North America.

The services sector contributes the most to the GDP of these origin countries, but in the case of Indonesia, the manufacturing sector has propelled its economic growth in recent years. In general, although its contribution to the GDP is outshined by other sectors, agriculture accounts for a significant share in providing employment opportunities. Given their large populations (except Ukraine), generating decent employment is a continuing challenge; without employment, the hoped-for demographic dividend from their youthful population, will not be realized. A common feature in the six countries is the high youth unemployment (20-29 years old) and the sizable share of the under 30-population who are not in employment, education or training.
Recent labour force participation rates in these countries range from 47% in Morocco to 71% in Ghana, according to ILO data; males tend to have a higher labour participation rate than females, and the differential is particularly wide in Morocco and India. As indicators, the labour force participation rate and employment rate mask important facets of employment, such as the length of working hours per week, salaries and working conditions. It is striking to note that in India, Indonesia, and Nigeria, more than 80% are in informal employment; in India, construction workers are overwhelmingly employed informally. Low wages, insecure employment and lack of social protection render workers vulnerable and wanting to seek better opportunities.

Human resources inventory: Beyond supply
Data on the human resource inventory on health, STEM and construction workers have some limitations and are not comparable. For one, the definitions of the skills or occupations covered by the major categories vary. For example, construction in the Philippines covers mostly skilled workers but not professionals while in Indonesia, India and Ukraine this category includes workers who receive tertiary education as well as those who receive training in technical and vocational training institutions. Another limitation is the lack of granular data on the various occupations under each category. Data on healthcare workers are mostly about nurses and doctors. In Indonesia and Ukraine, data presented on STEM workers is limited to ICT workers; in India, the emigration of professional health and STEM workers is not captured by the statistical system because India only collects data on the emigration of workers in less-skilled occupations migrating to 18 countries, i.e., the workers which need clearance from the Protector of Emigrants (the category of overseas Indians known as non-resident Indians).

The human resource inventory of health, STEM and construction workers shows a mixed picture in the seven countries. Under war conditions, Ukraine is experiencing a shortage of workers in these three categories (and in others as well). The war contributed to the labour shortage due to casualties, mobilization for defense efforts, and emigration. Before the invasion, Ukraine already had a shortage of health workers, which is ironic because Ukraine attracted foreign students to enroll in health-related fields. Ukraine had to bring in foreign workers to fill the shortage of workers in the healthcare and construction sectors. STEM workers who remained at home, particularly those in ICT, helped keep the economy afloat as the ICT sector generated investments and job contracts from overseas. The ICT sector was vibrant before the war; the number of workers in this sector was undercounted because those who became tech entrepreneurs were not included in the counting of ICT workers.
Currently, India, Indonesia and the Philippines have enough or more than enough supply of healthcare workers, but despite this, their healthcare worker to population ratio falls short of the World Health Organization requirement. The supply of workers is just one part of the equation. Many healthcare workers are unemployed amid the need and demand for workers. India, Indonesia and the Philippines find themselves in this paradoxical situation and among the reasons healthcare workers, especially nurses, are unemployed is due to low salaries (in the Philippines, private hospitals do not pay well) or

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because the employment opportunities are in far-flung areas. Ghana and Nigeria do not have enough supply of healthcare workers. Both are included in the World Health Organization's 2023 safeguard list, i.e., a list of countries from which nurses cannot be recruited so as not to impair their health system. In the case of Ghana, the need to fill nurse positions is further hampered by the long waiting period for the appointment of nurses, discouraging nurses to pursue local employment. Conditions in the origin countries, thus, serve as push factors compelling health care workers to seek better opportunities elsewhere.

Data on the current supply of STEM workers seem to suggest that India, which has gained renown as a source country of STEM workers, produces large numbers. In the case of the Philippines, ICT graduates are overrepresented in the STEM sector – and subsequently, there is an oversupply of such workers – while there is a need for more students to go into science, technology, engineering and mathematics. Indonesia has a severe shortage of STEM workers in general and ICT workers in particular. Origin countries in Asia which have a longstanding policy of sending migrant workers aim to send more highly skilled workers, and in this regard, STEM workers are potential candidates for overseas employment. However, the loss of STEM workers may have a negative impact on origin countries. Since destination countries are more likely to offer highly skilled workers a pathway for residence (and also a pathway for citizenship in European countries), the emigration of STEM workers may mean permanent resettlement.

In all origin countries, the demand for construction workers is high in view of ongoing and projected public infrastructure and real estate development projects (in the case of Ukraine, the construction needs are for defense mobilization and reconstruction). Countries like the Philippines are experiencing scarcity of construction workers in view of increasing demand for construction jobs locally and the competition with Middle Eastern companies offering higher wages.

As an indicator of the capacity to meet future demands for health, STEM and construction workers, data on enrollment and graduation, and where available, data on passing rates were presented in the country notes. In general, there are increasing numbers of student enrollment in tertiary education and technical-vocational training across all seven origin countries. Data by specialization within STEM is often not available, and for most countries, STEM data was limited to ICT. Also, as noted earlier, there can be country differences in the coverage of STEM. In India, for example, enrollment and graduation data regarding those specializing in Math is reported under Arts rather than STEM. Of the various fields In Ukraine, there has been great interest in ICT education and training which resulted in increased enrollment in this specialization. In India, the government worked at expanding the number of institutions offering training in health-related fields which increased student enrollment and graduates.

In general, while enrollment in tertiary education and technical-vocational training is on the rise in the origin countries, the quality of education and training, the match between human capital development and the needs of the domestic labour markets, and generating decent employment are key policy areas that origin countries need to address. Origin countries will need to invest more in human resource development planning to better understand the needs of evolving domestic labour market needs.

Migration and its impact on human resources in the origins

Given their migration history, young population, increasing education, and emigration pressures at home on the one hand, and the demand for workers, borderless flow of information and social networks on the other hand, aspirations to migrate in the seven origin countries are likely to intensify.

The increased demand for healthcare workers is already evident in the more developed economies and is likely to increase further as population ageing advances. As noted earlier, India, Indonesia and the Philippines have produced nurses who cannot be absorbed by the domestic labour market and who may turn their sights to opportunities abroad. The higher salaries offered overseas, prospects for professional development, and the possibility to secure permanent residence in destination countries in North America and Europe can make migration attractive. Similarly, opportunities for STEM and construction workers in the more developed economies are pull factors that would be difficult to match by origin

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countries. Although origin countries will not necessarily be depleted of human resources in these skills categories, they will likely lose the more experienced workers and this loss could have deleterious consequences on how they can best meet their own needs.

Origin countries will increasingly face the challenge of retaining needed human resources. They will have to contend with the possibility of brain drain and to manage the tension between respecting the right of individuals to migrate and to pursue what is best for them and to balance these considerations with national interests. While diaspora philanthropy and diaspora-led initiatives, such as medical missions and scholarship programmes, have been documented in these countries, there is as yet not much empirical support for the expected development impacts of circular migration, such as investments and knowledge transfers. In the foreseeable future where the need for workers will intensify, the more developed economies will have to consider migration as one of several strategies to sustain their economies and societies, and to work towards not only ethical recruitment, but also to ensure that the needs and development of origin countries are not jeopardized. Moreover, the protection and promotion of the rights of migrants should not be forgotten as the risks to unsafe, irregular pathways of migration persist despite advances in efforts to promote cooperation to uphold migrants' rights.

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PART II. COUNTRY NOTES

1. GHANA

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Context

Ghana is a lower middle-income country in West Africa with a GDP of USD76,370 million in 2023. It is primarily a service economy, with service sectors contributing half of its GDP (44.9%) in 2022. Agriculture, while contributing only 20.9% of the GDP, employs a significant percentage of the labor force (39.1%) and is also the only sector that grew from 2020 to 2022. Industry accounted for 34.2% of the GDP in 2022, with construction contributing about 15% (ITA, 2023). Growth rates in the sectors tend to fluctuate, but the GDP is expected to grow by 3.4% and 4.3% in 2024 and 2025 (AEO, 2024). The World Bank puts the total population of Ghana at 34.1 million in 2023,[7] an increase from 30.83 million in 2021. Ghana, however, experienced its lowest population growth from 2010 to 2020 at 2.1 per annum, or 2.4 per annum from 2000 to 2023.

Ghana has a relatively young population, the majority of which falls between the ages of 15-35 years, with those between the ages of 15-64 making up 60% of the population in 2023. The proportion of young people aged 15-35 years has been increasing, from 34.6% in 2000 to 38.2% in 2021 (GSS, 2021). There has been a decline in the proportion of children aged 0-14, from 41.3% in 2000 to 35.3% in 2021, with a slight uptake in 2023 to 37% (World Bank). The proportion of the elderly, 65 years and above, is at 4 percent.

In the third quarter of 2023, the labor force participation rate was 72.9% (GSS, 2024), up from 70.6% in 2022. There is a greater number of males (74.1% in 2022) compared to females (67.1% in 2022) in the labor force, and as such, higher unemployment among females (17.7%) than among males (10.9%). The average unemployment rate is at 14.7%.[8]

The youth, aged 20-24 and 25-29, also experience higher unemployment, at 36.6% for those in the 20-24 range and 22% for those in the 25-29 range. There were about 1.3 million unemployed youth in the third quarter of 2023 (GSS 2024). To counter this, the government has introduced programs to strengthen Technical and Vocational Education and Training (TVET) in a five-year strategic plan. A significant portion of the labor force - 60.6% in 2022 - have advanced education,[9] and unemployment among those with advanced education is at 5.3 (World Bank, 2022).

As of the third quarter of 2023, most of the labor force was employed in the services sector (43.9%), which includes commercial services, banking, ICT, tourism, and transportation. Agriculture, which comprises mainly agricultural production, employed 39.1%. Industry, which includes STEM, manufacturing, and construction, saw a decline in the share of employment, from 18.9% in 2022 to 16.4% in 2023.

Human Resource Inventory

1. Healthcare

The supply of nurses and doctors is below the SDG health workforce threshold of "4.45 physicians, nurses and midwives per 1000 population" (WHO 2021), given a nurses-to-population ratio of 1:600; and a doctors-to-population ratio of 1:4,000 in 2023 (MOH, 2024). Ghana has a total supply of 52,000

[7] The Ghana country profile for Link4Skills pegs the population at 31.35 million in 2023.
[8] The figure is from the Ghana country profile report for Link4Skills. The unemployment rate in 2023, from World Bank data is at 3.1.
[9] "Advanced education comprises short-cycle tertiary education, a bachelor's degree or equivalent education level, a master's degree or equivalent education level, or a doctoral degree or equivalent education level according to the International Standard Classification of Education 2011" (www.ceicdata.com).

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nurses and 7,800 doctors. The number of licensed nurses peaked in 2020, then took a dive in 2021. It is slowly increasing at 10,603 in 2023. Despite the number of licenses obtained, few nurses are hired, leading to a high nurse-to-population ratio. This is partly due to debt servicing that limits the number of nurses that can be absorbed by the public sector. Prior to 2012, nurses and midwives were posted directly to work. Given economic constraints, nurses and midwives now need to complete a one-year civil service requirement, in which they are paid an allowance instead of salaries (Entsiwah, 2023). As such, nurses and midwives need to wait for government clearance before they can apply to government health institutions. Newly recruited nurses, licensed in 2020, total 6,035. The remaining 21,266 licensed nurses in 2020 could be unemployed, underemployed, working in private facilities, working in other sectors, or could have migrated abroad.

Table 1.1.[10] Number of nurses and midwives who have been licensed from 2019 to 2023

Skills Categories	Years					
	2019	2020	2021	2022	2023	Total
Community Health	1372	842	543	641	378	3776
Public Health Nurses	264	238	86	135	53	776
Psychiatric Nurses	756	787	56	16	239	1854
General Nurses	5565	13277	2353	4719	6391	32305
Midwives	6614	8624	1422	692	3542	20894
Total	14571	23768	4460	6203	10603	**59605**

Source: Field data obtained from the N&MC, 2024.

Health and social work, on the other hand, employed 183,935 people, including auxiliary health workers such as technicians, drivers, and administrative assistants.

2. STEM

As part of the industry sector, which is the slowest growing with the smallest share in the labor force, STEM experienced a reduction in the labor force from about 32,000 in 2022 to about 16,000 in 2023. STEM comprises the areas of mining and quarrying, which employed 172,142 persons in the third quarter of 2023; information and communication, which employed 16,136; and professional, scientific, and technical activities, which employed 76,075.

Table 1.2. Employment of Persons in Selected STEM Industries 2022-2023 (from Ghana country profile)

Industry	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3
Mining and quarrying	137,027	129,435	136,476	140,702	156,505	176,768	172,142
Information and communication	32,468	31,357	36,369	38,408	35,622	23,735	16,136
Professional, scientific and technical activities	114,702	78,614	61,689	78,611	57,651	70,464	76,075

Source: Authors' elaboration of the AIHES Dataset from GSS (2022,2023).

There is currently no data on unemployment and underemployment in these sectors. As of 2024, there are 213 fellows; 7,500 professional engineers; 1,000 artisans; and 1,800 other engineers registered with the Ghana Institute of Engineering in 2024.

Construction

Construction has been experiencing consistent growth, although there are some fluctuations. As of the third quarter of 2023, there were 516,918 persons employed in the two areas of construction - buildings and infrastructure. Most of them were male (509,518) compared to only 7,401 females. Construction

[10] All tables are from the Ghana country profile report submitted to Link4Skills.

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employs 4.3% of the working population. There is currently no data on unemployment and underemployment.

Education, training, and assessment

Tertiary enrollment has declined but saw an increase in the 2019/20 intake, and higher education is seen to be expanding. The government has also begun to strengthen TVET in a five-year strategic plan. Institutions now fall under the Ministry of Education for regulation and standardization of the quality of TVET. There is also a National TVET Qualification Framework (NTVETQF), which is an eighth-level framework from Proficiency 1 to Doctor of Technology.

The formal TVET stream is through training institutions, while an informal stream can be pursued through apprenticeships and unstructured training environments (Ministry of Education,2021). In terms of TVET teaching, the government has created the Akenten Appiah Menka University of Skills and Entrepreneurial Development to be the premier training institution for training TVET teachers.

There are currently 238 pre-tertiary TVET institutions across the 16 regions of the country. Enrollment in public pre-tertiary or secondary education institutions has been steadily increasing from 31,281 in 2015 to 100,086 in 2020. However, as mentioned earlier, enrollment in tertiary institutions saw a decline, from 70,916 in the 2016/17 intake to 50,839 in 2018/19, only slightly increasing in 2019/20 to 56,610 (GTEC, 2021). This could be attributed partly to demographic changes and access to TVET.

Projected supply and demand

1. Healthcare

Nurses and midwives need to register with the Nurses and Midwifery Council regardless of whether their training was obtained in public or private institutions. Registration saw a decline during 2020-2021, from 16,731 in 2019 to 6671 in 2021, which could be linked to the closure of most schools during the Covid pandemic. Registration bounced back in 2023 to 20,835, although a number of these are re-registrants who failed previous nursing exams. Similarly, the number of those who have been given licenses dropped from 23,768 in 2020 to 4460 in 2021, given the small number of registrants in the same period. This figure has slowly increased to 10,603 in 2023. Based on the number of licenses given, as well as the number of nurses and midwives deployed for a one-year mandatory civil service requirement in 2023 and 2024, the supply of nurses is projected to increase. The National Service Authority deployed 12,295 nurses and midwives in 2023 and 20,478 in 2024 for this one-year responsibility.

2. STEM

The growth of STEM is seen to be more consistent than those of the health and construction sectors, although the area of information and communication is projected to fall further. Based on 2020 data from the National Accreditation Board, there were 13,881 students enrolled in science and 24,991 enrolled in engineering across 222 of the 252 accredited tertiary institutions. These enrollment figures would be bigger if data from all institutions were included. In terms of qualifications, only engineers are expected to take extra professional exams on top of what is required by their training institutions.

3. Construction

Student enrollment in construction was at 14,941 in 2017. While there is no clear pattern in student enrollment in construction, this figure is seen to grow with the general rise in TVET enrollment. Thus, the supply of labor in construction is also expected to increase. There is currently no system to register construction workers.

Migration of specific skills

The net migration flows from Ghana in 2020-2025 in all educational levels were at -17,000, while those with post-secondary education were at -6,900 (Wittgenstein Center, 2023).
Despite the ratio of nurses-to-population, there is an agreement with Barbados to deploy nurses and midwives from Ghana. This is because of the shortage in Barbados as well as the limited capacity of the

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healthcare system in Ghana to absorb nursing graduates, also with the expansion of nursing education programs (Williams, 2024).

In 2020, 95 nurses were sent. This figure grew to 155 in 2024. Much of the out-migration of nurses, however, is through private arrangements. In the first quarter of 2022, more than 3,000 nurses migrated to developed countries, and between 400 and 500 have left Ghana on a daily basis (Hinneh et. al., 2023). In the United Kingdom, the number of Ghanaian-trained nurses increased more than 13 times between 2019 and 2022. This out-migration could also be due to the long waiting period for a government clearance.

While there are no bilateral agreements in construction and those who leave do so through private arrangements, there are possibilities with the Ghanaian-German Centre for Jobs, Migration and Reintegration, which could lead to a formal agreement of labor circulation between the two countries, as well as formal deployment of Ghanaians to the rest of Europe. The German Chamber Network (AHKs), in particular, is looking to train Ghanaians to work in Germany and other EU countries under a program called "Apprenticeship-employment in Germany," which offers hands-on training in a German company together with theoretical training in a Vocational Education and Training School (AHK, 2024). The program duration is 3.5 years.

There are also no bilateral agreements in STEM, but student exchange programs, especially in ICT, could lead to out-migration. The Akenten Appiah-Menka University, which trains TVET teachers in Ghana, has student exchange programs with a Turkish university under the ERASMUS+ program.

Conclusion

Brain drain has been a challenge, particularly in the health sectors. While the number of licensed nurses is increasing, it has yet to meet 2020 figures. Debt servicing in Ghana has led to the suspension of public sector employment, which impacts the number of nurses that can be absorbed by the public sector. However, in 2024, the government has deployed 6,015 nurses and midwives to public hospitals in the country.

The wait period for obtaining a government clearance could also push licensed nurses to work abroad or in other sectors. In fact, there have been more nurses leaving to work abroad through private arrangements than through the bilateral agreement with Barbados.

The relatively high unemployment rate, especially among young people aged 20 to 29, could be linked to the decline in tertiary enrollment. As mentioned, there is a lower unemployment rate among those with advanced education. The high unemployment rate might also have links to Ghana as a country that absorbs international migrants taking up employment in the country. Further, the "high growth of low employment generating sectors" such as mining and finance (Baah-Boateng 2013:390) could contribute to high unemployment. Investment in sectors with "limited output expansion" but high labor absorption, such as agriculture and manufacturing, could ease unemployment rates.

The promotion of vocational education could also reduce youth unemployment. The Council for Technical and Vocational Education and Training (COTVET) has partnered with international organizations such the ILO and GIZ to establish the Sector Skills Bodies (SSB) to improve the quality of training. Among the sectors is construction.

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2. MOROCCO

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Context

Morocco is a lower middle-income country in North Africa, which has grown modestly in the past two decades (annual GDP growth of 3.7% from 2000 to 2023) and is expected to continue to grow modestly in the near future. In 2023, its GDP per capita (in PPP constant 2021 international USD) was estimated at USD8,782 (World Bank, 2024). The International Monetary Fund projects Morocco's GDP will grow 2.8% in 2024 and about 3.5% annually in succeeding years (International Monetary Fund, 2024). According to the most recent census, the country had a population of 36.8 million in 2024, and annual

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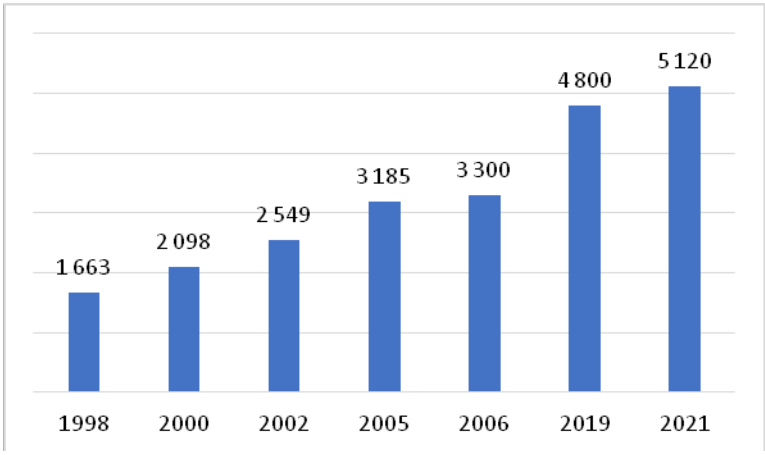
population growth in recent years was at 1.03%. Of the country's total population, 26% consists of those 14 years old and younger, 66% consists of those 15 to 64 years old, and 8% were 65 and older, signifying an ageing population.

The country's economy is dominated by the services sector, which accounts for 62% of national value added, compared to 27% for the industry sector and only 11% for agriculture. Services also has the biggest share in employment (48% in 2023), followed by agriculture (28%), and industry inclusive of construction and public works (23%). Labor force participation rate (LFPR) in the country is low and was at only 47% in 2023, with an enormous gap evident between males (74%) and females (21%).

Since 2006, the unemployment rate in the country has hovered around 9%-10%, based on International Labour Organization estimates, and was at 9.1% in 2023. The unemployment rate for those with advanced degrees, from the same ILO estimates, was much higher, however, at 25.9%. Based on government estimates, the unemployment rate was estimated to be higher at 13.7% in 2024 (and 13% in 2023) and has increased from the pre-pandemic period. The labour force participation rate has been declining, from 53.1% in 2000 to 43.6% in 2023, based on government estimates. The younger population bear the brunt of unemployment, with unemployment rate at 35.8% for those 15 to 24 years old, 20.6% for those 25 to 34 years old, 7.4% for those 35 to 44 years old, and only 3.7% for those 45 and older.

The number of Moroccans residing abroad was estimated at 5.12 million in 2021, which was about thrice what it was in 1998 when it was estimated at 1.66 million, according to data from the Ministry of Foreign Affairs and Cooperation (Figure 2.1). This figure excludes individuals living abroad who are not registered in consulates, Moroccans born in Morocco who have relinquished their Moroccan citizenship, as well as nationals or dual nationals born and residing abroad with at least one Moroccan parent. Europe hosts 86.4% of Moroccan migrants, with most being concentrated in three of its countries, namely, France (31.1% of Moroccan migrants), Spain (23.4%), and Italy (18.7%). A significantly smaller share is in Canada (3.8%) and the US. (3.6%).

Figure 2.1. Size of the Moroccan Community Residing Abroad Between 1998 and 2021 (in thousands)



Source: Ministry of Foreign Affairs, Cooperation, and Moroccans Residing Abroad.

Human resource inventory

1. Healthcare

According to the World Health Organization (WHO), Morocco has a critical deficit of health workers, with only 15.5 doctors, nurses and midwives per 10,000 population in 2017 (Figure 2.2) (World Health Organization, 2020). The problem is compounded by the uneven distribution of health workers across the country in favour of cities, particularly those with a university hospital. According to the WHO, domestic production of health workers is not sufficient to fill the shortage particularly given the ageing

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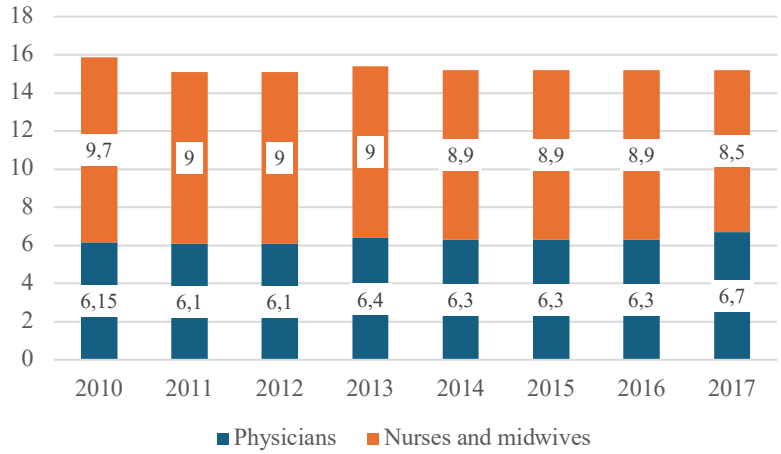
profile of the existing health workers. In 2015, 37% of health workers were over 51 years old, with 20% of doctors expected to retire by 2025) (World Health Organization, 2020).

Figure 2.2. Density of Physicians, Nurses and Midwives (per 10,000 population)



Source: Eastern Mediterranean Health Observatory as cited in World Health Organization (2020), see footnote 3.

2. Construction

According to data from the High Commission on Planning (HCP), an estimated 1.2 million Moroccans worked in the construction sector in Morocco in 2023. This represents an uptrend from 904 thousand in 2008 and 1 million in 2015. In 2023 alone, 19,000 new jobs were created in the construction sector in the country, according to the HCP.

3. STEM

A 2013 report placed the number of engineers in Morocco at only 8.6 per 10,000 population, which is low by global standards (Oxford Business Group, 2013). One reason for the low supply is that more than 600 Moroccan engineers are said to move abroad every year, gong mainly to Europe, the US, and Asia, and hose more likely to move are data engineers, web engineers, system architects, and consulting engineers (Oxford Business Group, 2013).

Education, Training, and Assessment of specific skills

Higher education providers in Morocco include public higher education providers, private higher education providers, and international partnerships (Bouguidou, 2023). Public higher education providers are supervised by the Ministry of Higher Education, Scientific Research, and Innovation (MESRSI) and includes 12 public universities, one public university under private management, and non-university higher education establishments (Bouguidou, 2023). Private higher education providers are mostly for-profit universities and establishments regulated by MESRSI. The third category are non-profit foundations that set up universities and establishments through partnerships. Public sector enrolment dominates higher education enrolment in Morocco, with 94% of total enrolment in school-year 2021-2022 compared to only 6% for the private sector.

1. Healthcare

In schoolyear 2021-2022, there were an estimated 5,300 graduates in health-related fields in public and private higher education institutions in Morocco. Health related fields include medicine, health sciences, dentistry, and pharmacy. Of these, about 3,500 were from public and 1,800 were from private higher education institutions. There is no available data as of now to determine the increase in the total number of health graduates over time, but specifically for the graduates from private institutions, the increase has been 30% annually from schoolyear 2018-19 to 2021-22.

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2. Construction

According to data from the Ministry of Economic Inclusion, Small Enterprises, Employment, and Skills, 13.4% of graduates of vocational training in schoolyear 2021-22 trained in construction and public works. While there is no data available yet on the total number of vocational training graduates in schoolyear 2021-22, in schoolyear 2020-21, the total number of graduates was 180 thousand. If there were the same number of graduates in schoolyear 2021-22, there would be approximately 24,000 graduates in vocational training on construction and public works.

3. STEM

In schoolyear 2021-2022, there were an estimated 40,000 graduates in STEM-related fields in public and private higher education institutions in Morocco. STEM-related fields include sciences, technology, and engineering sciences. Of these, about 34,000 were from public and 6,000 were from private higher education institutions. There is no available data as of now to determine the increase in the total number of STEM graduates over time, but specifically for the graduates from private institutions, the increase has been 17% annually from schoolyear 2018-19 to 2021-22.

In 2022, the number of workers who emigrated abroad through the formal system, whether through the National Agency for the Promotion of Employment of Skills, the French Office of International Immigration, or the Department of Employment, reached 31,124 people, marking an increase of 30.2% compared to the previous year (Table 2.1). The number of workers emigrating through the French Office for Immigration and Integration rose 73.7% in 2022 compared to 2021, reaching 18,814 people, which represents 60.4% of the total number of emigrant workers that year. The majority of these workers are seasonal, with only 10% migrating permanently.

International placement operations organized by the National Agency for the Promotion of Employment and Skills (ANAPEC) accounted for 38.7% of the workers placed abroad but experienced a decrease of 7.6% compared to 2021. The majority of the work contracts granted were seasonal (96.7%). Meanwhile, the Ministry of Employment placed 274 workers internationally, all permanently.

Table 2.1. Evolution of the number of Moroccan workers placed internationally between 2021 and 2022

Department	2021	2022
National Agency for the Promotion of Employment and Skills (ANAPEC)	13,025	12,036
French Office of International Immigration (OFII)	10,827	18,814
Department of Employment	51	274
Total	23,903	31,224

Source: Ministry of Economic Inclusion, Small Enterprises, Employment, and Skills (MIEPEEC)

Conclusion

The data currently available for Morocco on the inventory of human resources for the three identified skills is insufficient for us to offer any strong conclusion. It seems clear that unemployment is relatively high in the country, especially among the young and those with advanced degrees (at least in the aggregate). Meanwhile, economic growth has been modest and is expected to be modest, meaning new employment opportunities maybe limited. These suggest that labour migration could be mutually beneficial for the worker and the Moroccan economy (through remittances and by easing unemployment). On the other hand, there appears to be already a shortage of health workers in the country, which could be exacerbated by the further migration of such workers. More information is needed on the domestic supply and demand conditions for construction and STEM workers.

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3. NIGERIA

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Context

Nigeria is the third largest country in Sub-Saharan Africa, with a population of 223.8 million in 2023 (World Bank, 2024). It is a lower middle-income country with an economy dependent on oil and gas. Its per capita GDP in 2020 was USD2,040, which is seen to grow by 5% from 2024 to 2029, with possible fluctuations.

Children below age 15 make up almost half of the total population (43%), while those aged 15-64 comprise 53%. The elderly, aged 65 and above, comprise 4% (World Bank, 2022).

While the unemployment rate is relatively low (4.2% in Q2 of 2023) and labour force participation is at 80.4%, most of the labour force is in informal employment (92.7 in 2023). Time-related underemployment[11] in the second quarter of 2023 was at 11.8%.

Unemployment among young people aged 15-24 years is at 7.2%, while unemployment among those with post-secondary education is at 8% (NBS, 2023).

Agriculture, comprising mainly of farming, fishing, and forestry, accounts for 30% of the total employment and contributes 21.1% of the GDP. This sector has seen some growth (2.3% in 2023) but has had a slightly decreasing share in employment (-0.1), with labour being absorbed by manufacturing.

Industry, which includes energy production, construction, mining, and manufacturing, contributes 22.5% to the GDP. It has experienced steady growth, from 3.4% in 2021 to 4.1% in 2023, with manufacturing accounting for most of the sectoral growth (6.2% in 2023) and employment. However, this sector has absorbed only 10% of the total employment in 2023, which could be due to the higher levels of education required, particularly in STEM-related fields and specialist positions. Industry, however, is projected to add 2.1 million new employment over the next five years.

Services, consisting of government activities, transportation, communication, finance, and services provision (IMF, 2023), contributes the largest share of the GDP (56.4%) and employment (60%). It has had steady growth, from 5.1% in 2021 to 5.8% in 2023, with sectors such as ICT, finance, and insurance

[11] "Time-related underemployment refers to all persons in employment who (i) wanted to work additional hours, (ii) had worked less than a specified hours threshold (working time in all jobs), and (iii) were available to work additional hours given an opportunity for more work" (https://databank.worldbank.org/metadataglossary)

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among the fastest growing. In 2023, ICT registered a 10.3% growth, while finance and insurance grew by 7.5%. Finance and insurance, in particular, contribute significantly to sectoral employment.

Human Resource Inventory

1. Healthcare

The general low level of education in Nigeria is reflected among health workers, with only 9% of health professionals having an undergraduate degree. A majority (54%) do not have a formal degree, and only 37% have an associate degree.

Nigeria also experiences a dearth in the supply of health workers, with only 2.5 million - out of a population of more than 220 million - employed in health-related positions, including doctors (around 40,000 to 50,000), and nurses and midwives (200,000 registered). Despite the shortage, the migration of nurses and health professionals, particularly to countries such as the United Kingdom and the United States, continues.

Enrollment in nursing however, has increased steadily between 2018 and 2023, with the number of nurses growing by 15-20% each year. The number of nursing graduates who took professional licensing exams also increased, from about 8,500 in 2018 to more than 10,000 in 2022 (NMCN, 2022), with an average passing rate of 65-75%.

The number of medical and dental candidates has also been increasing, with an 8% increase in medical graduates taking qualifying exams in 2023, at 5,500 (MDCN, 2023). However, the passing rate for the medical and dental qualifying exams dropped slightly from 70% in 2022 to 68% in 2023.

On top of the exam given by the Medical and Dental Council of Nigeria, pharmacy graduates are required to take the Pharmacists Council of Nigeria (PCN) licensing examinations. In 2022, there was a 62% pass percentage out of 3,200 pharmacy graduates who took the certification tests (PCN, 2022).

2. Construction

Construction employed 2.3% of the workforce (1.75 million) in 2023. Most of those in construction are employed in households or the informal sector. Given the small number of trained labour, there is a dependence on foreign labour for specialized fields.

A majority (67.7%) of construction workers fall between the ages of 25-54, with 10% between ages 16-24 in 2021. Women comprise 19% of construction workers.

The number of students and graduates enrolled in different technical institutions throughout the country in specialties like electrical work, plumbing, and masonry, has been increasing, with over 50,000 students enrolled in 2023 (Dataphyte, 2023).

The National Board for Technical Education (2022) puts the number of those enrolled in construction skills training programmes in 2022 to about 15,000, the most common occupations being masonry, carpentry, plumbing, and electrical installation. About 10,500 applicants for construction skills training courses in 2022 were evaluated and certified at Level II or III of the National Skills Qualification in 2022. These include: 4,000 in masonry; 2,500 in carpentry; 1,200 in plumbing; and 1,500 in electrical installation.

Among the concerns, however, is a disconnect between training programmes and industry demands, as well as a lack of industry collaboration and apprenticeship opportunities. As such, while enrollment has been increasing, few graduates have the skills needed in the workforce. Aside from underemployment,

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there is a skills deficit in the construction industry, particularly for specialist positions.[12] Qualified professionals are also migrating for higher wages abroad.

3. STEM

STEM is affected by the general shortage of skilled workers with post-secondary education. Many STEM professionals are also underutilized because of skills mismatch in specialized positions available, particularly in technology-driven roles.

STEM graduates constituted 35% of all university graduates in 2023, a rise from 30% in 2018. Higher graduation rates are seen in Engineering and Medical Sciences compared to Mathematics and Physics. The number of women in STEM programs also increased, particularly in the medical sciences,[13] in which more women are seen to enroll. In comparison, more men enroll in engineering, with females comprising only 20% of graduates in Engineering and Technology.

The number of examinees and the passing rates in STEM-related licensing exams have shown steady growth. There were 8,000 applicants for the Professional Engineering Licensing Exam in 2022 (COREN 2022), a 15% increase from 2020. While the passing rate is still low, this percentage has also increased, with 55% of applicants certified in 2022 compared to 52% in 2021.

The inability to fill specialist occupations such as ICT experts, science and engineering professionals, and technical associate positions reflect a skills gap and a shortage of skilled workers for STEM-related jobs because of low levels of education, which could have implications on national productivity given the drive to boost digitization and the ICT sector.

Education, training, and assessment

Only around 14% (12.3 million) of the workforce have post-secondary education, including degrees in STEM disciplines such as science, technology, engineering, and math (NBS, 2023). The low levels of education and skills deficiency among the workforce contribute to high rates of underemployment and a shortage of skilled workers.

While many of those with higher education are employed (87.9%), there was a 9.4% unemployment rate among this group in 2023 (NBS, 2023), suggesting a mismatch in skills obtained and skills required. The most noticeable skills gap is in specialist occupations that include ICT experts, science and engineering professionals, and technical associate positions.

Passing rates for licensing and qualifying exams vary. Females tend to have higher passing rates (72% in 2022) than males (65% in 2022). Northern Nigeria has higher passing rates compared to southern Nigeria; and those from states that have more resources, such as Lagos and Oyo, witness a 10-15% higher passing rate compared to those from states with fewer resources, such as Borno and Adamawa (NSE, 2023).

Projected supply and demand

1. Healthcare

Historical patterns and expert input[14] show that shifts in demand may affect the number of nurses in the future. The figure below shows a comparative scenario in which there will be a decrease in supply under a low demand scenario and an increase under a high demand scenario. However, the migration of nurses

[12] Based on key informant interviews with the Construction and Civil Engineering Senior Staff Association of Nigeria (CCESSA) for the country profile report for Link4Skills.

[13] Data on medical and dental candidates are in the section on Health Workers.

[14] Projections are based on the Nigerian Federal Ministry of Health's policies, national health workforce data, and professional opinions on healthcare labour trends for the Link4Skills country profile report.

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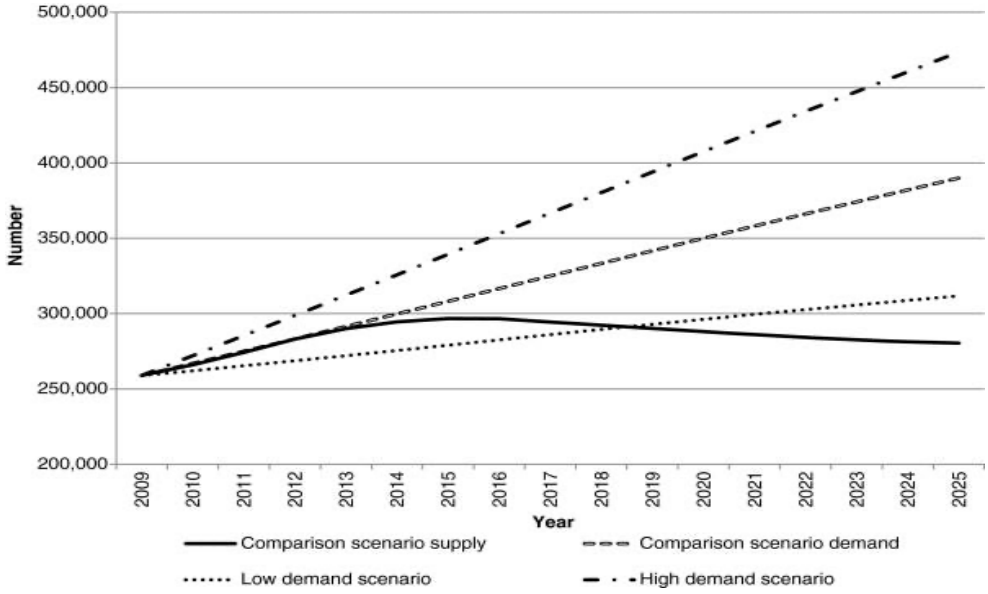
could affect the stability of this trend. If historical growth continues, there will be an estimated 211,922 nurses in Nigeria by 2026.

Figure 3.1.[15] Projected supply of nurses



Source: NMCN, (2022), MDCN, (2023).

2. Construction

By 2026, it is anticipated that Nigeria's construction workforce would number around 1.96 million, according to trend analysis and expert insights. But this figure could be affected by migration, skills deficit, and government policies.

3. STEM

Enrollment and graduation statistics from technical institutions around Nigeria and the National Universities Commission (NUC) estimate that by 2026, Nigeria may have over 314,000 STEM graduates joining the workforce on the assumption that there will be a steady growth rate of 6.5% per year. This projected supply could be impacted by education infrastructure, migration, government policy, and demand from the private sector and technology industry.

[15] All figures are from the Nigeria country profile report submitted to Link4Skills.

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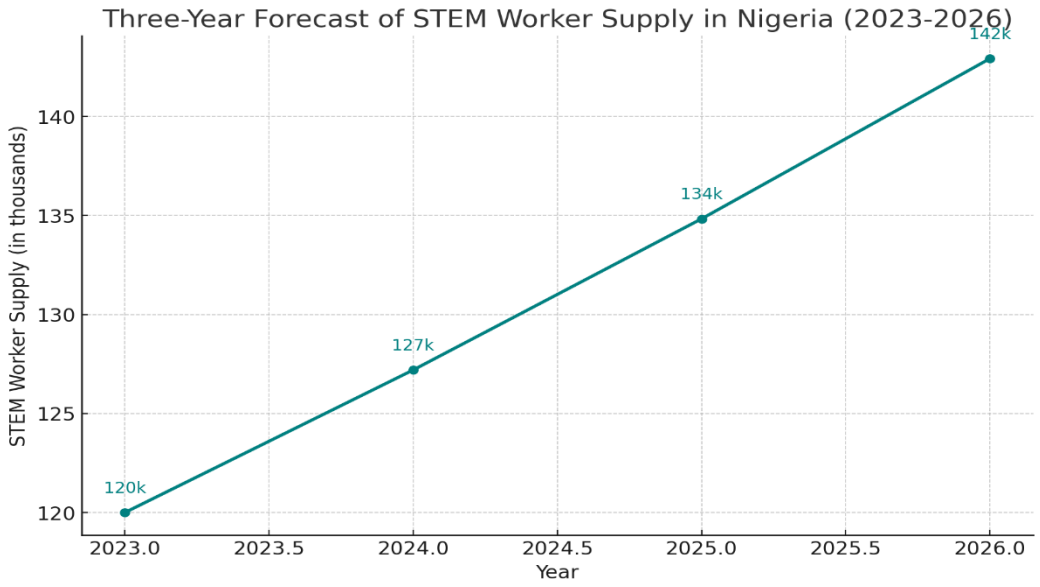
Figure 3.2. Forecast of STEM workers, 2023-2026



Source: COREN (2022), NBS (2023), NSE (2023).

Migration of specific skills

Despite the shortage, the number of Nigerian-trained nurses on the permanent registry of the United Kingdom increased from over 2,800 in 2018 to over 7,000 in 2023 (NMCN, 2023). Out-migration is part of a larger trend that has affected other sectors, including STEM. While the World Health Organization has stopped the active recruitment of health care workers from countries that experience shortages, including Nigeria, health workers can still apply individually to foreign institutions. As such, the migration of nurses to Europe, to the UK in particular, continues.

There is also an out-migration of construction workers to Europe, given the demand in Europe, the difficult working conditions in Nigeria, and the lack of opportunities for professional advancement.

Further, the number of Nigerian students studying overseas has tripled in the last ten years, caused mainly by Nigeria's poor educational system and the graduates' restricted employment options.

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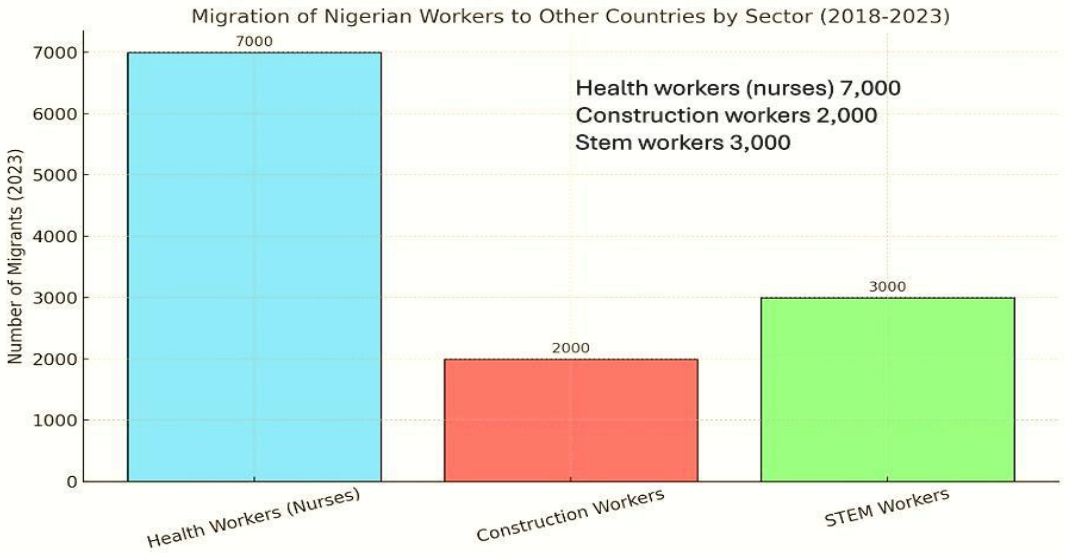
Figure 3.3. Migration of Nigerian workers to other countries by sector, 2018-2023



Source: NBS (2022), NMCN, (2022), CBN (2023), COREN (2022), NBS (2023), NSE (2023), MDCN, (2023)

Conclusion

The high rates of informal sector employment and low rates of post-secondary education have led to labour shortages for specialist occupations and shortages in trained labour across the sectors. A skills mismatch among those with advanced education and few opportunities for professional advancement tend to drive the out-migration of skilled workers and students as well.

High levels of underemployment also characterize the labour force, with many in informal employment. Worker retention has been a concern, especially in healthcare, with nurses migrating abroad because of excessive workloads and low pay.

Despite the low rates of post-secondary education, however, there is still hesitation when it comes to vocational education because it is regarded as a backup plan. Vocational education could respond to the training and skills needed by the domestic labour market.

Further, experts suggest that improving employment prospects, providing sufficient incentives, raising wages, and updating educational infrastructure could help with worker retention and could minimize out-migration and the loss of needed human resources.

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4. INDIA

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International Institute of Migration and Development

Context

India is a lower middle-income country in South Asia and the fifth-largest economy in the world in terms of nominal GDP. In 2023, the per capita GDP (in PPP constant 2021 international was estimated at USD9,172. Between 2000 and 2023, India's economy grew at an average annual rate of 6.3% and the World Bank projected the economy to grow at 7% for 2024-2025. This impressive growth, however, masks income inequality, regional disparity between South and North India, and marked productivity gaps between sectors.

The world's most populous country with a population of about 1.43 billion is also a young nation, with a median age of 28.2 years in 2023, and with most of the population (67 %) in the working ages of 15-64. Population ageing has started, especially in the Southern states of the country, notably Kerala, where the share of the elderly population is projected to increase from 13.1% in 2011 (4.6 million out of 35.4 million) to 20.2% in 2026 (8.3 million out of 41 million).

The 2024 Economic Survey of India reported that from 2019 to 2023, the services sector accounted for wh55% of GDP, the industrial sector contributed 26%, and the agricultural sector, 19% (Department of Economic Affairs, n.d.). In terms of employment, according to the Periodic Labour Force Survey, more than 45% of the workforce is employed in agriculture, 11.4% in manufacturing, 28.9% in services, and 13.0% is in construction. The discrepancy highlights productivity gaps between sectors. While India has booming cities and industries, agriculture is still the primary source of employment. By sector, agriculture has grown at 1.9% annually, the industry sector at 5.4%, and the service sector at 7.5% (International Labour Organization, 2024).

India's labour force participation rate (LFPR) has been low averaging 45%-48% over the past two decades. There is a significant gender disparity, with the LFPR for males at 73.5% and for females at 24.8% as of 2023. Youth unemployment and underemployment remain challenges, although recent years have seen improvements, with urban unemployment falling to 6.6% in July 2023 compared to 8.9% in July 2019 (Ministry of Statistics and Programme Implementation, 2024).
India has a long history and high levels of migration, both domestic and international. Internal migration is significant, with an estimated 450 million internal migrants as per the 2011 Census. Migration patterns are largely rural-to-urban, driven by employment, education, and marriage. International migration also

plays a significant role in India's socio-economic development. The *2024 World Migration Report* cited India as the largest source country of international migrants, with an estimated diaspora of 22 million people. Major migration destinations are the Gulf Cooperation Council (GCC) countries, the United States, the United Kingdom, and Canada. A major component of the Indian diaspora is labour migration. According to the Ministry of External Affairs, approximately 1.9 million workers migrated annually from 2015 to 2019, primarily to the GCC countries. The COVID-19 pandemic reduced deployment numbers to 950,000 in 2020, but saw recovery to 1.5 million in 2022 and 2.1 million in 2023. It is also the top remittance-receiving country, receiving USD125 billion in 2023, accounting for 3.4% of GDP.

Human resource inventory

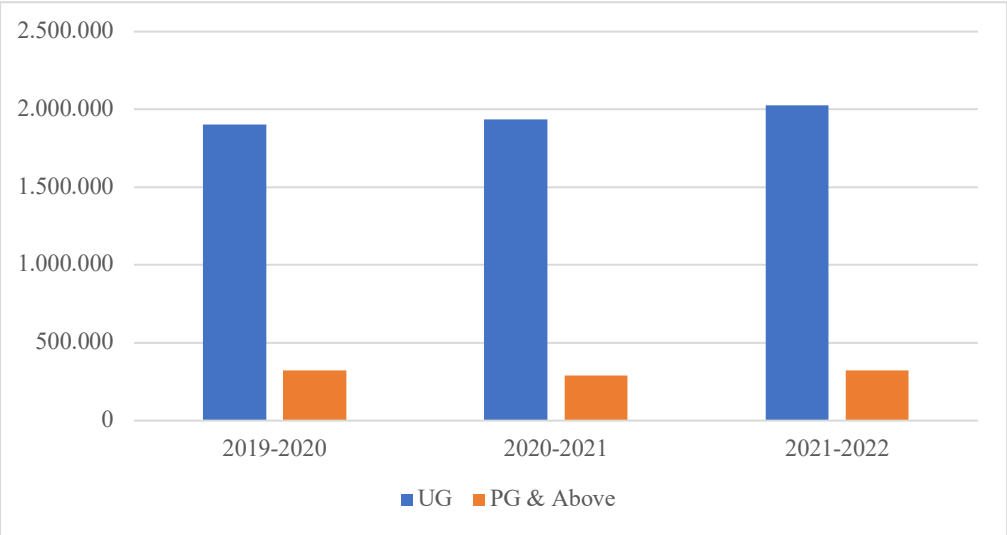
1. Healthcare

India has approximately 1.3 million doctors with recognized medical qualifications, 2.47 million registered nurses and midwives (RN&RM), and 1.33 million pharmacists as of 2021 (Ministry of Health and Family Welfare, 2022). The ratio of doctors to the population in the country is 1:811 (Indian Express, 2024). Health- related fields include allopathic medicine practice, registered nurses, registered midwives, and pharmacists.

2. STEM

The data available on STEM workers are calculated based on graduates in the STEM field. Figure 4.1 shows a steady increase in the number of STEM graduates with a bachelor's degree from 1.9 million in 2019-2020 to over 2 million in 2021-2022. The number of STEM postgraduate students completing their program remains stable at around 300,000 each year. According to the Center for Security and Emerging and Technology (CSET) report 2023, STEM graduates are estimated to be 30% (2.55 million) of the total graduates in 2020. The report states that India produces the second-highest number of STEM graduates after China, which produces 3.75 million STEM graduates. However, there are no de-segregated data for mathematics graduates who go on to be employed in the STEM field. In the Indian higher education system, many mathematics graduates are classified under the Arts stream, making it difficult to account for their contribution to the STEM workforce, and obscures the employment of mathematics graduates in sectors like data science, analytics, and financial modeling.

Figure 4.1. Number of STEM graduates in undergraduate and graduate levels, 2019-2022



Source: All India Survey on Higher Education (AISHE).

3. Construction

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The construction sector's share of total employment in the labour force increased from 12.1% in 2020-21 to 13.0% in 2022-23; the growth was higher in rural areas compared to urban areas (Ministry of Statistics and Programme Implementation, 2023).

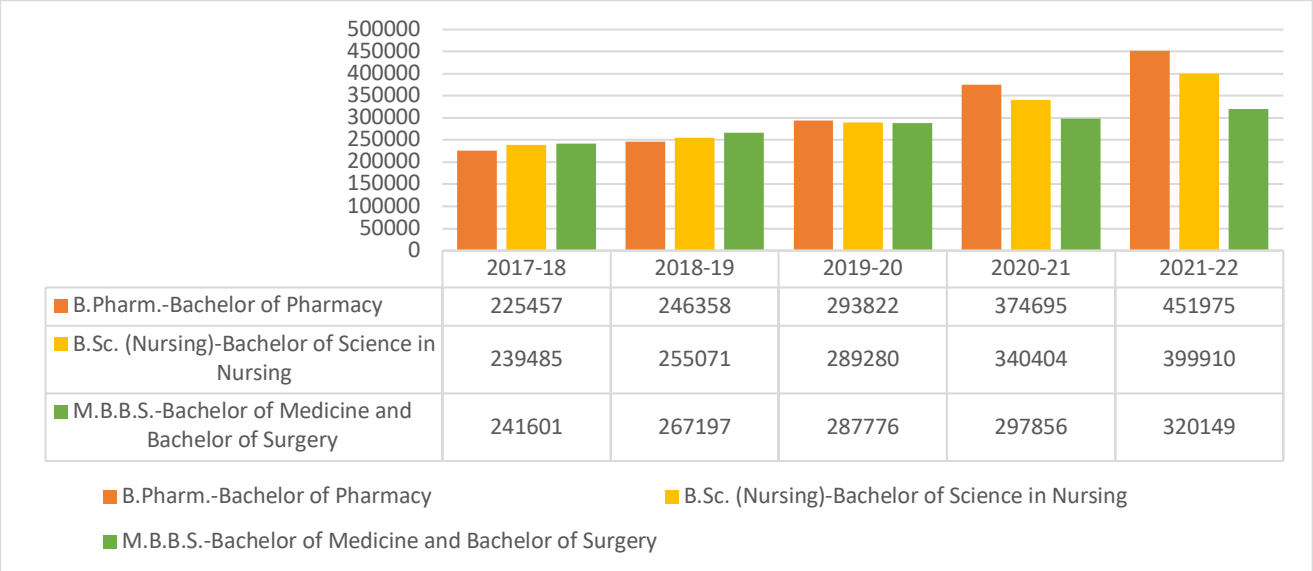
The construction sector in India predominantly employs workers as casual labor, accounting for 83.3% of its workforce, indicating reliance on flexible, non-permanent employment. The rest includes those who are self-employed (12.3%) and regular wage or salaried workers (4.4%). This sector's employment structure highlights the precarious nature of work and vulnerability of workers (Ministry of Statistics and Programme Implementation, 2023).

Education, training, and assessment of specific skills in the country

1. Healthcare

Figure 4.2 presents enrollment data and trends in health-related programs between academic years 2017-2018 and 2021-2022. Between these two periods, enrollment in pharmacy, nursing and medical school (MBBS) increased by 66%, 67% and 19.83% , respectively (Ministry of Health and Family Welfare, 2024). In 2000-2010, there was a significan growth in nursing institutions, especially in 2000-2005, which contributed to increased enrollment in nursing programs since.

Figure 4.2. Enrollment in health-related fields, 2017-2022



	2017-18	2018-19	2019-20	2020-21	2021-22
B.Pharm.-Bachelor of Pharmacy	225457	246358	293822	374695	451975
B.Sc. (Nursing)-Bachelor of Science in Nursing	239485	255071	289280	340404	399910
M.B.B.S.-Bachelor of Medicine and Bachelor of Surgery	241601	267197	287776	297856	320149

Source: Annual Report 2023-24: Ministry of Health and Family Welfare.

2. STEM

STEM has a total enrollment of 9.85 million students across all higher education program, according to All India Survey on Higher Education for the academic session (AISHE) 2021-22. Engineering & Technology accounts for 4.13 million students, with the highest enrollment in Computer Engineering, followed by Mechanical, Electronics, Civil, and Electrical Engineering. Science has a total enrollment of 5.72 million students across all levels, with 4.92 million at the UG level, 0.75 million at the PG level, and 0.045 million at the Ph.D. level. Data also show higher male enrollments than female enrollments, but the gap has been narrowing over the years. The total enrollments have fluctuated slightly but generally remained close to 9.5 million, with male enrollments at 5,656,000 and female enrollments at 4,193,000.

3. Construction

Industrial Training Institutes (ITIs) are vocational training institutions offering skills relevant to various industries, including manufacturing, construction, and services. Data show a steady increase in enrollment in ITI programs, but in general those who completed the training is lower compared to

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enrollment figures. There is no data specific to those who enrolled and acquired training in construction; furthermore, data is only available up to 2018.

Projected supply of workers

1. Health

The stock and flow of health-related workers in India are expected to increase significantly in the coming years based on increasing enrollment in health-related fields due to government initiatives to promote medical education, expansion of medical institutions, and higher passing rates in licensure exams, such as the National Exit Test (NET) for medical graduates.

Based on AISHE reports, between 2019 and 2021, the number of medical science graduates (including doctors, nurses, and graduates of public health programmes) grew by 50%—from more than 200,000 to more than 300,000. Assuming a consistent upward trend with an annual increase of approximately 50,000 graduates, the number of health-related graduates is projected to reach 500,000 by 2026, reflecting a 150% increase compared to 2019.

2. STEM

Between 2019 and 2022, the number of STEM graduates is around 2 million, according to AISHE reports. The number of STEM graduates is projected to continue growing based on rising enrollments in STEM, reflecting the government's focus on enhancing higher education access and the demand for a skilled STEM workforce in domestic and international markets. Assuming a consistent f 4-5% average annual increase in enrollments and graduation rates between 2023 and 2026, STEM graduates are forecasted to reach 250,000 by 2026.

3. Construction

Table 4.1 shows increasing enrollment numbers over the years, but the number of graduates remains low. This disconnect underscores a key issue: while ITIs offer training programs, entry pathways or skills certification for employment remain limited in the construction industry. There is also a gap in tracking post-training employment and sector-specific skill application, which makes it difficult to understand the impact of training on the construction sector workforce.

Table 4.1. Enrolment in and completion of construction courses in ITIs

Year	Enrolment	No. of students who completed the course
2015	11,02,121	644,410
2016	11,95,487	1, 077,932
2017	12,12,680	1,004,073
2018	14,55,430	984,230

Source: Ministry of Labour and Employment (n.d.).
Note: The courses listed under construction are: Building Construction Management, Building Construction Supervisor, Building Construction Technology, Construction & Wood Working, Construction Machinery cum Operator, Construction Surveying, and Construction Technology. Data are available until 2018 only.

Utilization of specific skills

1. Healthcare

Based on data from the PLFS 2023, of individuals holding a diploma or certificate (graduate and above level) in health-related fields (doctors, nurses and others_, 75% are employed, reflecting high utilization of their skills and the growing need for human resources in the healthcare sector. Only 4.2% are unemployed, and the rest are not in the labour force. For those facing challenges in securing employment domestically, the global demand for health care workers provides possibilities for employment overseas.

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2. STEM

Unemployment of STEM graduates in India has fluctuated in recent years, with noticeable trends across specific fields. In Engineering and Technology, the unemployment rate increased by 61% from 0.36 million in 2017 to 0.58 million in 2019. Although it slightly declined to 0.57 million in 2020, it rose again by 19% to reach 0.68 million in 2022. [16]These figures highlight a persistent mismatch between the rising number of graduates and the available job opportunities in various STEM fields.

3. Construction

There are various training programs related to construction skills in ITIs and similar vocational institutes, but there are no specific degrees for construction-related education and training. Moreover, labor market data from the Periodic Labour Force Survey (PLFS) and related studies often lack information to track construction-specific occupations.

According to data from the ITI Tracer Study, pass-out or completion rates for construction-related trades were approximately 47% in 2023, which is higher than previous years (Ministry of Labour and Employment, n.d.). The unemployment rate for ITI graduates specializing in construction skills was around 33%, indicating that many trained individuals either remaining unemployed or not fully utilizing their primary skills. Although efforts like the Vocational Training Improvement Project (VTIP) have improved training access and outcomes, many construction workers still seek additional employment opportunities to achieve sufficient work hours.

Unlike other occupations, there is no higher education degree specific to construction. Engineers working in construction and other sectors are under STEM. Construction workers in India refer to those in low- and semi-skilled workers based on their education. Most of these workers do not acquire formal training. Those who acquire training from vocational training programs or centers are a fraction of the actual number of construction workers in India. Construction skills training outcomes are not separately reported. These make it difficult to analyze trends specific to construction workers.

Migration of specific skills

1. Healthcare

India is a major source of skilled healthcare workers globally, particularly nurses and physicians (Table 4.2). Over the past five years, the migration of health workers has surged, driven by global healthcare demands and better professional opportunities abroad. This trend is underpinned by structural factors such as labour shortages in developed countries and India's policy initiatives to support skilled worker mobility.

Table 4.2. Emigration of nurses and physicians, 2018-2022

Year	Nurses	Physicians
2018	42,790	27,255
2019	50,685	29,792
2020	75,749	30,245
2021	82,556	31,707
2022	106,640	13,548
Total	358,420	132,547

Source: Organisation for Economic Co-operation and Development (2023).

The emigration of nurses markedly increased after 2019, including during the height of the COVID-19 pandemic in 2020 and 2021, but in contrast, the emigration of doctors dropped in 2022. Based on the OECD Data and Emigration Clearance report, the United Kingdom has been the leading destination of nurses, with 76,371 deployed there from 2018 to 2022; Saudi Arabia (25,653) and Australia (22,365)

[16] There are no unemployment data specific to STEM. Since Engineering is one of the most studied courses in India, unemployment data are available specifically about Engineering graduates.

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complete the top three major destinations. With the triple-win agreement between India and Germany, the latter is receiving an increasing number of Indian nurses, but the numbers thus far (2,942 between 2019 and 2021) are fewer compared to the major destinations. Some insights on the decline in the emigration of Indian doctors to the UK, a major destination, may be due to increasing costs of living, more stringent qualifications requirements, and working conditions (NDTV, 2024). It remains to be seen whether the decline is temporary.

2. STEM

India has emerged as a leading source of STEM talent worldwide. Over the past five years, the demand for Indian STEM workers has grown, fuelled by global shortages in technology and engineering sectors and the acceleration of digitalization during the COVID-19 pandemic. Data on the migration of Indian STEM workers are not monitored in India; data on this migration are available in destination countries. According to the American Immigration Council, India is the primary source country of foreign-born STEM workforce in the US, contributing 28.9% (approximately 721,000 workers) of the total foreign-born STEM workforce in 2019. In Europe, Germany is emerging as a major destination for Indian STEM professionals. The number of Indian academic STEM professionals employed in Germany grew by 78.1% between 2012 and 2016, reaching around 6,700 workers as of mid-2016. More recent data on Indian STEM workers are not available. India and Germany signed a bilateral cooperation on skilled migration through the Migration and Mobility Partnership Agreement (MMPA), which can be a prelude to more active recruitment from India.

3. Construction

Most construction workers in India are internal migrants, with states like Maharashtra, Delhi, and Karnataka as the main hubs for construction jobs.

As regards international labor migration, construction workers are among the 70% of Indian migrants in the Gulf who are employed in semi-skilled or unskilled occupations. The low cost of Indian workers is a major reason for the heavy reliance of GCC countries on Indians for their infrastructure and construction projects (Chanda & Gupta, 2018).

Israel is a new destination beyond the GCC for skilled Indian construction workers (The Hindu, 2024). The deployment of Indian construction workers to Europe remains limited. Except for some data on Indian construction workers migrating toe GCC, data on construction workers migrating to other regions and data by skill category are sparse.

Conclusion

India's inventory of skills in health, STEM, and construction reflects both strengths and challenges in meeting current and future demands. While it is one of the largest pools of STEM, healthcare, and construction graduates globally, largely due to its vast population, the adequacy and distribution of this workforce remain significant concerns. Regional disparities further exacerbate the issue, with a significant divide in workforce availability between rural and urban belts.

India's youth employability rate of 51.25% highlights a growing talent pool. In healthcare, the sector is undergoing rapid transformation driven by technological advancements and increased government investment. However, India's doctor-to-population ratio remains below the WHO recommendation of 1 doctor per 1,000. Additionally, there is a rising need for specialists in health informatics, telehealth operations, and AI-integrated diagnostics to address evolving healthcare requirements.

In STEM, India produces a significant number of graduates annually. However, aligning these graduates' skills with industry needs remains a challenge. While there is a high demand for competencies in data science, cloud computing, and AI/ML development, a notable shortage exists in specialized fields like AI engineering and advanced digital technologies. This gap underscores the need for robust upskilling initiatives to bridge the divide between education and employment. Other challenges regarding the workforce are the gender gap in STEM and female participation, which have been taken up by government initiatives.

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While India is projected to witness growth in healthcare, STEM, and construction graduates, rising migration trends also mean a larger outflow of these graduates. Increasingly, Indian workers are moving to European countries over traditional Gulf destinations due to the prospect of permanent residency. The healthcare sector, in particular, has seen a consistent outflow of nurses, doctors, and other practitioners. With a growing population and internal developmental needs, India must balance its domestic demands while addressing the increasing outflow of talent. India's current supply of health, STEM, and construction skills is insufficient to meet its long-term needs. Strategic initiatives to upskill graduates, bridge rural-urban disparities, and retain talent are essential to sustain internal growth and support global workforce demands. Investments in specialized training and innovative skilling programs will be crucial for India to capitalize on its demographic advantage and prepare for the future.

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5. INDONESIA

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Context

Indonesia is an upper-middle-income country in Southeast Asia, renowned for its vast natural potential, rich cultural diversity, abundant human resources, and steadily growing economy (World Bank, 2023). In 2023, its per capita GDP (in PPP constant 2021 international USD) was estimated at USD13,492.[17] Indonesia's GDP expanded at an average rate of 4.9% annually from 2003 to 2023. During this period, it has gradually transitioned from an economy heavily reliant on natural resources to a more diversified economy. The World Bank (2024) forecasts Indonesia's GDP to grow at an average rate of 5.1% per year from 2024 to 2026.

With a population exceeding 270 million in 2023, Indonesia ranks as the fourth most populous country in the world. While its population growth rate had gone down to 1.16% from 2015 to 2020, it remains a relatively youthful population, with 53% of the population in the ages 25-64 years old. Currently, 7% are 65 years and older, but by 2035, this age group is expected to grow to 11%, indicating a gradual shift toward an ageing population (Badan Pusat Statistik, 2023a).

Indonesia's economy has been strongly supported by the manufacturing sector, particularly non-oil and gas manufacturing, a key driver of growth since 2000. Between 2019 and 2023, the main pillars of economic growth are manufacturing, which accounted for 20% of the total GDP; wholesale and retail trade, 13%; and agriculture, 12%. Agriculture is the largest sector providing jobs to around 39.4 million workers or 28% of the total 144 million in the labor force

[17] Unless otherwise stated, data are from various publications of Badan Pusat Statistik (Statistics Indonesia). For details, see https://www.bps.go.id/id/publication

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(as of 2023); followed by wholesale and retail, with 27.1 million workers (as of February 2024), and manufacturing, 18.8 million (as of 2023) (Badan Pusat Statistik, 2023b).[18]

Indonesia's labor force participation rate (LFPR) has shown consistent annual increases in the last five years, reaching the highest at 69.5% in 2023. By educational attainment, the working-age population with a university education exhibit the highest LFPR – at 84.38% in 2023— while the lowest (57.32%) was noted for those whose highest education level is junior high school (Badan Pusat Statistik, 2023b).

The unemployment rate has been on a decline during the same period, except for a temporary rise in 2020 during the COVID-19 pandemic. By educational attainment, those with a vocational high school education have the highest unemployment rate, 9.31% in 2023, while those without any formal education have the lowest, 1.51% in 2023 (Badan Pusat Statistik, 2023b)

Millions of Indonesian migrant workers have sought overseas employment in the past decades. There was a sharp drop during 2020 and 2021, the COVID-19 pandemic, but by 2022, the numbers migrating for overseas employment started to pick up again, driven by the high demand in key destination countries (BP2MI, 2024; Asis, 2024). In 2023, 274,965 Indonesian migrant workers went abroad, with 55.6% employed in formal sectors (i.e., those employed in non-domestic work sectors) and 44.4% in informal sectors (i.e., those employed in domestic work and working for individual employers) Table 5.1). The majority of workers, 93%, were placed in Asia and Africa while Europe and the Gulf Countries hosted 6.4% of all overseas Indonesian workers.

Table 5.1. Overseas Indonesian workers by sector and destination, 2023

Destination Region	Formal	Informal	Total
Asia & Africa	133,864	121,979	255,843 (93.0%)
Europe and Gulf Countries	17,251	225	17,476 (6.4%)
American & Pacific Area	1,645	1	1,646 (0.6%)
Total	152,760 (55.6%)	122,205 (44.4%)	274,965 (100.0%)

Source: BP2MI (2024)

Human resource inventory

1. Healthcare

Data from the Ministry of Health indicate that human resources in the health sector in Indonesia have been increasing in 2019-2023, from 1.18 million in 2019 to 2.08 million in 2023. The number of Health Professionals—which includes specialist doctors, general practitioners, specialist dentists, general dentists, nurses, midwives, pharmacists, clinical psychologists, and traditional health practitioners— is greater than the number of Allied Health Professionals—which includes support health workers, medical laboratory technologists, biomedical personnel, medical technicians, nutritionists, public health workers, environmental health workers, and physical therapy personnel (Figure 5.1). In particular, the number of nurses totaled 557,000 as of February 2023. According to the Ministry of Health, Indonesia has a surplus of nurses and this will continue in the coming years. The main issue is the uneven distribution of nurses across the archipelago and between urban and rural areas (McKenna and Herdiyanto, 2023).

[18] Additional information on the number of workers aged 15 years and above in Indonesia in 2023, by sector are available at https://www.statista.com/statistics/994498/employment-numbers-by-industry-indonesia/

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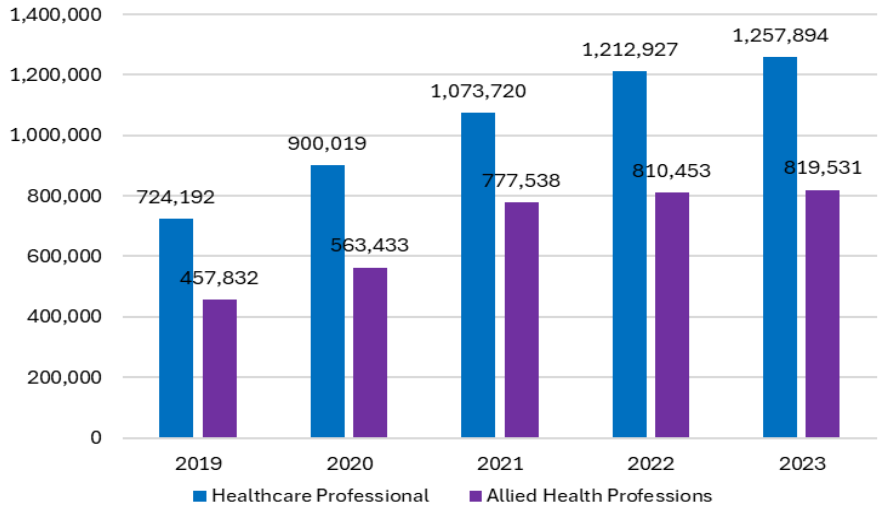
2. STEM

Data for specific STEM occupations are not available. The Indonesia country report, thus, focused only on ICT workers. In 2021, Indonesia had around 1,080,000 ICT workers, with technicians and administrators experiencing the largest growth.[19] Indonesia's ICT workforce is quite diverse, with an emerging pool of technical talent in network and system/database management areas. Engineers, specialists, and researchers and innovators in emerging fields like artificial intelligence and blockchain are also part of the ICT workforce, contributing to the country's technological advancement.

Figure 5.1. Number of Healthcare and Allied Health Professionals in Indonesia

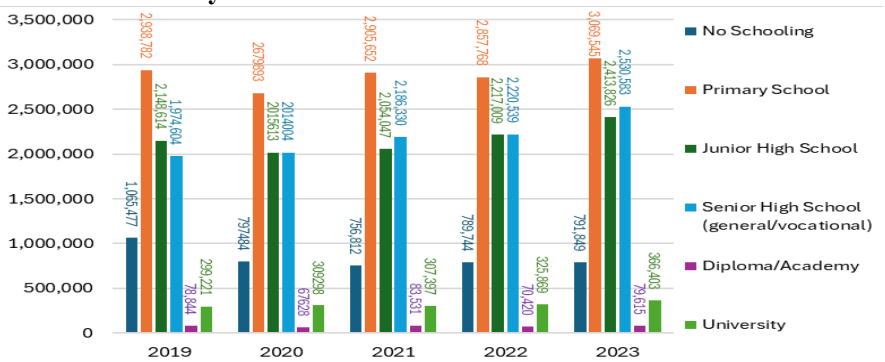


Source: Health Profile of Indonesia (Ministry of Health of the Republic of Indonesia), 2019 – 2023.

3. Construction

Figure 5.2 presents the number of construction workers and their educational level in the period 2019-2023. In 2023, there were 9.3 million construction workers in the country. By educational level, those with primary education make up the largest group, while those with higher education (diploma or university) comprise the smallest share.

Figure 5.2. Population 15 years of age and over who worked during the previous week in the construction sector by educational attainment



Source: Construction in Figures (BPS-Statistics Indonesia), 2020 – 2024.

[19] The ICT workforce data are from the ICT Sector Workforce Demand Projection 2022-2025 by the Ministry of Manpower of the Republic of Indonesia. The 2021 figures are based on extrapolations from surveys of startups and established companies/institutions in Indonesia, while the 2022-2023 data are projected from the 2021 results. For details, see https://bit.ly/it-workforce-projection

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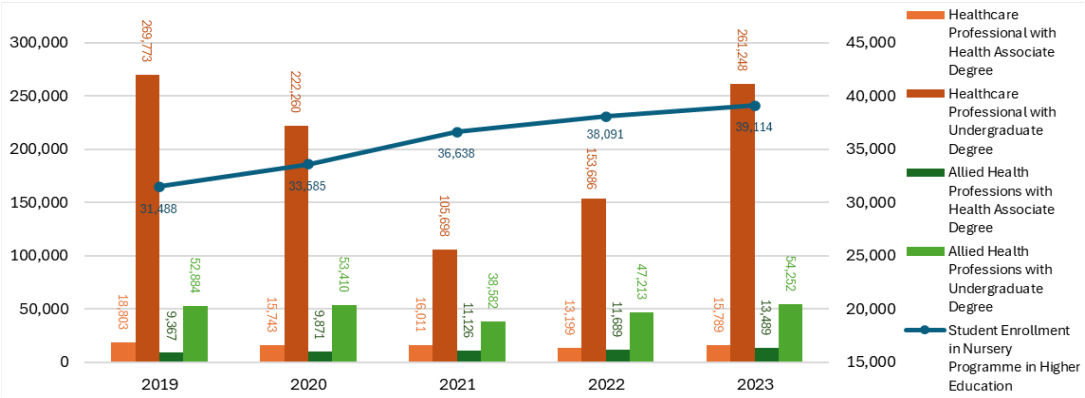
Education, training, and assessments

1. Healthcare

Between 2019 and 2023, the number of graduates in health-related programs from higher education institutions in Indonesia decreased by 1.72% with a fluctuating trend over the past five years (Figure 5.3). Healthcare Professionals with undergraduate degrees—nurses, midwives, pharmacists, general doctors, and dentists—have the largest number of graduates for all years. A distant second are Allied Health Professions with undergraduate degrees—including public health, biomedical science, medical technology, nutrition, physical therapy, and traditional health

Figure 5.3. Number of Graduates in Health Fields and Student Enrollment in Nursing Programme in Higher Education



Source: Health Profile of Indonesia (Ministry of Health of the Republic of Indonesia, 2019 - 2023); Pangkalan Data Pendidikan Tinggi (Indonesian Higher Education Database, 2019–2023)

As for nursing students in higher education institutions, the number of enrollees for undergraduate and associate programmes has been growing, reaching 39,114 in 2023. Nurses and midwives registered the most number who received registration certificates in 2019-2023, according to the Ministry of Health.

2. STEM

Compiling data for all STEM fields will require massive work as data will have to be manually collected for each program based on data from Pangkalan Data Pendidikan Tinggi (Indonesian Higher Education Database). Data presented here are limited to enrollment in ICT fields; workforce data are also only available for ICT. In Indonesia, enrollment in ICT-related fields increased from 97,458 students in 2019 to 132,300 in 2023. Emerging fields such as data science, software engineering technology, and cybersecurity are contributing significantly to this growth, indicating a shift toward cutting-edge technologies and specialized skills. At the same time, established fields like information systems, information technology, design communication visual, and telecommunications engineering continue to attract a substantial number of students, providing a strong foundation for the country's ICT workforce.

3. Construction

Enrollment in technical/vocational and tertiary education institutions for construction-related programmes is increasing, according to data from the Indonesia Higher Education Database.[20] These programmes cover a wide array of construction-related fields, including building construction, structural engineering, road and bridge technology, water and building technology, and construction management. Many receive training and certification from technical/vocational institutions, but as shown in Figure

[20] Enrollment data in STEM and construction are sourced from Pangkalan Data Pendidikan Tinggi (Indonesian Higher Education Database). The data were manually collected for each program, university/institution, and enrollment year because no aggregate data are available. This may result in potential omissions or errors. For details, see https://pddikti.kemdikbud.go.id/program-studi

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5.2, the largest share of construction workers has primary education. While formal education, training, and certification programs are available, a shortage of skilled labor remains a challenge, affecting overall construction quality. In 2022, out of a total of 8,481,349 construction workers, only about 7.3% completed training and obtained certification. The demand for certified and competent construction workers in Indonesia has reached around 2 million, while in total, about 720,000 workers have been certified and deemed competent by Professional Certification Bodies (LSPs). To address this gap, the Directorate General of Construction Development has set an annual target of certifying 125,000 construction workers and is regularly conducting training and certification programs for workers, including foremen and craftsmen. Additionally, the lack of specific data on unemployment and underemployment in this sector makes it difficult to assess the full extent of worker utilization, as available data mainly covers the general workforce.

Utilization of specific skills and projected supply

The utilization of healthcare professionals in Indonesia faces a significant challenge in meeting human resource demands. According to the Coordinating Minister for Human Development and Culture, Indonesia currently has 0.68 doctors (including specialists) per 1,000 population, which falls below the World Health Organization (WHO) standard of 1 doctor per 1,000 population (Coordinating Ministry for Human Development and Cultural Affairs, 2023). The shortage of healthcare professionals outside Java Island is severe, especially in the provinces of Papua Island, which have the highest share of health centers lacking doctors, nurses, midwives and dentists.

The supply of nurses in Indonesia presents a paradox, according to a 2018 report of the Ministry of Manpower. The report noted that of the 695,248 qualified nurses, only 446,428 are employed while the remaining 248,820 are unemployed or looking for employment. The report noted that based on the ratio set by the government, there would still be an excess of 219,257 nurses even if the demand for domestic nurses were met. The uneven distribution of nurses throughout the archipelago and between urban and rural areas; nurses tend to be concentrated in more developed areas while fewer work in less resourced and far-flung areas (Stratsea, 2021).

Concerning the ICT sector, based on projections by the Ministry of Manpower, employment opportunities in the ICT sector in Indonesia will continue to increase. By 2025, Operators, Technicians, and Administrators are forecasted to reach around 1.4 million; Engineers will number more than 300,000; Specialists; and Analysts and Architects will be around 200,000 (for details, see https://bit.ly/it-workforce-projection).

In Indonesia, there is a significant gap between the demand for and supply of skilled STEM workers, particularly in technical and digital fields. In 2019, the demand for engineering graduates with S1/D4 (bachelor's/vocational bachelor's equivalent) degrees reached 117,982, while only 20,635 were available (Adikara, 2020). For D3 engineering graduates, the demand was 194,183, but only 5,242 were available. The World Bank projects a need for 9 million ICT professionals by 2030 (World Bank, 2018). However, only around 2% of the 600,000 annual ICT graduates work in the technology roles (Yulianti, 2022), with many either working in unrelated fields or remaining unemployed. The gap is exacerbated by more job openings than available IXT professionals to support the growth of startup companies in Indonesia (Radya foundation, 2021). Employers also face difficulties in finding candidates with the required digital skills, impacting the sector's ability to meet its growth potential.

The Indonesian construction sector is largely made up of casual daily wage workers, with 42% having only elementary education or none. These workers typically engage in informal, small-scale projects without job security or benefits, making them vulnerable to unemployment and underemployment. There are no data on the projected supply of construction workers.

Migration of specific skills

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1. Healthcare

The number of Indonesian healthcare workers abroad increased from 57,235 in 2019 to 63,859 in 2023. The numbers were lowest in 2021 at 7,402. The deployment of Indonesian nurses overseas represents a modest yet vital aspect of the country's contribution to global healthcare. Under the government-to-government (G-to-G) program[21] with Japan and Germany, the number of deployed nurses is very small (8 and 16 nurses to Japan in 2021 and 2022-2023, respectively (BP2MI, 2024); and 84 nurses to Germany, according to the country report). Structural barriers, regulatory challenges, and inadequate data transparency further constrain these deployments, emphasizing the importance of robust workforce strategies and enhanced international cooperation. The deployment of Indonesian workers to nursing homes abroad suggests diversification of health care migration. The number of migrant workers who took up work in nursing homes increased from 62 in 2021 to 1,079 in 2022, and 1,403 in 2023.

2. STEM

Due to data limitations, this analysis focuses only on ICT workers, as comprehensive data for all STEM occupations are difficult to obtain. The emigration of Indonesian ICT workers between 2019 and 2023 declined from 29,744 in 2021 to 4,935 and 420 in 2020 and 2021, respectively, due to the pandemic. The numbers soared to 29,628 in 2022 but declined to 21,915 in 2023 reflecting the fewer numbers going to South Korea and Malaysia. Operators, technicians and electronic technicians were the largest groups of STEM workers who migrated, mostly to other Asin countries. According to BP2MI, 28 engineers and technicians were sent to South Korea and 90 to Japan under the G-to-G program in 2023 (BP2MI, 2024). These trends highlight increasing demand for Indonesian STEM workers overseas.

3. Construction

The emigration of Indonesian construction workers[22] abroad increased from 2021 to 2023, as global conditions improved. The increase from 6,078 in 2022 to 17,554 in 2023 suggests increasing demand, especially in Asia and Africa (BP2MI, 2024).

Conclusion

Indonesia's ascent as an upper income country and the diversification of its economy poses optimistic prospects for development. With a young population with increasing access to education, Indonesia will need to generate significant decent employment to reap the benefits of demographic dividend. Despite manufacturing contributing the most to its GDP, agriculture is the sector that accounts for 28% of employment. A younger population with more education may lead to young people retreating from agriculture, which suggests the need to address the ageing of farmers and the general issue of rural development.

Mapping the current and future supply of health, STEM and construction workers is hampered by data limitations. Indonesia does not have a centralized database of the human resources. There is no compilation of the number of graduates from all higher educational institutions; also, the data on STEM graduates and workforce are limited to those in the ICT sector. The inventory of health, STEM and construction skills in Indonesia presents a mixed picture. Enrollment and graduation numbers in these fields are also supply indicators. There is an increasing trend in these indicators in all three skills. In the case of construction, the training is provided by training institutes rather than higher educational institutions.

The supply of human resources in these skills and occupations is only one part of the broad picture. In terms of number, the supply of skills may be sufficient, but the distribution of skills could be a challenge.

[21] The G-to-G programme is a bilateral agreement between Indonesia and other countries to facilitate the recruitment and emigration of Indonesian workers in specific occupations through formal government channels.

[22] Construction workers include: (1) building construction laborers; (2) building frame and related workers; (3) construction managers; (4) construction supervisors; and (5) carpenters and joiners.

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Overseas employment provides opportunities for higher incomes. Indonesia has actively participated in temporary labour migration for decades, sending mostly workers in less-occupations, and mostly domestic workers, to more developed economies in Asia. Given the excess of nurses, Indonesia may emerge as a source county of nurses in response to global demand, but it will also have to address language requirement and certification of qualifications required by destination countries. Domestically, Indonesia will also have to balance the capacity to address the domestic need for health, STEM and construction workers while allowing or encouraging the migration of these of skilled and professional workers.

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6. PHILIPPINES

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Context

The Philippines is a lower-middle-income country in Southeast Asia, which has grown strongly in the past two decades (annual GDP growth of 4.9% from 2000 to 2023) and is expected to continue to grow strongly in the near future (International Monetary Fund, 2024; World Bank, 2024a). In 2023, its GDP per capita (in PPP constant 2021 international USD) was estimated at USD9,965 (World Bank, 2024b).[23] The country had a population of 117 million in 2023, with annual population growth of 1.6%. The country's population is still relatively young with 49% consisting of those 24 years old and younger, 23% consisting of those 25 to 39 years old, and only 8% were 60 and older.

The country's economy is dominated by the services sector, which accounts for 61% of GDP, compared to 30% for the industry sector and only 9% for agriculture. Most of employment is also in services (57% in the last five years), followed by agriculture (24%), and industry (19%). Labor Force Participation Rate (LFPR) in the country has typically ranged from 60%-66% across the years but there is a large gap of typically more than 25-30 percentage-points between males (74.6% in 2022) and females (48.4% in 2022).

The country's labour market has been tightening over the years with the unemployment rate dropping from 8% in 2005 to 4.4% in 2024. This is true across different education levels, with unemployment rate for those with at least bachelor's or undergraduate degrees dropping from 10.7% to 5.6% in the same period.

The estimated stock of Filipino labour migrants abroad varies depending on the source but number in the several millions. From 2015-2019, prior to the COVID-19 pandemic, average annual deployment totalled more than two million, counting both land-based and sea-based workers and new hires and rehires (Department of Migrant Workers, 2024). Deployment refers to temporary labour emigration that was registered with the Department of Migrant Workers (DMW). Deployment declined during the pandemic but was back to 1.75 million in 2023, of whom 508,000 were new hires and 1.2 million were rehires. Of the total, 972,000 went to the Middle East, 596,000 to Asia, 82,000 to Europe, 39,000 to Oceania, 30,000 to Africa, and 26,000 to the Americas. Most of the labour migration from the country is still for lower-skill work. Based on the 2022 Survey of Overseas Filipinos by the Philippine Statistics Authority (PSA), only 13.4% took up jobs as high-skill workers (defined here as managers, professionals, associate professionals, or technicians), while the rest or 86.6% were employed in lower-skilled occupations (Table 6.1). But the composition of OFWs differed by destination. The share of

[23] This and other data cited in this section, unless otherwise stated, are from the World Bank's World Development Indicators. See https://databank.worldbank.org/source/world-development-indicators.

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high-skill workers was 25.3% in Australia and 18.5% in the Americas, whereas it was only 13.4% in Gulf countries and 12.9% in Europe.

Table 6.1. Overseas Filipino Workers by Skill Level and by Destination from the SOF 2022

Destination Region	Managers, Professionals, Associate Professionals, and Technicians	Other Workers	Total
	Number		
Gulf Countries	151,015	972,687	1,123,702
North and South America	25,055	110,657	135,712
Europe	21,562	145,464	167,026
Australia	14,012	41,465	55,476
Other countries	82,822	628,623	711,445
Total	294,466	1,898,894	2,193,360
	Share in row totals		
Gulf Countries	13.4	86.6	100.0
North and South America	18.5	81.5	100.0
Europe	12.9	87.1	100.0
Australia	25.3	74.7	100.0
Other countries	11.6	88.4	100.0
Total	13.4	86.6	100.0
	Share in column totals		
Gulf Countries	51.3	51.2	51.2
North and South America	8.5	5.8	6.2
Europe	7.3	7.7	7.6
Australia	4.8	2.2	2.5
Other countries	28.1	33.1	32.4
Total	100.0	100.0	100.0

Source: Philippine Statistics Authority's 2022 Survey of Overseas Filipinos.

Human resource inventory

1. Healthcare

Based on the PSA's labour force survey, there were about 1.4 million working age Filipinos in 2023 who had some degree or qualification in health and related Fields (Figure 6.1). Health and related fields include medicine, nursing, midwifery, dental studies, nutrition and dietetics, early childhood care and development, clinical counselling, health, fitness and lifestyle management, and similar fields. Of these, 1.24 million had bachelor's or graduate degrees and 155,000 had associate degrees, which are two-to-three-year courses that are not equivalent to a bachelor's degrees. Meanwhile, the number actually employed as health professionals or associate professionals was 910,000 in 2023, of whom 405,000 were employed as health professionals and 505,000 were employed as health technicians.

For those with health-related degrees, the unemployment rate has recently been significantly declining, signifying a high utilization of the skill. Among those with bachelor's or graduate degrees in a health-related field, the unemployment rate has gone down to 3.8% in 2023 from

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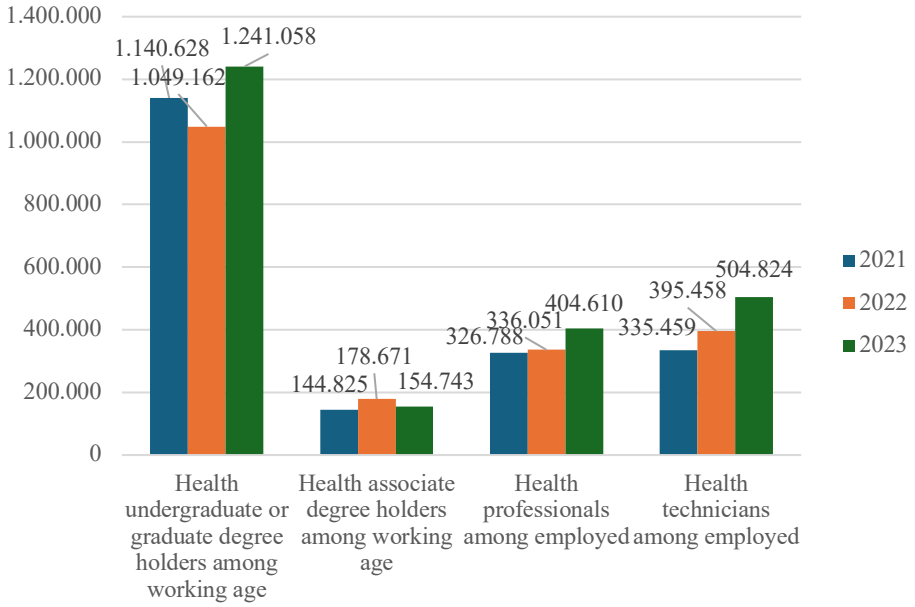
7.2% in 2021 and 5.6% in 2022. Among those with an associate degree in a health-related field, the unemployment rate was even lower in 2023 at only 2.6%, which was down from 5.4% in 2021 and 6.2% in 2022. These are in line with recent pronouncements by the Philippine Department of Health that the Philippines has a shortage of about 190,000 healthcare workers (Bosano, 2022). This shortage is due to both emigration of healthcare professionals, especially those with more work experience, as well as the unwillingness of some healthcare graduates to take on healthcare work in the country due to low pay.

Figure 6.1. Number of Working Age with Degrees in Health and Number Employed as Health Professionals and Technicians



Source: PSA's Labour force surveys, various years.

2. Construction

From the labour force survey, there were an estimated 1.26 million Filipinos working as construction workers in 2023. Construction workers include miners, shotfirers, stone cutters and carvers, building frame construction and related trades workers, building construction finishers and related trades workers, and painters and related trades workers.

The underemployment rate of construction workers has declined in the past three years but remain relatively high at 15.2%. This means there has been increased utilization of construction workers but that 15% of them are still looking for additional hours of work.

3. STEM

From the labour force survey, there were about 4.1 million working age Filipinos in 2023 who had some degree or qualification in STEM. STEM fields include natural sciences, mathematics, statistics, information and communication technology, engineering and engineering trades, and architecture. Of the total, 3.32 million had bachelor's or graduate degrees in STEM and 999,000 had associate degrees in STEM. Meanwhile, the number actually employed as STEM professionals or STEM technicians totalled about a million in 2023, of whom 535,000 were employed as STEM professionals and 465,000 as STEM technicians.

The unemployment rate for those with STEM degrees has also been significantly declining also signifying a high utilization of the skill. Among those with bachelor's or graduate degrees in STEM, the unemployment rate has gone down to 6.5% in 2023 from 12.7% in 2021 and 8.3%

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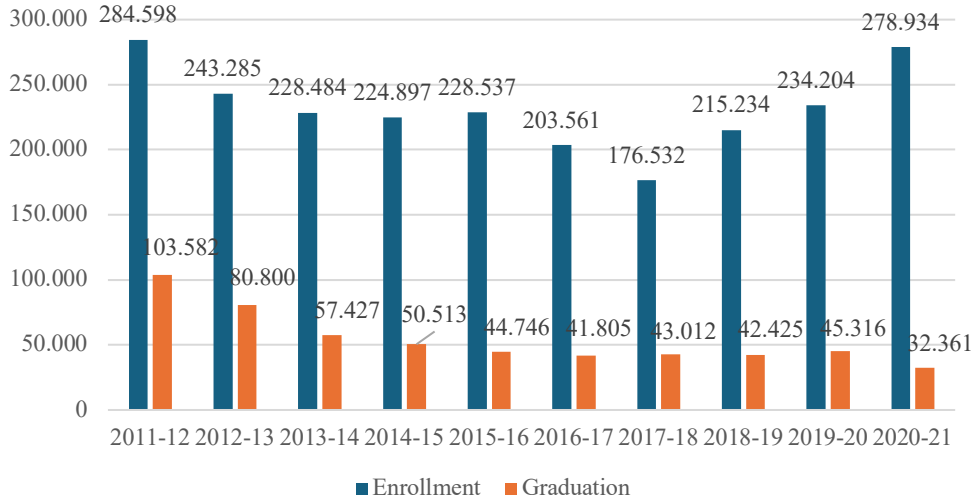
in 2022. Among those with an associate degree in STEM, the unemployment rate was even lower in 2023 at only 4.2%, which was down from 11.3% in 2021 and 7.3% in 2022.

Education, training, and assessment

1. **Healthcare**

According to the most recently available data from the Commission on Higher Education (CHED), there were 279,000 students enrolled in in schoolyear (SY) 2020-21 in health-related fields in the Philippines, and this is expected to increase with the impact of a law providing for free tuition and other fees in state universities and colleges (Figure 1.2).[24] The number of graduates in health-related fields has been on a recent downtrend as it was affected by the introduction of senior high school in the basic education curriculum, which meant there were no entrants to higher education for two years, but this is expected to pick up in the coming years.

Figure 6.2. Enrollment and Graduation in Health-related Fields



Source: Commission on Higher Education.

For select professions in the Philippines, it is necessary to pass a board exam administered by the Professional Regulations Commission before he or she can practice his or her profession. Looking specifically at the board exam results for nursing, the number of nursing board passers was at 37,000 in SY2023-24, substantially higher than the 11,000 in SY2021-22 and the 25,000 in SY2022-23 (Figure 6.3). The increase in board passers is both due to an increased number of board takers and a higher share of board passers. prior to SY2022-23, the passing rate in the nursing licensure exams never exceeded 57% and usually it was substantially lower. Since SY2022-23, it has exceeded 70%. Figure 6.3. depicts the actual number of nursing board exam passers for SY2011-12 to SY2023-24 and the forecast level of nursing board exam passers for SY2024-25 to SY206-27 assuming average recent enrolment growth in the higher education sector of about 4% and assuming a 70% passing rate.[25]

[24] https://unifast.gov.ph/uaqtea.html.

[25] The passing rate was a very high 78% in SY2023-24. The first round of the nursing board exam for SY2024-25 had a passing rate of 69.7%. There was no nursing licensure exam in SY2020-21 because of the pandemic and some of the rapid increase observed in the following school-years was because of delayed taking of the licensure exams.

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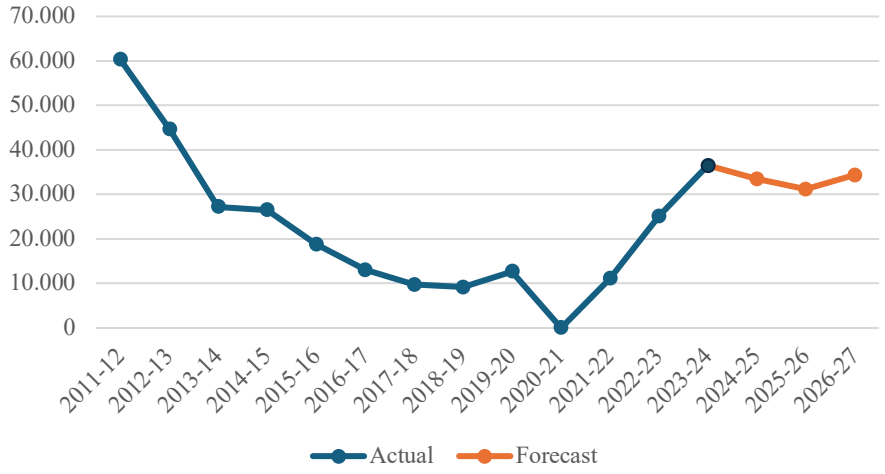
Figure 6.3. Nursing licensure exam passers: actual and forecast for SY2024-25 to SY2026-27



Source: Professional Regulations Commission.

The stock of health-related professionals and technicians is expected to rise in the country, assuming there is no extraordinary increase in overseas migration, because of strong demand from the public sector, which is trying to address nursing shortage in public health hospitals and health centres and also from private healthcare providers.

2. Construction

The number enrolled and graduating in construction-related training under the Technical Education and Skills Development Authority (TESDA), the government agency tasked to manage and supervise technical education and skills development in the country, has been on declining trend since before the pandemic. The number enrolled was at 64,000 and the number graduated was at 69,000 in 2022. There were 86,000 in 2022 who were certified for their competency in construction out of 91,000 who were assessed by the TESDA. This was up from 58,000 certified in 2021 and 36,000 certified in 2020, but down from more than a hundred thousand in the two years prior to the pandemic, as the slowdown in the construction sector during the pandemic dampened demand for certification in construction skills.

The stock of workers in the construction sector is also expected to increase in line with expectations that the construction sector will faster than the rest of the economy in the next few years, fuelled by both public and private infrastructure projects (NEDA, 2024; Jocson, 2024; Gonzales, 2023). This is expected to increase demand for training and certification in construction-related skills, as well as to increase actual employment in the construction sector.

3. STEM

There were 511,000 students enrolled in in SY2020-21 in STEM fields in private and public colleges and universities in the Philippines. There was an increasing trend in enrolment in STEM fields from SY2011-12 to 2015-2016, but this was reversed due again to the introduction of the senior high school program. It has since been on an uptrend again but has not yet reached the peak it achieved in SY2015-16. The number of graduates in STEM fields, meanwhile, has been steadily increasing from 63,000 in SY2011-12 to 99,000 in SY2018-19. It only fell very slightly in SY2019-20 but dropped more substantially to 81,000 in SY2020-21, reflecting the decline in enrolment the previous years due to senior high school. Looking at the board exam for STEM, we find the number of board takers to have been on an increasing trend recently,

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although this is likely largely due to delays in taking the exam because of the pandemic.[26] The number of STEM board passers, meanwhile, was at 26,000 in SY2023-24, higher than the 11,000 in SY2021-22 but lower than the 27,000 in SY2022-23. The passing rate for STEM board takers has actually been declining from more than 50% in the years before the pandemic to 43% in SY2023-24.

Similar to health-related workers, the flow and stock of STEM workers is expected to increase in the next few years, mainly because of the increased overall enrolment incentivized by free tuition in state universities and colleges, despite declining passing rates in the board exams. The stock of STEM professionals and technicians is also expected to rise, again assuming there is no extraordinary increase in overseas migration, because of a tightening labour market.

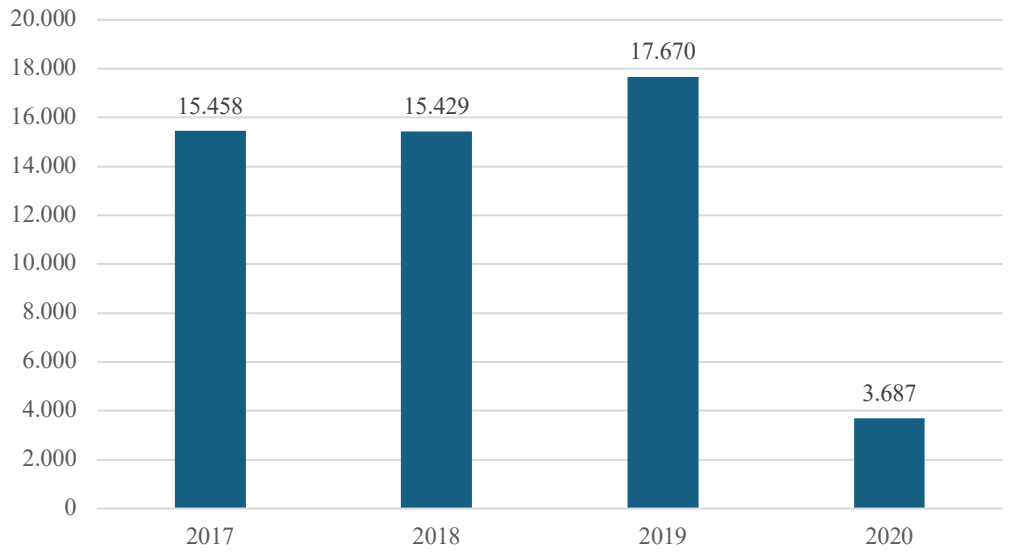
Migration of specific skills

1. **Healthcare**

Figure 6.4 shows the overseas deployment of Filipino nursing professionals and associate professionals from 2017 to 2020, sourced from the DMW. Unfortunately, more recent comparable data is not currently available. The figure shows that, prior to the pandemic, between 15,000 and 18,000 nurses were migrating every year. This drastically went down to less than 4,000 in 2020 because of travel restrictions, including a specific temporary ban on the overseas deployment of Filipino nurses. In 2022 and 2023, the DMW reported that 9,000 and 13,000 nursing professionals were deployed abroad (no figures for nursing associate professionals).

The major destination areas of Filipino nurses are the Gulf countries and the United Kingdom. Of the roughly 18 thousand nurses who migrated in 2019, 12 thousand went to the Gulf countries and two thousand went to the United Kingdom. Germany was recorded as the destination of 550 Filipino nurses in 2019.

Figure 6.4. Deployment of Filipino nursing professionals and associate professionals, 2017-2020



Source: Professional Regulations Commission.

[26] STEM occupations that require passing a licensure exam include Mechanical Engineers, Chemists, Civil Engineers, Electrical Engineers, Chemical Engineers, Aeronautical Engineers, and Agricultural and Biosystems Engineers

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2. Construction

Prior to the pandemic, there was a declining trend in the deployment of construction workers from the Philippines, from 8,000 in 2017 to 3,000 in 2019. Construction workers include (1) building construction labourers; (2) building frame and related workers; (3) construction managers; (4) construction supervisors; and (5) carpenters and joiners. Surprisingly, deployment actually increased in 2020 at the height of travel restrictions. Gulf countries, especially Saudi Arabia, are the main destination of Filipino construction workers. In 2020, Poland was recorded as the destination of 5 Filipino construction workers, but no other EU country was recorded as the destination of a Filipino construction worker.

3. STEM

The deployment of Filipino engineers and engineering technicians – a subset of STEM workers – declined from about 9,000 in 2017 to about 7,000 in 2019. In 2020, only about one thousand were deployed due to the pandemic. Saudi Arabia and other Gulf countries are the primary destination of Filipino engineers and engineering technicians. In the four years, there was only a handful of Filipino engineers and engineering technicians who were recorded to have been deployed to Austria, Germany, the Netherlands, and Poland.

Conclusion

The Philippines' relatively strong economic growth in the past two-and-half decades has resulted in the tightening of the domestic labour market, as manifested in historically low unemployment and underemployment rates at present. With economic growth projected to continue to be strong in the next few years, demand for high-skill workers is also expected to remain robust. At the same time, the country continues to produce a large number of high-skill workers, including in health and STEM, which was boosted by a recent law providing for free tuition and other fees in state universities and colleges and limited scholarships in private universities and colleges.

Given the large disparity that continues to exist between potential earnings abroad and domestic wages, especially for high-skill workers, demand for overseas employment will likely continue to be strong. But brain drain has become a serious concern given the tight labour market, especially in the health sector where the Philippines is seen as not meeting the global standards for number of health workers, particularly nurses and doctors, by a large margin. It was easier to argue that overseas migration was a win for the country and not just the migrant and the destination country when the unemployment and underemployment rates were high.

As the country moves ahead, the Philippines needs to contend with the tough balancing act of meeting domestic labour market demand while continuing to facilitate the migration of workers, including high-skill workers, who are looking to better their lives by working abroad.

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7. UKRAINE

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Context

Russia's full invasion of Ukraine on February 24, 2022 resulted in a massive humanitarian crisis, loss of human lives, and population displacement. Before the invasion, Ukraine's population was already on a long-term decline, dropping by 20 percent between 1991, the year of independence. and 2020 (from 52 million to 42 million). This was due to low birth rates and emigration. The further reduction to 37 million as of 2023 reflects the casualties and emigration because of the war. Population ageing, below replacement fertility, and emigration are leading Ukraine towards a future of negative population growth.

Since the invasion, emigration from Ukraine shifted from the Russian Federation to other destinations, and from voluntary migration towards forced displacement. As of mid-2020, more than half (53 percent) of Ukrainians residing overseas were in the Russian Federation. As of November 2024, the UNCHR recorded some 6.8 million Ukrainian refugees globally, most of whom fled to neighboring countries, with the largest now based in Poland (around 60 percent), and another 4 million who are internally displaced (USA for UNHCR, n.d.). Ukraine is also a destination country, with some 5 million migrants coming from Europe and Asia especially of international students. As of January 2023, Ukraine received 51,676 international students, with India (28 percent), China (11 percent) and Morocco (10 percent) as top three source countries; this number dropped by 39 percent between 2022 and 2023 (IOM Global Data Institute, n.d.). Following the initial shock of the invasion, Ukraine has adjusted to the unsettling conditions of the ongoing war. Ukraine's most recent Human Development Index (HDI) of 0.731, down from the previous 0.734, reflects the setbacks caused by the war, but also demonstrates Ukraine's

resilience (United Nations Development Programme Ukraine, 2024). The economy managed to grow at 3.2 percent in 2024, according to the World Bank (2024). The National Bank of Ukraine reported that in 2023, the three sectors that contributed the most to the country's Gross Value Added were, in rank order, construction, manufacturing and ICT. The growth in construction and IT reflects heavy government spending on infrastructure and defense needs and e-services, respectively (Ukraine Country Report). In terms of employment by sectoral composition, the dominance of services over industry and agriculture remains unchanged.

Human resources inventory[27]

Stock of health, STEM and construction workers

The invasion shrank the supply of workers in Ukraine resulting in shortages across various sectors. Based on information from think tanks, unemployment declined in 2023 relative to 2022, but was higher compared to pre-invasion levels. While Ukraine has adjusted to structural changes in the economy wrought by the war, filling vacancies remains a challenge because of lack of workers— "a significant part of Ukrainians are abroad, and about a million men and women are defending the country in the ranks of the Defense Forces" (Center for Economic Strategy, n.d.).

Regarding the supply of and demand for workers in health, STEM and construction, the following trends have been reported as follow.

In 2019 and 2021, there were 579,000 and 546, 000 health workers with an associate or undergraduate degree in health-related fields, respectively; in the same years, 551,000 and 520, 000 were employed as health professionals, respectively. The decline between 2019 and 2022 was due to the COVID-19 pandemic and the invasion in 2022. As of January 2023, the number of registered medical workers in 2,200 health institutions was around 325,000, which is way below the 520,000 health-related workers employed in 2021.

The number of workers in construction also decreased substantially before and after the invasion. During the war, Ukraine had to bring in construction workers from countries as Pakistan, Nepal, India, Bangladesh, the Philippines, and from several African countries (Nastych, 2023). According to the State Statistics Service, there were 690,900 workers employed in construction in 2021, 17 percent of whom were informally employed. The number employed in construction decreased to 226,300 as of December 2022, and to 225,120 as of December 2023.

According to the Labor Force Survey in 2021, 2.3 million people were employed in STEM, of whom, 422,000 people performed professional, scientific and technical activities and 289,000 were employed in the ICT sector. As of June 2024, the Pension Fund reported a marked decrease in the number employed in these sectors, 269,000 and 153,000, respectively. In particular, the ICT sector was thriving before the war. The number of private entrepreneurs working in the ICT sector increased in the last ten years from 77,000 up to 275,000 (DOU, 2024). Ukraine has the second highest number of CIT specialists among CEE countries, after Poland. The number of ICT workers is undercounted because the technopreneurs are not captured by the statistics.

[27] The State Statistics Service of Ukraine has not published data on employment since the invasion; reports by research organizations and think tanks fill the information gap.

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Health, construction and STEM workers were part of the outmigration of Ukrainians even before the 2022 invasion and the war added a push factor to outmigration. These skills are also mobilized in the defense efforts of Ukraine. The granting of visa-free access to the European Union (EU) in 2017 facilitated and accelerated the migration of workers and students in these fields. Ukrainians filled the need for workers in health care, construction and agriculture in various EU countries. Before the invasion, Also notable has been the increasing trend in migration for permanent settlement to the EU.

Projected supply and demand

The country report has some notes on the projected need and supply of health and construction workers in the next three years. There was no mention about STEM workers.

Ukraine's healthcare system is experiencing a shortage of qualified medical staff, a crisis that has been intensified and deepened because of the war. At the beginning of 2023, there was an estimated deficit of 30-40% of doctors (based on the number of doctors needed per volume of patient visits, as recorded by 2030, the staffing of medical institutions in Ukraine with doctors will be 75 percent, and 73.6 percent of the required number of nurses and paramedics, respectively.

Data on enrollment and graduates

As mentioned earlier, the country report noted the low production of health care workers, particularly nurses and doctors, which contributes to the shortage of health personnel. Interestingly, although Ukraine does not produce more health workers, it attracts foreigners to study health-related degrees. The invasion, however, resulted in the reduced number of foreign students enrolled in health-related programmes in Ukraine. The number of people willing to take the exam is growing from 78 447 in 2019 to 99269 in 2023. At the same time, the number of those who passed did not increase much, from 66131 persons in 2019 to 75369 in 2023 (Table 7.1).

Table 7.1. Number of examinees and passers in the Health-related/Nursing professional licensing exam

	2019	2020	2021	2023
Examinees	78,447	83,531	101407	99269
Passers	66,131	73804	75964	75369

Source: Ministry of Public Health of Ukraine (n.d.).

STEM graduates are broadly divided into non-ICT and ICT, a field of study which has been gaining popularity in Ukraine. While graduates of bachelor's degrees were decreasing between 2016 and 2023 (from 46,169 to 22,131), the opposite is true for graduates of master's degrees for the same period (from 7,904 with a sharp increase to 28,788 in 2018 and declined thereafter, although the 9,765 graduates in 2023 were still more compared to the number in 2016). As regards, the trend for ICT graduates, those with bachelor's degrees numbered 16,856 in 2016 which went down to 14,888 in 2023. The trend for those who graduated with a master's degree increased from 3,198 in 2016 to 5,978 in 2023, and in the intervening years, there were pronounced increases, notably the 9,168 recorded for 2018.

In Ukraine, workers in the construction sector includes those with varying levels of education, from low education to vocational training to those with tertiary and higher education degrees. Those with low education obtain jobs as auxiliary workers, those who complete vocational training work at specialized tasks (e.g., bricklaying, plasterers), and those with tertiary and higher education work at supervision and planning tasks. The construction sector includes graduates with a specialization in Architecture and Urban Planning, and Construction and Civil

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Engineering. Data on the number of graduates with a bachelor's and MA degrees between 2017 and 2023 show a declining trend. In 2017, there were 7 ,084 who graduated with a bachelor's degree; in 2023, the number was almost halved to 3,577. The number of MSc graduates declined from 6,611 in 2017 to 2,817 in 2023. Graduates of vocational training (junior specialists) went down from 4,878 in 2017 to 2,093 in 2023.

Conclusion

The invasion has caused destruction and suffering in Ukraine. The population of Ukraine had been already declining for almost three decades due to low fertility, relatively high mortality and high levels of emigration, and since the invasion, deaths and emigration added to population decline. Even before the war, many Ukrainians were already living outside the country. The Ukrainian diaspora increased in recent years due to emigration spurred by the conflict in the eastern region in 2014, economically motivated migration which accelerated with the granting visa-free travel in the Schengen area, and recent forced emigration because of the 2022 invasion.

Russia's aggression directly impacted the economy--Ukraine's gross domestic product fell by around 30 percent and the supply of needed workers has been depleted by emigration, causing massive shortages across all sectors. The declining trend in these sectors has been exacerbated by the invasion.

Ukraine has been facing a shortage of healthcare workers due to the low production of graduates. In the last 30 years, the number of doctors and nurses decreased by 2 and 4 times, respectively. Between 2021 and 2022, Ukraine lost 89,000 health workers because of the war and increased emigration of doctors, nurses and other health professionals was recorded since 2022.

The construction industry is also facing shortage of skilled labour due to the emigration of construction workers and ongoing mobilization. There is a shortage of workers in almost all specializations. Before the war, the shortage started to become evident from 2017, when Ukraine's visa-free regime with the EU came into force. In addition, the number of construction degree graduates in 2017-2023 has been gradually decreasing. In 2024, mobilization is among the main factors that negatively affected the number of construction workers. In 2024 and after, Ukraine's construction industry will be focused on restoring and modernizing infrastructure, developing residential and industrial construction.

The ICT industry is experiencing brain drain as the war drags on. The industry became essential in logistics and humanitarian relief, and it was one of the sectors that generated revenues from overseas investments and clients (Guest, 2024). However, as the war approaches the third year, investments and clients from abroad are slowing down, and the departure of some 65,000 ICT professionals is a drain to the industry. For ICT workers and tech entrepreneurs who remain at home, working under war conditions means innovating and making plan Bs to keep going.

Despite the lack of data, it is not difficult to appreciate the impact of the war on Ukraine. The shortage of workers is clearly not limited to health, STEM and construction, but the depletion of workers with these particular skills has far-reaching implications on Ukraine's reconstruction prospects. Although some return migration has occurred, the uncertain conditions may not favor permanent return. Moreover, the possibility of permanent residence in the countries where Ukrainians had sought refuge may also result in permanent resettlement.

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Appendix

Table 1.1.[28] Number of nurses and midwives who have been licensed from 2019 to 2023

Skills Categories	Years					
	2019	2020	2021	2022	2023	Total
Community Health	1372	842	543	641	378	3776
Public Health Nurses	264	238	86	135	53	776
Psychiatric Nurses	756	787	56	16	239	1854
General Nurses	5565	13277	2353	4719	6391	32305
Midwives	6614	8624	1422	692	3542	20894
Total	14571	23768	4460	6203	10603	**59605**

Source: Field data obtained from the N&MC, 2024.

[28] All tables are from the Ghana country profile report submitted to Link4Skills.

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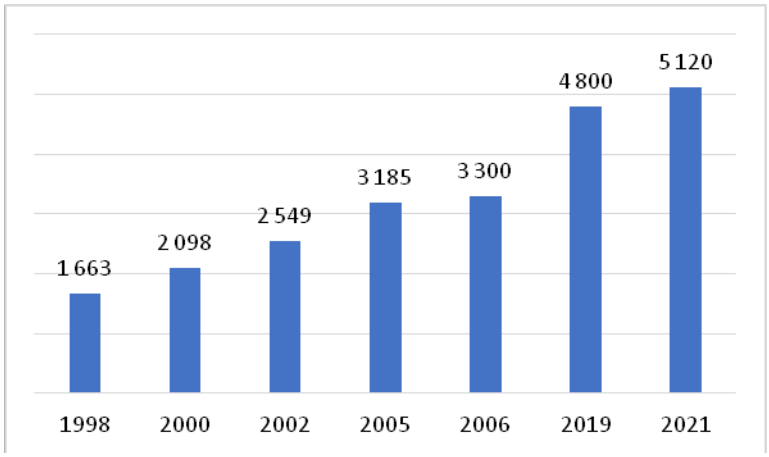
Table 1.2. Employment of Persons in Selected STEM Industries 2022-2023 (from Ghana country profile)

Industry	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1	2023 Q2	2023 Q3
Mining and quarrying	137,027	129,435	136,476	140,702	156,505	176,768	172,142
Information and communication	32,468	31,357	36,369	38,408	35,622	23,735	16,136
Professional, scientific and technical activities	114,702	78,614	61,689	78,611	57,651	70,464	76,075

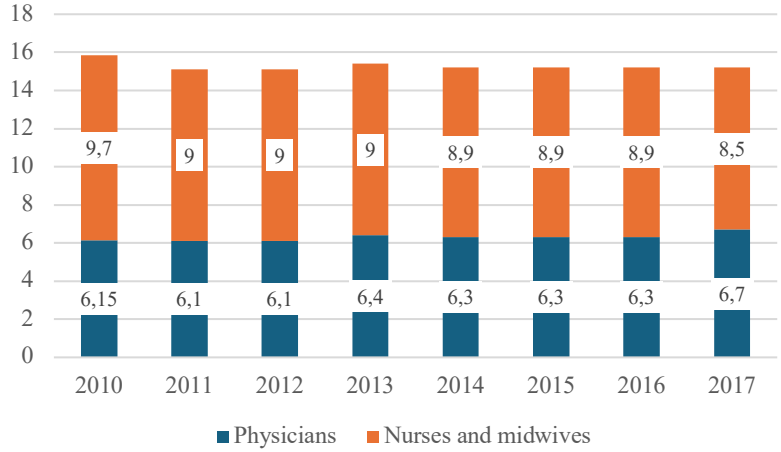
Source: Authors' elaboration of the AIHES Dataset from GSS (2022,2023).

Figure 2.1. Size of the Moroccan Community Residing Abroad Between 1998 and 2021 (in thousands)



Source: Ministry of Foreign Affairs, Cooperation, and Moroccans Residing Abroad.

Figure 2.2. Density of Physicians, Nurses and Midwives (per 10,000 population)



Source: Eastern Mediterranean Health Observatory as cited in World Health Organization (2020), see footnote 3.

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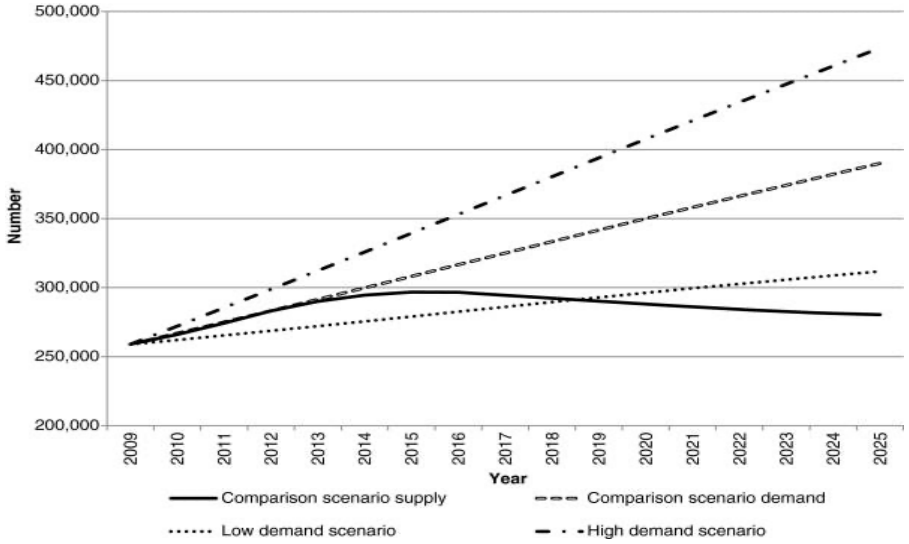
Table 2.1. Evolution of the number of Moroccan workers placed internationally between 2021 and 2022

Department	2021	2022
National Agency for the Promotion of Employment and Skills (ANAPEC)	13,025	12,036
French Office of International Immigration (OFII)	10,827	18,814
Department of Employment	51	274
Total	23,903	31,224

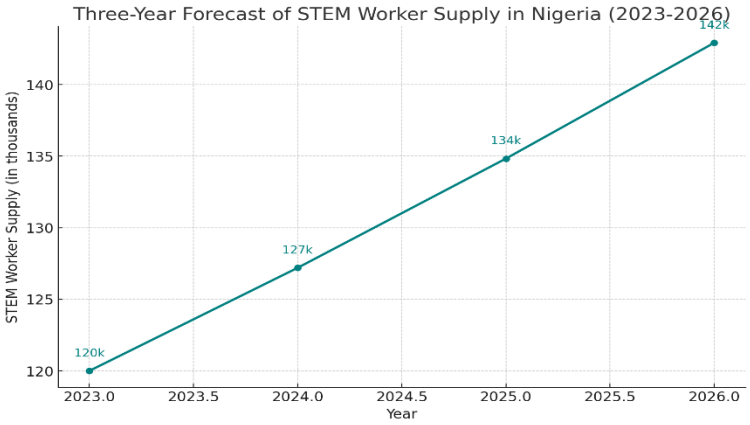
Source: Ministry of Economic Inclusion, Small Enterprises, Employment, and Skills (MIEPEEC).

Figure 3.1.[29] Projected supply of nurses



Source: NMCN, (2022), MDCN, (2023).

Figure 3.2. Forecast of STEM workers, 2023-2026



Source: COREN (2022), NSE (2023).

[29] All figures are from the Nigeria country profile report submitted to Link4Skills.

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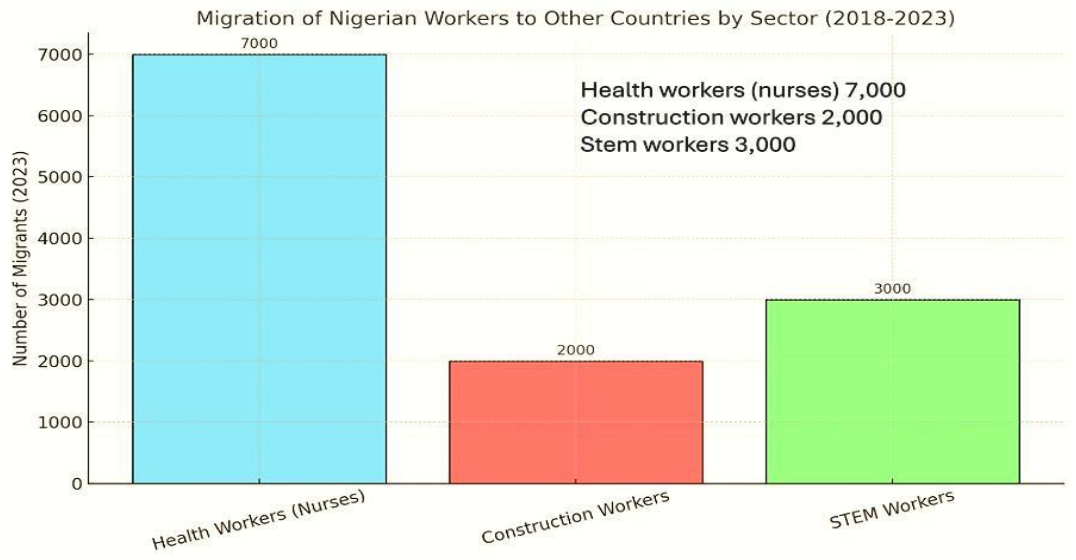
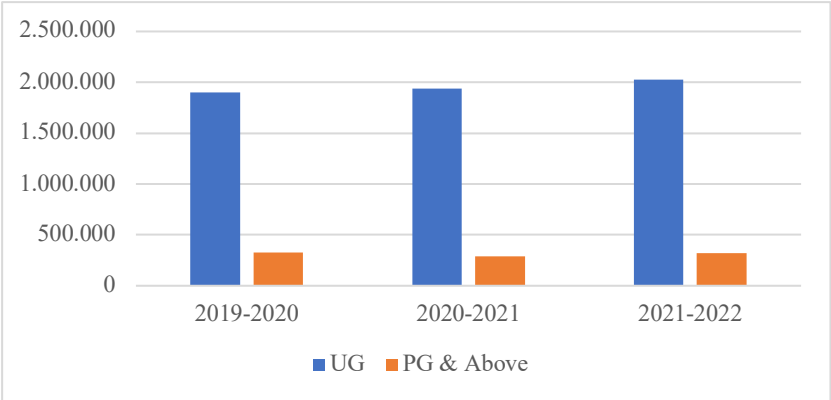
Figure 3.3. Migration of Nigerian workers to other countries by sector, 2018-2023



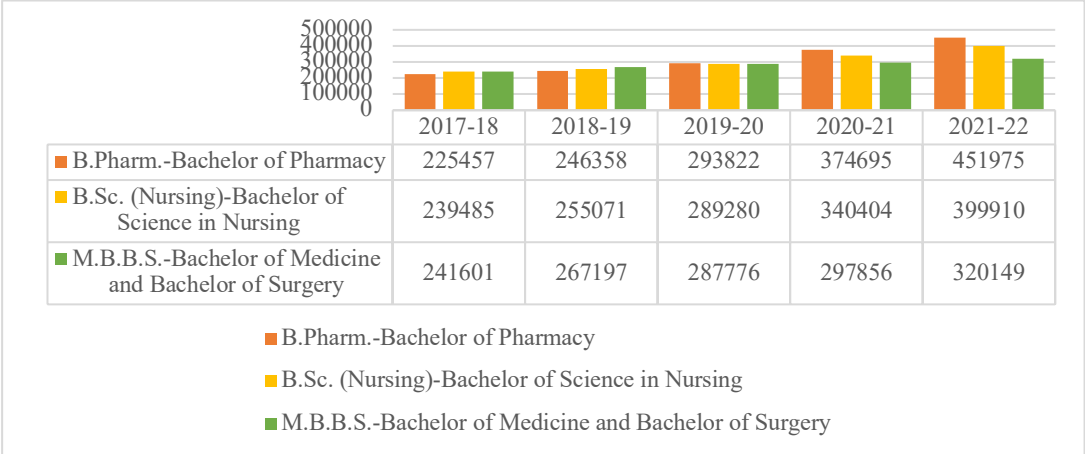
Source: NBS (2022), CBN (2023).

Figure 4.1. Number of STEM graduates in undergraduate and graduate levels, 2019-2022



Source: All India Survey on Higher Education (AISHE).

Figure 4.2. Enrollment in health-related fields, 2017-2022



	2017-18	2018-19	2019-20	2020-21	2021-22
B.Pharm.-Bachelor of Pharmacy	225457	246358	293822	374695	451975
B.Sc. (Nursing)-Bachelor of Science in Nursing	239485	255071	289280	340404	399910
M.B.B.S.-Bachelor of Medicine and Bachelor of Surgery	241601	267197	287776	297856	320149

Source: Annual Report 2023-24: Ministry of Health and Family Welfare.

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Table 4.1. Enrolment in and completion of construction courses in ITIs

Year	Enrolment	No. of students who completed the course
2015	11,02,121	644,410
2016	11,95,487	1, 077,932
2017	12,12,680	1,004,073
2018	14,55,430	984,230

Source: Ministry of Labour and Employment (n.d.).

Table 4.2. Emigration of nurses and physicians, 2018-2022

Year	**Nurses**	**Physicians**
2018	42,790	27,255
2019	50,685	29,792
2020	75,749	30,245
2021	82,556	31,707
2022	106,640	13,548
Total	358,420	132,547

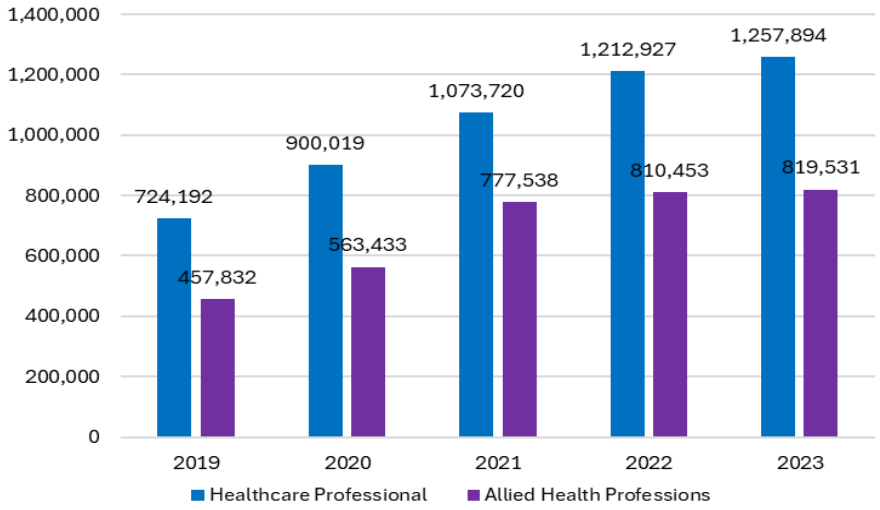
Source: Organisation for Economic Co-operation and Development (2023).

Table 5.1. Overseas Indonesian workers by sector and destination, 2023

Destination Region	**Formal**	**Informal**	**Total**
Asia & Africa	133,864	121,979	255,843 (93.0%)
Europe and Gulf Countries	17,251	225	17,476 (6.4%)
American & Pacific Area	1,645	1	1,646 (0.6%)
Total	152,760 (55.6%)	122,205 (44.4%)	274,965 (100.0%)

Source: BP2MI (2024).

Figure 5.1. Number of Healthcare and Allied Health Professionals in Indonesia



Source: Health Profile of Indonesia (Ministry of Health of the Republic of Indonesia), 2019 – 2023.

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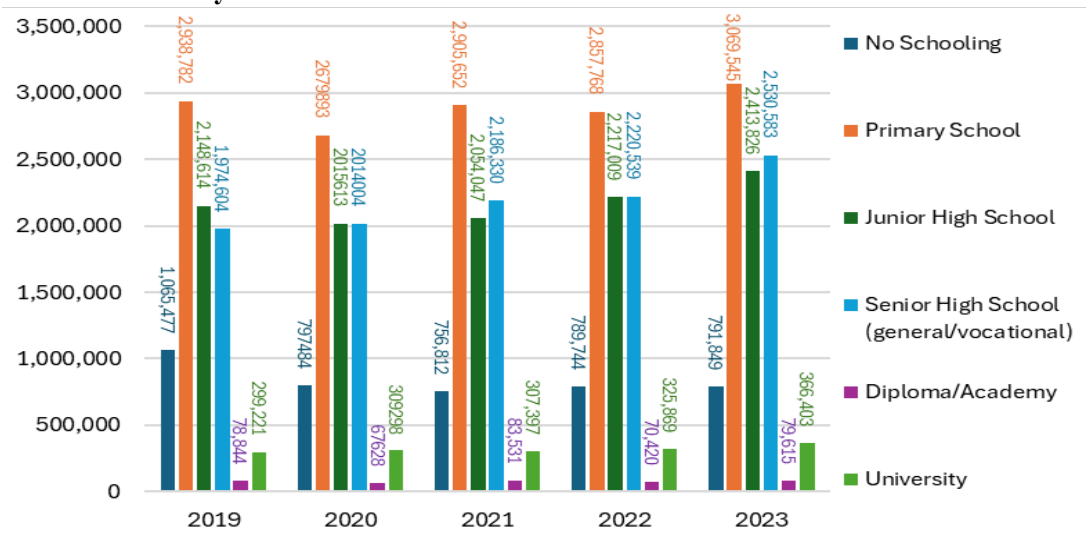
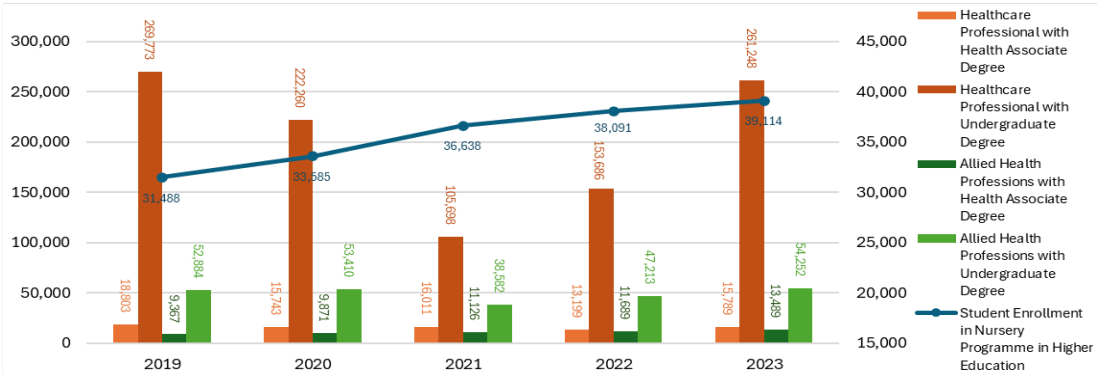
Figure 5.2. Population 15 years of age and over who worked during the previous week in the construction sector by educational attainment



Source: Construction in Figures (BPS-Statistics Indonesia), 2020 – 2024.

Figure 5.3. Number of Graduates in Health Fields and Student Enrollment in Nursing Programme in Higher Education



Source: Health Profile of Indonesia (Ministry of Health of the Republic of Indonesia, 2019 - 2023); Pangkalan Data Pendidikan Tinggi (Indonesian Higher Education Database, 2019–2023)

Table 6.1. Overseas Filipino Workers by Skill Level and by Destination from the SOF 2022

Destination Region	Managers, Professionals, Associate Professionals, and Technicians	Other Workers	Total
	Number		
Gulf Countries	151,015	972,687	1,123,702
North and South America	25,055	110,657	135,712
Europe	21,562	145,464	167,026
Australia	14,012	41,465	55,476
Other countries	82,822	628,623	711,445
Total	294,466	1,898,894	2,193,360

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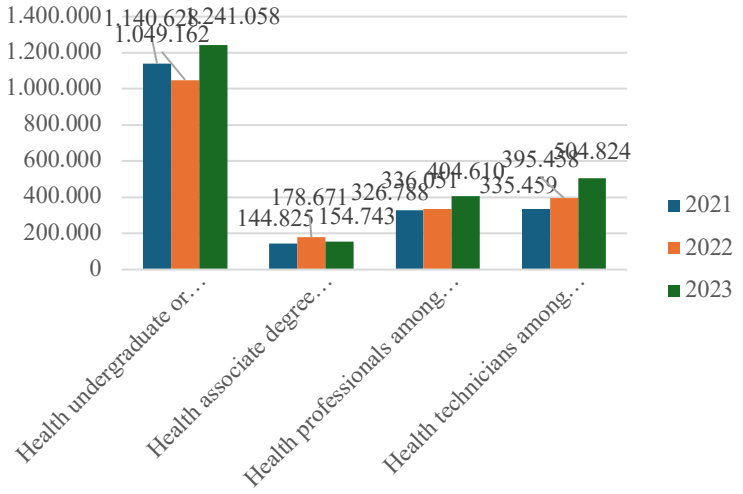
	Share in row totals		
Gulf Countries	13.4	86.6	100.0
North and South America	18.5	81.5	100.0
Europe	12.9	87.1	100.0
Australia	25.3	74.7	100.0
Other countries	11.6	88.4	100.0
Total	13.4	86.6	100.0
	Share in column totals		
Gulf Countries	51.3	51.2	51.2
North and South America	8.5	5.8	6.2
Europe	7.3	7.7	7.6
Australia	4.8	2.2	2.5
Other countries	28.1	33.1	32.4
Total	100.0	100.0	100.0

Source: Philippine Statistics Authority's 2022 Survey of Overseas Filipinos.

Figure 6.1. Number of Working Age with Degrees in Health and Number Employed as Health Professionals and Technicians



Source: PSA's Labour force surveys, various years.

Figure 6.2. Enrollment and Graduation in Health-related Fields

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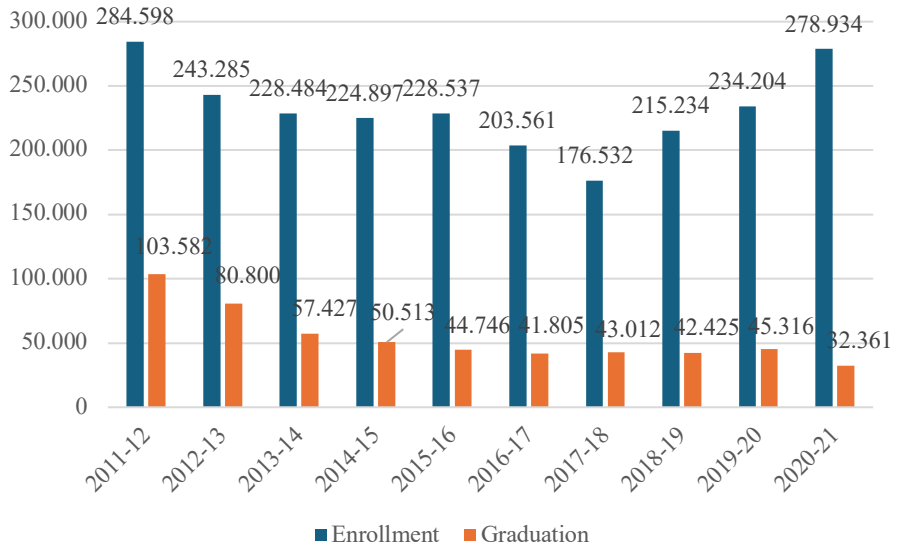
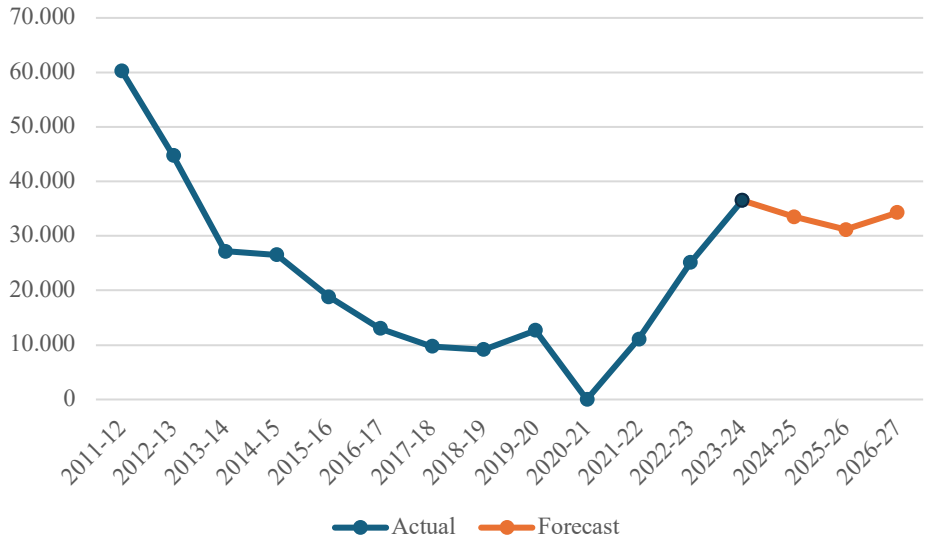


Source: Commission on Higher Education

Figure 6.3. Nursing licensure exam passers: actual and forecast for SY2024-25 to SY2026-27



Source: Professional Regulations Commission

Funded by the European Union

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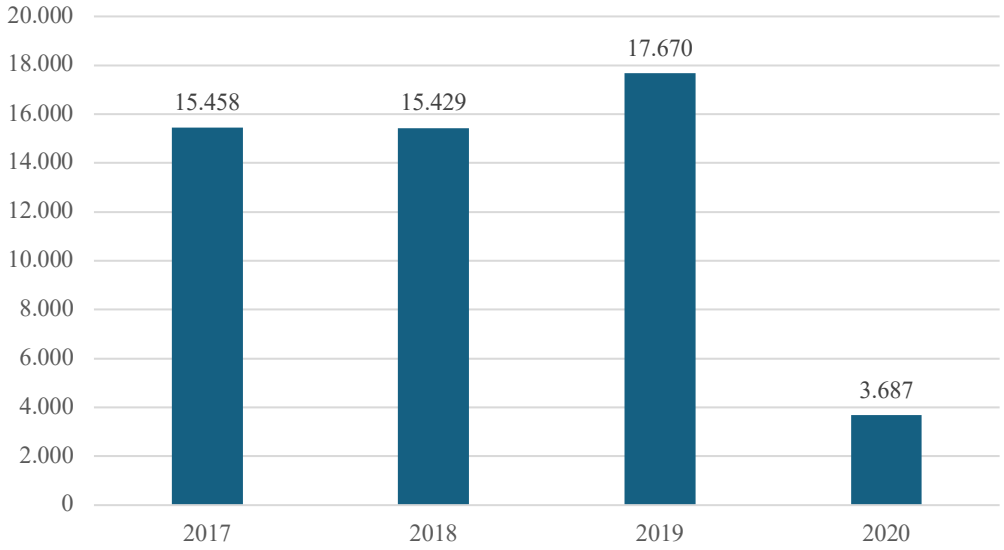
Figure 6.4. Deployment of Filipino nursing professionals and associate professionals, 2017-2020



Source: Professional Regulations Commission

Table 7.1. Number of examinees and passers in the Health-related/Nursing professional licensing exam

	2019	2020	2021	2023
Examinees	78,447	83,531	101407	99269
Passers	66,131	73804	75964	75369

Source: Ministry of Public Health of Ukraine (n.d.).

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