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Green skills in Africa: Comparative insights from South Africa, Guinea and Ghana

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This paper examines how South Africa, Guinea and Ghana are developing the green skills needed for an equitable and effective green transition, and the role that both the European Union and China have in supporting green skills in these three countries. Across the three countries, the green transition unfolds amid several challenges: fragility, high levels of unemployment and dependence on coal (South Africa), extractive sectors (Guinea) and petroleum oil (Ghana). Although each country faces distinct pressures, a common challenge is the limited capacity of education and training systems to produce the foundational and technical skills required to effectively sustain a national green economy.

Both the EU and China are key partners for these countries in their green transition. In this paper, we argue that a more demand-driven, system-strengthening approach, which is anchored in local ownership, will be essential if green skills are to support a just and sustainable economic transformation. The EU is a recognised actor that supports TVET and (green) skills development in all of the three countries. China is most known for investments in infrastructure, but it is also an actor in green skills , often tied to major infrastructure projects but also initiatives such as the Luban workshops. However, their respective approaches are evolving and, while remarkable differences remain, similarities also arise.

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Acronyms

ACET	African Center for Economic Transformation
ACQF	African Continental Qualifications Framework
AfDB	African Development Bank
AFD	Agence Française de Développement
APR	Annual Performance Report
AU	African Union
BPC	Beijing Polytechnic College
BRICS	Brazil, Russia, India, China, South Africa
BPA	Bui Power Authority
CPD4E	Career Path Development for Employment
CTVET	Commission for Technical and Vocational Education and Training
CTIP	Clean Trade and Investment Partnership
DG CLIMA	Directorate-General for Climate Action
DG INTPA	Directorate-General for International Partnerships
DHET	Department of Higher Education and Training
EC	European Commission
ECFR	European Council on Foreign Relations
ECDPM	European Centre for Development Policy Management
EEAS	European External Action Service
EIB	European Investment Bank
EITI	Extractive Industries Transparency Initiative
ETF	European Training Foundation
EU	European Union
EWSETA	Energy and Water Sector Education and Training Authority
FOCAC	Forum on China–Africa Cooperation
GDP	Gross Domestic Product
GG	Global Gateway
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit

HDI	Human Development Index
IRENA	International Renewable Energy Agency
JET-IP	Just Energy Transition Investment Plan
JETP	Just Energy Transition Partnership
LDC	Least Developed Country
MIP	Multiannual Indicative Programme
MoE	Ministry of Energy
MoU	Memorandum of Understanding
NEET	Not in Employment, Education or Training
NDP	National Development Plan
ND-GAIN	Notre Dame Global Adaptation Initiative
NGO	Non governmental organization
ODI	Overseas Development Institute
PAIED/FP	Programme d'appui à l'insertion et à l'emploi décent par la Formation professionnelle
PCC	Presidential Climate Commission
PNDIG	Politique Nationale de Développement Industriel de la Guinée
ProDEG	Programme Décennal de l'Éducation en Guinée
PV	Photovoltaic
REIF	Renewable Energy Investment Fund
SAREM	South African Renewable Energy Masterplan
SETA	Sectoral Education and Training Authority
SME	Small and Medium-sized Enterprise
STEM	Science, Technology, Engineering and Mathematics
TAIEX	Technical Assistance and Information Exchange
TEI	Team Europe Initiative
TVET	Technical and Vocational Education and Training
UENR	University of Energy and Natural Resources
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USIP	United States Institute of Peace
WB	World Bank

Executive summary

'Green skills', referring to skills and abilities needed in the green transition, will be paramount to realise the development ambitions of African countries, including rising economic benefits of their national endowments, boosting local employment and fostering green industrial development in various sectors. This paper examines how South Africa, Guinea and Ghana are developing the green skills of their respective populations, and the role that both the European Union and China play in supporting those.

The green transition unfolds with varying pace and amid several challenges in the three countries, including fragility and high levels of unemployment. The capacity of education and training systems to produce the foundational and technical skills required for emerging green sectors is limited. Furthermore, the economic dynamics in the countries pose specific challenges.

Across the three countries, while development cooperation and grants remain central, the EU deploys a differentiated set of tools, ranging from development-focused TVET support in Guinea, to a broader, geopolitically oriented toolbox in South Africa, with engagement in Ghana centred more on general TVET reforms than on green skills. The analysis suggests scope for a more holistic approach to skills support, ensuring that green energy and infrastructure projects consistently include components to strengthen local capacities, while also recognising the foundational role of basic education in enabling effective skills development.

Through Global Gateway, the EU is shifting toward more opportunity- and demand-driven approaches in skills development, a direction that can better link skills initiatives to concrete job opportunities. Yet, to realise this opportunity, the EU needs to become a more agile actor with lighter processes and further strengthen its cooperation with the private sector. This approach should also weigh the advantages of still supporting more systemic TVET interventions.

China's engagement in green skills development is more pragmatic, fragmented and directly tied to specific investment opportunities than the one of the EU. In Guinea, skills initiatives are embedded in major industrial projects such as Simandou 2040, where the Simandou Academy seeks to train engineers and technicians for mining and infrastructure operations. In Ghana, China's role is most visible in renewable energy infrastructure and Luban Workshops, though evidence of deep skills transfer remains mixed. Yet, in South Africa, Chinese cooperation seems to be broader and includes BRICS-based TVET initiatives,

long-term training for lecturers and partnerships between colleges and Chinese institutions, although still with linkages to China's central role in supplying renewable energy technologies.

Ultimately, harnessing the full potential of green skills will require more coordinated, strategic and country-tailored efforts from all partners to ensure that Africa's green transition is both inclusive and transformative.

Introduction

Climate change is having far-reaching effects across African countries, intensifying water scarcity, reducing agricultural yields and disrupting livelihoods (Fonjong et al., 2024). This highlights the need to adapt to a changing climate and offers a rationale for an equitable green transition. Africa has one of the world's most promising renewable energy sources (solar, wind and hydropower), as well as minerals that are needed to produce green technologies. Yet, many African countries are struggling with granting solid energy access to their populations, are heavily relying on carbon-intense technologies and reap limited benefits from their resources (Medinilla et al., 2022; Karkare, 2024).

The green transition can bring vast economic benefits to Africa. It has the potential to boost employment in the renewable energy sector, and foster innovation in green sectors (Ferroukhi et al., 2022, AfriCGE 2025). African countries are willing to tap into these opportunities: they adopt various ambitions and strategies to achieve green industrialisation objectives (Medinilla and Byiers, 2023). As African economies undergo a green transition, having a well educated, highly skilled workforce as well as competent technicians will be crucial to mitigate the socio-economic implications – including shifting demands in job markets – that the green transition brings.

This brief is part of a two-paper series exploring the development of green skills in Africa, as well as analysing how China and the EU support it. While the first brief focused on the policy level and on the overall EU and Chinese support for green skills, this one looks at practical experiences in partner countries, building on literature review and interviews with European and African actors, government representatives, analysts and CSOs. It draws examples from three country case studies, namely Ghana, Guinea and South Africa[1]. While green skills are developed across the education system preparing populations for various jobs and tasks,

[1] We chose these to be the case study countries because they reflect a variety of contexts in terms of income, fragility and languages. Both the EU and China are active in green sectors in these countries.

this study focuses on green skills in TVET specifically, as TVET has a crucial role to play in upskilling the youth that access the labour market for the first time as well as existing workforce (Cloete et al., 2022).

The brief starts by explaining the key issues related to green skills development in each country and then explores how both the EU and China support green skills in these three countries. It also discusses their comparative advantages and where potential complementarities lie.

1. Green skills in South Africa, Guinea and Ghana

The first paper of this series looks at the continental and regional frameworks related to green skills development in Africa, showing that green skills are a cross-cutting, multisector area (Veron and van der Meer, 2025). The relevant policy frameworks tend to focus on (1) youth employability/employment, (2) economic transformation, or (3) socio-environmental resilience. Green skills are an element of policies that contribute to broader objectives, above all job creation, economic productivity, local value addition and access to services (for example energy). This is echoed in the AU's TVET strategy, which points out that rather than being an end in itself, skills development is a driver for productivity, competitiveness, inclusive sustainable growth and personal development (African Union, 2025).

Box 1: Green skills definition

Terms like green jobs and green skills appear frequently in policy debates, yet they are often vague in terms of the tasks or occupations that are included (Vidican Auktor, 2022). This series of papers conceptualise green skills in the following way:

Green skills refer to the knowledge, abilities, values and attitudes that enable individuals and organisations to support a sustainable, resource-efficient and low-carbon society. They encompass **both technical and transversal competencies**, from engineering, science and operations management to sustainable thinking and decision-making, that are essential for all sectors and levels of the economy (Veron and van der Meer, 2025).

According to the African Continental Qualifications Framework, green skills (also referred to as "skills for the green economy", "skills for green jobs" or "skills for the green transition") consist of:

- Transversal skills, relevant to all economic sectors and professions;
- Specific skills, needed to adopt or implement standards and processes;
- Highly specialised skills, on specific green technologies (ACQF, n.d.).

Green skills can be developed in various ways through the education system from basic and secondary education to TVET and higher education, yet each level provides a different set of training and foundational knowledge. Primary and secondary education build a foundation for green skills (such as basic knowledge in literacy, numeracy, STEM fields, critical thinking). In higher education, the potential is in fostering innovations, complex technical skills and planning to prepare students to high-paying expert jobs. Once the innovation and planning is there, workers with training obtained from TVET have the technical skills to implement the building, installation and maintenance of the green technology (Cloete et al., 2022).

As explored in the first paper of this series, the African continental strategies broadly recognise green skills as crucial for an economically and politically viable green transition in Africa. While continental policy frameworks indicate an overall direction, actions at the national and local levels to foster economic opportunities and close education gaps are most impactful. This is why this paper looks at how different countries approach green skills. In this section we look at the cases of Ghana, Guinea and South Africa.

Three countries, three sets of challenges

Each of the case study countries pose a set of specific challenges, often linked to limited diversification of the national economy, with overreliance on one or two key sectors of economic activity. Furthermore, the three countries are highly impacted by climate change. The ND-GAIN Country Index summarises a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience (ND-GAIN, n.d.). All three countries are recognised as vulnerable to climate change, South Africa being 94th, Ghana 111th and Guinea 154th of the 181 ranked countries.

Guinea's economy relies heavily on the extractive sector, which contributes over 17% of government revenues, 92% of exports and 20% of GDP in 2022 (EITI, 2022). The country primarily produces gold, diamonds, and bauxite[2] – mostly export raw – with the world's largest reserves of iron, as well as nickel (EITI, 2022). Yet, Guinean people are among the poorest in the world. Youth unemployment is a huge issue in the country. In 2019, 34 % of young people were not in education, employment or training (World Bank, 2025). An overwhelming majority (96%) of the labour force works in the informal sector (TheGlobal Economy.com, n.d.; African Development Bank, n.d). Furthermore, the country exhibits significant state fragility due to corruption, poor rule of law and dire socioeconomic conditions (World Bank, 2023; OECD, 2025).

The country's vulnerability to climate change is further exacerbated by unsustainable production practices. For instance, mining activities traditionally rely on fossil fuels as a primary energy source. The demand for an energy transition, and related mineral extraction, is putting increased pressure on managing energy and water infrastructures in urban and rural areas (Kolie et al., 2024). While reliable, clean and affordable energy and water resources, and managing red mud[3] remain a challenge in Guinea (Margolin, 2024), each of these activities require different skill sets which are currently lacking in the country.

For **South Africa,** the key challenge is in its dependency on coal, which fuels 83 % of the country's energy production, compared to only 6.4% coming from hydropower and 7.3 % from other renewables (Cole et al., 2025). South Africa's coal power plants source their coal from domestic mines and coal production supports local economies through wages, procurement and municipal revenues. In 2024, it provided nearly 100,000 direct jobs and generated about ZAR 195.6 billion (USD 10.4 billion) in sales, with working conditions and wages generally better than in other formal sectors (Cole et al., 2025). The communities that are dependent on coal face uncertainty over their future as coal mines are scheduled to close in coming years, as part of efforts to green the national energy matrix (Ryan, 2024). In a country that is facing mass unemployment (32% for the general population and 46% among youth in the first quarter of 2025) and levels of inequality among the highest globally, any potential job losses linked to closure of coal plants are a major political and social issue (Government of the Republic of South Africa, 2025a).

[2] Guinea was the largest global bauxite producer in the world in 2023 according to US Geological Survey Data (Flourish, 2025).

[3] Red mud is the industrial waste product from aluminum production, also called bauxite residue. The industrial red mud is a highly alkaline and potentially toxic substance containing iron oxides that give it its red color, along with other minerals and heavy metals.

South Africa grapples with an energy crisis that stems from a mix of structural, technical, financial and governance failures accumulated over decades. These include old and poorly maintained grid, mismanagement of and corruption of the state-owned enterprise Eskom, as well as the slow uptake of alternative energy sources (Bookbinder, 2023; Hanto et al., 2022). Yet, the green energy transition is politically contested. On the one hand, there is a push to transition towards renewable energy and phase out coal. But on the other hand, support for the continued use of coal is still strong (von Lüpke, 2025).

Renewable energy has significant potential to generate employment in South Africa as coal mining declines. One modelling study suggests that based on 2018 levels, the renewable energy transition could create 580 000 (or 1.2 million in the best case scenario) jobs in the years to 2030 (Okunlola et al., 2019). Realising this potential also depends on targeted green skills training and reskilling programmes, ensuring that workers are equipped to participate in emerging renewable energy industries (Winkler and Black, 2024). A recent study covering about half of South Africa's coal mine workforce shows that workers in the sector have generally low levels of education and a limited skills base, which makes them particularly vulnerable to job losses from mine closures. This underscores the urgency of targeted skills development programmes to support their transition (Cole et al., 2025).

For **Ghana**, the green transition faces significant obstacles due to its heavy reliance on non-renewable sources within its energy system. Petroleum is identified as the leading source of energy consumed, accounting for 47.6% of the entire supply based on 2019 data, with Ghana producing 173,000 barrels of crude oil per day while importing 77,000 barrels annually (Kipkoech et al., 2024). Furthermore, the electricity generation mix is heavily dependent on fossil fuels, dominated by 14 thermal plants that constituted almost 60% of the mix as of 2022; these thermal plants are fuelled by natural gas and oil and were primarily developed to diversify the energy mix away from hydropower, especially during droughts (Kipkoech et al., 2024). This dependence on imported petroleum fuel is costly and results in negative environmental, economic and political consequences, with the reliance on thermal sources contributing to a rise in electricity costs.

While Ghana has achieved significant economic and social progress over three decades, and reached a middle-income status in 2011, more than a fifth of its population experiences poverty, with rates exceeding 50% in northern regions. (World Bank, n.d.). Youth unemployment in Ghana is alarmingly high at 38.8%, and among those employed, nearly 68% work in vulnerable jobs – low-paid, insecure

positions that offer little stability or long-term prospects (Mensah and Bagnetto, 2025). The renewable energy transition could also in the case of Ghana bring employment benefits. For instance, implementing three key green and climate policies could result in 100 000 additional jobs compared to business-as usual scenarios (i.e. not implementing them) (PAGE, 2024). Reaping these benefits will require investments in skills development to ensure workers have the skills needed for these jobs, otherwise the potential for new employment in the industry and services sectors will be limited (Oteng et al., 2024).

National green skills strategies

The three countries are aiming to reap the benefits that the green transition can offer, which is exemplified by a plethora of strategic and policy frameworks that aim to fuel economic transformation. In **Guinea**, it has been a long-standing objective of the government to move the economy away from its high dependency on raw mineral exports to one with greater focus on mineral processing and refining, to generate higher-skilled, more productive, value-added employment.[4] The *Politique Nationale de Développement Industriel de la Guinée (PNDIG)* 2022–2040, identifies the creation of productive jobs and the strengthening of local labour capacity as core priorities for structural transformation (PNDIG, 2023).

The **South Africa**'s National Development Plan (NDP) 2030 commits the country to "an environmentally sustainable and equitable transition to a low carbon economy" (Government of the Republic of South Africa, 2012). South Africa has pushed the concept of 'just transition' globally, also on the basis of its Just Transition Framework, created by the Presidential Climate Commission (2022). Both documents also acknowledge that a high level of skills is needed to realise a green and just transition in South Africa.

Ghana's National Development Plan (2018–2057) and Medium-Term Policy Framework (2022–2025) set out a vision of a prosperous and self-reliant nation, prioritising universal energy access, expansion of renewable energy, increased investment in generation capacity, and the strategic use of oil and gas resources to drive economic growth (National Development Planning Commission, 2021).

Specific strategies on education and TVET recognise the need to bolster employability, in line with private sector needs, though they do not always address green skills. For instance, the national skills development plan 2030 of

[4] See Vision 2040 pour une Guinée émergente et prospère (Republic of Guinea, 2024a).

South Africa includes a goal of taking advantage of new opportunities in the knowledge and green economies (Department of Higher Education and Training, 2019). It does not explicitly mention green skills, but lays a broader foundation for skills planning in the country, and emphasises both supply and demand challenges, focusing on demand-driven skills, responsiveness to labour markets, and better labour-market intelligence.

Guinea's National Strategy for Employment and that for Technical and Vocational Education and Training (TVET) recognised the need to target youth not in employment, education, or training (NEET) and for aligning TVET offers with the needs of the industry by engaging with the private sector. The National Employment Plan identifies an entire strategic objective dedicated to strengthening the link between skills and employment, further divided into (1) matching skills requirement and training offer, (2) mobility in employment, and (3) employability of youth. Le Programme Décennal de l'Education en Guinée (ProDEG), a 10-year education sector plan for the country, aims to expand access and enhance the quality of TVET and anticipate job market needs (Government of Guinea, 2020). Finally, the 2040 vision includes an objective to improve employability through continuing education and innovation in the vocational training sector, but does not address green skills or green jobs (Republic of Guinea, 2024a).

Notably, **Ghana's** National Green Jobs Strategy (2021-2025) – a multi-sectoral framework to organise and harmonise existing green interventions in Ghana through effective coordination – aims to develop employable skills, especially for the youth, women and persons with disabilities to take advantage of existing and emerging green jobs potential (Government of Ghana, 2022)**.** Key sectors include clean and renewable energy, agriculture, forestry and fisheries, waste management and recycling, construction, nature and eco-tourism. It also involves establishing an observatory to anticipate future green skill demands. According to an interviewee, the strategy could have potential in alleviating the country's dire situation in terms of youth unemployment.

However, it was striking that several of our interviewees had not heard of this strategy and some pointed out that its implementation has been lagging. This is despite the fact that there are some notable investments recently announced in the sector. Under Ghana's Energy Transition Framework, the government aims to add 400 MW of renewable capacity within five years – supported by public and private financing. Linked to this, the government also plans to create thousands of jobs (News Ghana, 2025). The country has also launched a Renewable Energy Investment Fund (REIF), which aims to attract local and international investments

in the renewable energy sector (Goodrich, 2025). The announced investments provide a window of opportunity to strengthen the link between energy investments and green skills and ensure that the employment opportunities are fully seized.

Finally, green skills are often included in the strategies that focus on socio-environmental resilience and adaptation and mitigation of climate change. Guinea's National Climate Change Strategy (2019) highlights the need for climate education and awareness, including training courses and centres of excellence. **Ghana**'s National Energy Transition Framework, a long-term plan (2022-2070), is aimed at decarbonising the energy sector and achieving net-zero emissions as a response to the negative impacts of climate change (Government of Ghana, 2023). It also aims at incorporating energy transition into the curricula of academic institutions. **South Africa**'s Renewable Energy Masterplan (Government of the Republic of South Africa, 2025b), while primarily focusing on fostering renewable energy production in the country, includes a goal of job creation across the value chain and to build capacities needed in the industry, including the skills base.

Green skills are thus seen as a multidimensional topic as well as an enabler of a broader societal and economic transition. Yet, **they are unevenly inserted in national employment or TVET strategies and other relevant ones - and implementation is often a challenge**. Further, interviewees broadly point out that the implementation of strategies has not always progressed as hoped and the link between green skills development and job prospects remains underexplored. One reason is slow progress on investments themselves. Second, even when investments are there, systems able to predict skills needs are weak across the board. One interviewee pointed out that there is an assumption that the green transition will create new kinds of jobs, but it lacks hard data on what kind of jobs, where and with what skills level. Another interviewee pointed out that while countries have set skill anticipation systems, they would often need stronger input from the private sector, than what is currently happening.

Green skills as a cross-cutting government responsibility

Due to their cross-cutting nature, responsibility for green skills development tends to be divided between multiple government organisations in the three countries. For instance, **South Africa** has adopted an integrated approach to environmental education, rather than have a dedicated environmental education and training authority. Sectoral Training Authorities (SETAs) are responsible for training within their respective sectors. The Energy and Water Sector Education

and Training Authority (EWSETA) has a core mandate to anticipate and build the required skills for the energy and water sectors, which cover a large part of green skills in the country. While this integrated approach can bring benefits, interviews highlight that having an overview and ability to direct TVET actions in a strategic and comprehensive manner is complex in such a system. Green economy value chains span across multiple sectors, for example the EV value chain involves the Manufacturing SETA, Transport SETA, and EWSETA, the latter handling charging infrastructure.

Guinea's education and skills system is characterised by numerous ministries and agencies with overlapping mandates, weak coordination mechanisms, and limited institutional capacity for effective policy design and implementation (Karkare et al. 2025). While the military-led 'transition government' is providing some political drive to develop green skills and jobs, given their interest in reaping more benefits out of Guinea's mineral wealth, it is also creating unpredictability in policy decisions and putting officials under pressure to act with 'quick wins' in mind (Karkare et al., 2025).

Ghana has made an attempt to address fragmentation in the TVET sector, by realigning all TVET organisations, previously under the responsibility of nine different ministries, under the TVET Service and establishing a Commission for Technical and Vocational Education and Training (CTVET) in 2020 (Ghana Technical and Vocational Education and Training Service, n.d.). Yet, overlaps and institutional rivalry between these two organisations remain a key issue (ACET, 2025).

Persistent challenges hindering green skills deployment

Due to challenges in access and quality of basic education in all three countries, the basic skills levels are low, which hinder the success of training initiatives. In **Ghana**, as many as 80% of children complete primary school without having acquired basic literacy and numeracy skills (UNICEF, 2024). In **South Africa**, there are vast inequalities in learning outcomes at the basic level, with kids from wealthier families performing much better than others (Böhmer and Murru, 2025). In **Guinea**, in 2019 only 45% of primary school graduates achieved satisfactory reading proficiency, and just 32% demonstrated adequate skills in mathematics (Tiregul, n.d.).

Guinea's education system is in a critical state – it is among the 16 countries in Africa that do not meet any of the international benchmarks on education spending (be it 15% of total public expenditure or 4% of GDP). In 2018, Guinea spent

2,4 % of its GDP on education (World Bank, 2021). In 2022, this had reduced to 1,99% (TheGlobalEconomy.com, n.d.). According to the World Bank public expenditure review, financing Guinea's education programme for 2020-2029, the ProDEG, will require increasing education spending from 14.4 % of total spending in 2019 to 21.7 % in 2030, while mobilising external resources. Similarly **South Africa** faces significant challenges in its education system, which is characterised by low literacy and numeracy rates, high dropout rates and a struggle to provide quality education, particularly in disadvantaged communities (Institute of Race Relations, 2022). Interviewees expressed a concern that without sufficient interventions in maths and science at an early age, the opportunities for cultivating necessary skills at the TVET and higher education levels are lost.

Even when skills development is present, education systems are not equipping the workforce with the skills required for emerging roles. For instance, in **Ghana**, according to a survey with key stakeholders, 70 percent of respondents cited significant skills mismatches, despite the fact that in the past years investments in TVET have increased and TVET opportunities have expanded (ACET, 2025). In **South Africa**, the education and training system has not kept pace with rapid economic and technological change, resulting in a mismatch between the skills graduates bring and those employers need, while TVET and skills development remain chronically under-resourced (Franz and Ninan Dulvy, 2020). **Guinea** faces similar constraints: its education system struggles to produce technicians and specialists – such as engineers, industrial mechanics, electricians and precision welders – and shortages in industrial maintenance skills limit the ability of local firms to meet industry standards (Karkare and Cissé, 2025).

While spending on TVET and green skills training could help address issues, this is not a silver bullet. This is exemplified by **Guinea**, where spending on TVET has increased in recent years, expanding training opportunities and raising the share of TVET students, but persistent mismatches between the skills acquired and those demanded by employers remain a major constraint (Republic of Guinea, 2024b; World Bank, 2021). This is also due to teaching techniques not being suited to needs related to the energy transition, even in vocational schools, which also explains why Guinea puts a lot of emphasis on teacher training or "training of trainers" (Interview, June 2025).

2. Green skills at the nexus of EU development policy and geopolitical strategy

The EU has been active in green skills development and TVET in all three countries, its involvement has acquired a new layer of relevance in the last few years. Partnerships in green skills development increasingly combine development cooperation with broader geopolitical and economic objectives. Energy cooperation is now a strategic imperative for Europe, as part of a wider objective to strengthen European energy security and competitiveness in green sectors: as the continent pursues greater autonomy and diversification in supply chains, it requires trusted partners that can supply critical raw materials, participate along clean industrial value chains, and help shape inclusive climate governance (Muresan and Naidu, 2025).

The EU's multiannual indicative programme (MIP) in **Guinea** for 2021-2027 (DG INTPA, 2021a) identifies vocational training as an essential driver of inclusive and sustainable economic and social development. The EU thus currently supports a **"Programme d'appui à l'insertion et à l'emploi décent par la Formation professionnelle"** (PAIED/FP – 24 M EUR) that seeks to improve the quality of vocational training and access to decent jobs for young Guineans. Adopting a Team Europe approach, the PAIED is implemented by AFD (France) focusing on curriculum reform, GIZ (Germany) focusing on activities in primary education, and ENABEL (Belgium) focusing on SMEs and decent employment through vocational training. The programme integrates green skills across the board in its approach:

- Climate and environmental issues are taken into account across several areas of the programme, particularly in the renovation of technical and vocational training programmes.
- Training courses must include, as much as possible, modules to raise awareness of climate issues.
- The programme also provides for the introduction of new courses such as ecotourism, waste management and agroecology.
- In the rehabilitation or construction of training centres, the programme emphasises the use of renewable energies (e.g. solar panels), efficient and non-polluting water supply systems, waste management, and the use of local materials to limit environmental impact.

According to interviewees, while the introduction of green courses was originally pushed by the EU, it now seems to be owned by the government with a strong degree of co-creation. Nevertheless, there is a lack of demand for such courses, partly because of perceived lack of relevance or job prospects. More

broadly though, awareness-raising about the green transition and related skills is challenging in a context of low employment and high poverty levels.

This suggests that despite the good EU and member states' track record as a development cooperation partner that supports skills and TVET, the EU needs to redefine its contribution, if the intention is to work alongside its Global Gateway strategy, with a strong focus on investments and private sector development. There is indeed room to work with the private sector more intentionally as well as to scale up its efforts to link training with actual investments and from there employment opportunities, particularly in the context of Simandou Vision 2040 (Karkare et al., 2025).

For **South Africa**, on the other hand, the EU's toolbox is broader, reflecting the more functioning markets and a stabler context. South Africa has emerged as a key partner for Europe as part of a wider effort to diversify economic partnerships. Interviewees from South Africa point out that European actors have major interests in accessing their country's market, particularly concerning renewable energy technologies – and skills development can act as a way to create an enabling environment for businesses.

A significant part of the EU's support to green skills development in South Africa takes place in the context of the Just Energy transition Partnership (JETP) – an intergovernmental partnership for the energy transition. This is an initiative that the EU has been heavily involved in and promoted with a group of other international actors. South Africa was the pilot country of these partnerships, but they have since been adopted in Indonesia, Vietnam and Senegal (DG CLIMA, 2025). South Africa's 2023-2027 Just Energy Transition Investment Plan (JET-IP) highlights the need for upskilling the population, aligning skills training with green economy job market needs, and ensuring that the education system delivers. According to a progress report in 2025 (JET Project Management Unit, 2025), some institutional arrangements have been made, including establishing the JET Skills Desk under The Department of Higher Education and Training (DHET) and several initiatives are being planned.

Much of the EU's concrete support seems to take place under the NDICI-Global Europe, as several actions under the current MIP target the green transition and skills.

- *Support for South Africa's Just Energy Transition* (2023) focuses on job creation and skills development, particularly for those most affected by the transition. It aims to improve the effectiveness of the TVET system in matching skills to the just energy transition and mitigate the negative

impacts for coal-dependent communities. The action is framed in the context of the JETP, aiming to contribute to its implementation. Taking a Team Europe Approach, it is integrating programmes carried out by member states, such as GIZ's Career Path Development for Employment (CPD4E) programme (JET Project Management Unit, n.d.) and AFD's revival of Eskom's Academy of Learning (DG INTPA, n.d.-a).

- *Sustainable Development of Strategic Value Chains*: *Critical Raw Materials, Green Hydrogen and its derivatives (2025),* another action explicitly supporting JETP, also has a skills development component aiming to expand the skills-base of responsible CRM and green hydrogen value chains (DG INTPA, n.d.-a).
- *Enabling the Just Energy Transition through Job creation and Public Financial Management (2025)* aims at driving job creation by addressing both supply (e.g. through skills development) and demand (e.g. through value chain promotion) issues, as well as public finance management (DG INTPA, n.d.a)

Due to slow implementation of the JETP, investments in skills development have been slow: while R1.1 billion (EUR 56 million) was allocated, only R453 million (EUR 23 million) has been directed to actual training activities up to 2024 (Lehmann-Grube et al., 2024). Some questionable expenditures classified as "skills," such as financing the secondment of a British High Commission employee to the Presidential Climate Commission, contributed to undermine its credibility (Lehmann-Grube et al., 2024). Broader issues also come into play, as the green energy transition remains a politically contested issue in South Africa (Lüpke, 2025; Bookbinder, 2023): green skills development needs to be coupled with tangible job creation, something that is also delayed in the case of South Africa due to the many questions that coal replacement raises in the country.

South Africa is the first country to have signed a Clean trade and investment partnership (CTIP) with the EU in March 2025. Hailed as an 'alternative form of engagement', the CTIP will reportedly focus on green investments, clean energy, skills and technology, and on industrial development along strategic supply chains. The CTIP will be coupled with a Global Gateway investment package of €4.7 billion for South Africa (Jütten, 2025). Pitched as a comprehensive framework for trade, cooperation and investments, the CTIP might offer more space for green skills cooperation – though details are not publicly available yet.

The EU has an important role in skills development in **Ghana**. Several interviewees pointed out that the EU, and its member states, such as Germany, are active in the sector. Under the MIP 2021-2027, the priority "Green growth for jobs" (DG INTPA,

2021b) sets the ambition to better integrate green and digital skills into TVET, as well as higher education and research. To enhance the relevance of curricula to labour market demands, EU interventions aim at boosting TVET-industry cooperation by enhancing private sector engagement in TVET curriculum design, training and assessment, including in green skills (renewable energy and energy efficiency).

The EU–Ghana Pact for Skills (DG INTPA, n.d.-a) under the current MIP is a EUR 25.5 million programme whose primary purpose is to increase youth employment by reducing the persistent mismatch between the skills provided by training institutions and the demands of the private sector, while simultaneously improving employment services to ease access to the job market, including to reassign workers to new occupations. Activities include enhancing the capacity of state institutions to implement key TVET reforms, strengthening cooperation between TVET providers and industry to integrate green and digital skills into curricula, fostering partnerships between European and Ghanaian universities to promote knowledge exchange, improving employment services for job seekers, and supporting TVET institutions to deliver inclusive, high-quality competency-based training and rapid reskilling programmes for workers affected by the green transition (E4Impact Foundation, n.d.). The Action contributes to the Team Europe Initiative (TEI) on Smart, Green and digital recovery in Ghana, which has an overall budget of 800-850 MEUR, and it also includes initiatives by the Czech Republic, Denmark, France, Germany, Hungary, Spain, The Netherlands as well as the EIB (DG INTPA, n.d.-a).

Under Global Gateway, the EU is supporting renewable energy production in Ghana. The Kaleo Solar Power Plant (I and II) is a 2024 Flagship for GG (European External Action Service, 2025). Another key flagship is Kpong Hydropower Dam Rehabilitation, aiming to contribute to ensuring the dam's resilience, safety and security – a Global Gateway Flagship in 2025 (DG INTPA, n.d.-b). The Global Gateway's 360 degree approach aims to couple investments in hard infrastructure with those in soft infrastructure (e.g. social investments, environmental sustainability, enabling business environment, etc.), including skills. However, it is so far unclear how the 360 degree approach is operationalised in the case of these investments in Ghana and whether there is a dimension of skills development or technology transfer included. As such, these two green infrastructure projects, could provide an opportunity for demand-driven VET, to ensure that the Ghanaians not only benefit from improved infrastructure but also improved capacities.

Across the three countries,the EU deploys a differentiated approach to skills development, ranging from development-focused TVET support in Guinea, to coupling specific geopolitically relevant projects and skills in the case of the JETP in South Africa, while engagement in Ghana is more centred on general TVET reforms rather than green skills as such. More broadly, with Global Gateway, the EU is shifting towards more opportunity- and demand-driven approaches in skills development, under the 360 degree approach. This is a welcome direction, as it will enable coupling skills development with concrete job opportunities, if the EU manages to make its ways of working more agile and strengthen its cooperation both with the local and European private sector (Veron and van der Meer, 2025). While this approach brings benefits in terms of potential employability, our analysis indicates that the success of those efforts ultimately relies on a more holistic support. This means not only ensuring that projects related to green energy or infrastructure consistently include strengthening the capacities of local employees, but also recognising the role of basic education as an enabler of skills development in the first place.

3. China: A growing, pragmatic but uneven contribution to green skills development in Africa

China is a longstanding partner for many African countries and a central actor in the green transformation of the continent. China's contribution spans from investments and lending to enabling green energy infrastructures, its role as a leading supplier of green technologies such as solar panels, wind turbines and new energy vehicles (Veron and van der Meer, 2025) as well as early-stage investments in industrial processing. In **South Africa**'s energy transition, especially as a major exporter of clean energy technologies, it is the primary supplier of assembled wind turbines, lithium-ion batteries and electric vehicles. In 2024, South Africa sourced 93% of its lithium-ion batteries, 52% of its fully electric vehicles and 77% of its wind-powered electric generating sets from China (Kiryakova, 2025). In **Guinea**, China plays a major role in the mining sector – particularly in bauxite and increasingly iron ore, combining large-scale extraction with growing investments in processing and infrastructure. In **Ghana**, China is a major actor in the solar PV sector, having invested in several large scale projects (United States Institute of Peace, 2025; Ola, 2016).

Despite this leading role in African countries' green transformation, the country's role in green skills development is more difficult to assess. Challenges arise mainly from patchy information of concrete initiatives in the public domain and an apparent mismatch between political declarations and traceable initiatives on

the ground (Veron and van der Meer, 2025). One additional challenge arises from the fact that some skills provision may be embedded in private sector activities, which tend to be less traceable or ancillary to much broader interventions.

With these caveats in mind, available information suggests that China is forming partnerships in green sectors in the three countries. The Forum on China–Africa Cooperation (FOCAC) has consistently included language on education and skills training, as well as green transformation (King, 2019). In the context of the 2024 FOCAC Summit, and **South Africa**'s President Cyril Ramaphosa's concurrent state visit to China, South Africa's Department of Higher Education and Training (DHET) and the Beijing Polytechnic College (BPC) signed a Joint Declaration of Cooperation focusing on TVET. The agreement connects nine South African TVET colleges – one from each province – with the BPC, committing to joint research, faculty and student exchanges, curriculum development, technology transfer and capacity building. While not exclusively framed as green skills, the cooperation aligns closely with South Africa's green transition priorities by strengthening technical education and vocational training systems needed for sustainable industrial development (Inner City Gazette, 2025).

In the case of **Ghana**, the Ghana–China Climate Summit, held in September 2025, showcases the drive to intensify cooperation in climate change, with some aspirations to explore a more formal cooperation (such as a Memorandum of Understanding (MoU)) between China and Ghana on green development (Africa-China Centre, 2025; Think Energy Media, 2025). The discussions also indicated that China is willing to share technology and expertise with Ghana, for instance through training programs (Mutethya, 2025).

With **South Africa**, cooperation also takes place in the BRICS context, which creates a conducive forum for cooperation around the green transition and green skills. As BRICS members, China and South Africa have a shared platform for cooperation on the green transition and skills development. For instance, the BRICS Technical and Vocational Education and Training (TVET) Cooperation Alliance, established in 2022, serves as a multilateral framework for sharing knowledge, resources and best practices to enhance employability and the relevance of TVET systems (BRICS TVET Cooperation Alliance CHARTER) (BRICS Brasil, 2025a). BRICS has also created an energy research cooperation platform, which includes collaboration on skills development to support sustainable energy transitions (BRICS Brasil, 2025b).

Partnerships for skills development are also taking place at a more operational level. In **South Africa**, EWSETA has partnered with the Chinese Culture and

International Education Exchange Centre (CCIEEC) to establish a comprehensive renewable energy education and industry system in the country's TVET colleges and to enhance the international standards of South African TVET colleges over the next few years (Bulbulia, 2024). This also includes study visits and longer stays in China, where lecturers from TVET colleges will receive a year-long training in solar PV manufacturing – in line with China's rising position as a destination for African student exchanges. The cooperation also includes building manufacturing plants within the premises of TVET colleges that have unutilised land. The project thus is designed to stimulate economic activity within the TVET colleges themselves, providing real-time practical exposure for students (Interview, 2025).

Research suggests that skills development is happening as part of larger projects, although here the evidence is more complex to trace and assess. China's Ministry of Commerce and the Ministry of Ecology and Environment issued the Green Development Guidelines for Overseas Investment and Cooperation (2021) and the Guidelines for Ecological Environmental Protection in Foreign Investment Cooperation and Construction Projects (2022) that encourage Chinese contractors and developers to strengthen human resources development, environmental protection training and capacity building. However, neither document explicitly emphasises developing these capabilities among local workers or within local communities (Veron and van der Meer, 2025). These guidelines are part of a wider push to improve sustainability standards and local community beneficiation, to better align practice to international standards and make up for limitations in local legislation as well as to tackle the negative perceptions around Chinese projects in Africa, including in lack of knowledge transfer (King, 2019).

In **Guinea**, China plays a major role in the $20 billion Simandou Vision 2040 iron ore project, which is the largest of its kind globally. The initiative aims to position Guinea as a top iron ore producer, create around 60,000 direct jobs and stimulate regional value chains through infrastructure such as the Trans-Guinean Railway, a deep-water port and the Simandou Academy for local capacity building. Through the Simandou Academy, according to a recently signed agreement, 14 Guinean students will receive comprehensive engineering training over five years in China, to equip Guinea with highly qualified technical professionals capable of supporting major infrastructure and mining projects, essential pillars of national development (Les Infos de Guinee, 2025). It is also worth highlighting that rather than short courses, this is a longer training, which takes time. While this engineering training will be paid by Guinea, it does indicate that both Guinea and China are investing in a longer term partnership in the context of Simandou 2040.

Simandou 2040 is seen by several interviewees as a real opportunity for vocational training and the development of sustainable value chains. The involvement of the Ministry of Environment, the Ministry of Higher Education, the Ministry of Vocational Training and the Ministry of Pre-University Education in the Academy is positive, showing the relevance of Simandou as a core priority of the current government. It also illustrates the rather pragmatic approach of China to skills development, where skills are incorporated into industrial projects when there is an interest to do so.

China played a central role in **Ghana**'s Bui Dam, providing most of the financing through Exim Bank of China and executing the project via Sinohydro,[5] making it a flagship example of China-backed energy infrastructure in West Africa. Despite the significance of the project, local technological learning and knowledge transfer were minimal. Although 91% of the workforce during construction was Ghanaian and most construction materials were sourced locally, Chinese workers still covered project management and technical oversight roles, with local workers largely confined to low-skilled roles after brief two-week training sessions or on-the-job instruction (Bhamidipati et al., 2021). Upon completion, the Bui Power Authority lacked the operational and maintenance capacity, leading to Sinohydro's re-engagement for major maintenance. The turnkey contract structure and absence of a government-led strategy for capacity building meant that opportunities for developing domestic expertise in dam construction, engineering and maintenance were largely missed, leaving Ghana with limited skills gains despite high local participation during construction (Lema et al., 2021).

Finally, Luban workshops have a key role to play in China's engagement around skills development in South Africa and Ghana. The Luban workshops are a key capacity building initiative, with a goal of sharing China's TVET models with other countries and cultivating competitive local skilled talents (Veron and van der Meer, 2025). In **South Africa**, the Luban workshop at Durban University of Technology (DUT) was inaugurated in December 2019 as the first in the country (Wei, 2023). Chinese officials have described the initiative as a "goodwill present" to South Africa, thus both a symbol of soft power and a practical training programme (see Mahtani, 2023). Indeed, the Luban workshops are as philanthropic as they are strategic, in terms of improving China's image in partner countries while simultaneously serving economic interests and promoting Chinese technologies (Lemon and Jardine, 2025). Although not named as a green skills initiative, the workshop in South Africa supports capabilities essential for the country's transition to a green economy. In **Ghana**, the Luban workshop at the

[5] Sinohydro is a Chinese state-owned enterprise engaged in hydropower and civil engineering construction.

University of Energy and Natural Resources (UENR) focuses on equipping young people with skills in sustainable agriculture and fostering employment opportunities in the Bono Region (University of Energy and Natural Resources, 2024).

Our research points out a number of ways in which China engages in (green) skills development in the three countries, as a way to strengthen political ties and goodwill, enlarge markets for its own products, mitigate reputational risks and enhance the viability of green infrastructure development. Our interviewees consistently noted that China's skills development initiatives are practical and tied to concrete job opportunities arising from investments or specific projects. Still, our research pointed to examples of broader partnerships and initiatives such as China's partnership with EWSETA in South Africa and engagement in Simandou 2040 in Guinea, highlighting another side of Chinese engagement that is more focused on the wider green transition and long-term skills development.

Our study also reveals mixed views on China-backed training activities and knowledge transfer. In **Ghana**, an interviewee pointed out that Chinese companies have shared expertise that helps operating and repairing EVs charging stations imported from China but that Chinese entities can be quite selective and can choose to withhold strategic knowledge (Interview, 2025).

Conclusions

This research paper has shown the extent to which green skills development is an emerging need in the three African countries. Investing in skills can support a just transition to a greener economy, as well as underpin national demands for sustainable development, growth and employment. Still, those three countries continue to face many challenges. Partnering with external actors, such as the EU and China, can help them address some of the technical knowledge gaps or the more systemic issues that they face.

Europe is a recognised actor in skills development in the three countries. The EU institutions and the member states together bring added value in strengthening regulations and policy frameworks that can embed green skills in national education and labour systems, as well as offering concrete TVET opportunities. Their added value lies in their long-standing and comprehensive support, although stronger linkages with actual demand and job creation need to be strengthened.

With Global Gateway, the EU's approach is changing and it may result in being narrower, with a focus on supporting green skills to foster specific investment projects where the EU has an interest. This would mark a shift away from systemic approaches that take into account the broader education system and job market of partners. This change may bring in benefits and target skills investments where the job prospects are the highest, but moving to narrower approaches also includes some trade-offs that the EU needs to consider carefully.

While China does not necessarily use green skills or the green transition as an entry point, it is extensively involved in green infrastructure and industrial development. China's involvement in the skills development sector has been more linked to specific investments in areas like mining, dams, or solar PV, creating pockets of technical capability. Though unevenly, this approach has proved pragmatic and able to provide some direct response to the interests of the partner countries, which largely revolve around job creation and value-addition. The Luban workshops – both their deployment and the political significance they acquired – and examples of partnership with specific training organisations like EWSETA, provide indications of an emerging wider approach. This suggests that China is adopting a more nuanced strategy that fosters human capital development of its partners (Lemon and Jardine, 2025).

This raises important considerations for the EU. As a market leader in green technology exports, industrial actor and green energy contractor in Africa, Europe should consider how this Chinese presence will shape green skills needs on the continent – and what role Europe can play in it. Secondly, Europe never was the sole provider of skills on the African continent, but the co-existence and established presence of other actors calls for a reflection on how to limit duplication or parallel efforts. In a way, our research points out to many differences between the EU's and China's approaches, but also to some similarities in their respective evolutions – with China moving into the territory of wider skills development support and the EU in a stronger integration of skills development with investments under the Global Gateway. Going forward, this could blur the lines of their respective added value but also open space for mutual learning.

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