

# RENEWABLE ENERGY AND MOROCCO'S NEW GREEN INDUSTRIES CAN EXPAND WOMEN AND YOUTH EMPLOYMENT THROUGH SUSTAINABLE DEVELOPMENT

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December 2024

## Key Points

- Morocco is a regional leader in renewable energy development, consistently ranked as one of the world's top three most attractive markets for renewables investment, according to EY (Ernst & Young), when normalized for GDP. No other Middle East and North Africa nation places among the top 10, and Jordan is the only other Arab country in the top 25. Already at 38% in 2022, the kingdom is well on track to meet its target of reaching 52% of generation capacity from renewables in 2030.
- Morocco's success stems from its multi-faceted green energy ecosystem that is giving rise to international renewable energy export supply chains based on production of green hydrogen, in the form of green ammonia, as well as phosphates, other minerals and metals, fertilizers, agri-food products, and electric vehicles.
- Morocco's national strategy for sustainable development includes an explicit priority of expanding employment opportunities among women, youth, and rural populations. As rising green industrial manufacturing and green agricultural production are becoming drivers of long-term, private sector employment, a synergy is emerging between Morocco's efforts to expand its already significant renewable energy sector and its objective of increasing the number of women and young people engaged in formal employment. Expanding job creation will require robust coordination between Morocco's green energy and training ecosystems to overcome specific challenges facing women and youth in low-income urban and rural areas.



## Introduction

Morocco's impressive renewable energy development is driven by its dynamic green energy ecosystem, in which renewable energy is being incorporated into major sectors of the economy. The North African country is creating international renewable energy export supply chains centered around its production of green hydrogen, in the form of green ammonia, as well as phosphates, other minerals and metals, fertilizers, agri-food products, and electric vehicles (EVs) — the manufacturing of which is increasingly powered, in part or entirely, using renewable energy. Morocco's green energy ecosystem based on renewable energy can expand job opportunities for women, youth, and rural populations.

For green industrial manufacturing, green agrifood production and agribusiness, and related sustainable solutions businesses as well as the adjacent retail services and sales industries to significantly expand employment, these sectors need to generate micro, small, and medium enterprises (MSMEs). MSMEs account for about 95% of private sector activity in Morocco and 50% of job creation. The kingdom's approach to achieving a prosperous society through sustainable development and the expanded employment of young

people and women will succeed to the extent to which its green energy ecosystem encourages entrepreneurship among those populations.

The creation of green industrial manufacturing and sustainable solutions MSMEs that started at the beginning of the current decade represents a third wave of development in Morocco's start-up ecosystem. This new phase requires a self-sustaining, bottom-up dynamic in which MSMEs in green industry and adjacent sectors create sufficient opportunities for employment and soft skills development to stimulate the growth of more MSMEs that will, in turn, do the same.

In achieving the goal of generating and supporting a self-sustaining, bottom-up dynamic, Morocco's fertilizer manufacturing giant the OCP Group (originally, Office Chérifien des Phosphates) and its constellation of subsidiaries and associated entities play a central role. The hub for these entities is the OCP-funded Mohamed VI Polytechnic University (UM6P), including sustainable development "next industries" developer InnovX and Al Moutmir, which assists farmers with innovative technologies and best practices for sustainable agriculture and provides training for running retail services and sales businesses connected to the agricultural sector.

The expansion of employment opportunities also greatly depends on robust coordination between the country's green energy and training ecosystems. To broadly expand employment opportunities through the new third wave of MSMEs created via the OCP constellation, other holding companies or independent start-up ventures will require training ecosystems to overcome specific challenges facing women and youth in low-income urban and rural areas.

## Morocco's Green Energy Ecosystem: Renewable Energy Export Supply Chains

By 2027, Morocco is slated to possess about 9.7 gigawatts (GW) of solar and wind power generation capacity, due to

projects begun during the previous decade. Beyond these projects, newer renewables mega-projects, such as the combined 5 GW solar power complex and 5 GW wind farm being developed by Total Eren as part of its \$10 billion green ammonia facility, are directly driven by the needs of Morocco's green energy ecosystem and international renewable energy supply chains.

Morocco's development of renewable power generation and storage infrastructure is integral to the country's efforts to develop sustainable, high-value-added industrial and agricultural production. Morocco holds 73% of the world's phosphate rock reserves from which the phosphorus used in synthetic fertilizers is derived. OCP's international sales account for over 20% of Morocco's export revenues. The sustainability of OCP's operations through energy transition is thus a vital national interest, placing the company in a leadership role in the development of Morocco's green energy ecosystem and capabilities as a global sustainable solutions provider.

OCP's central role in renewable energy and green tech development has been boosted by Morocco's rise as a global green hydrogen leader, prompted by the aim of using the derivative green ammonia to supply the company's lucrative fertilizer manufacturing. Prior to the outbreak of the 2022 Russia-Ukraine war, OCP imported 1.5-2 million tons of conventional, natural gas-derived ("gray") ammonia annually to meet its production requirements and is now eyeing a 58% increase in production capacity to supply global fertilizer shortfalls. OCP has made hydrogen import replacement a top priority, announcing plans in 2023 to construct a green ammonia plant using renewable energy to replace gray ammonia imports with the goal of meeting its own requirements and producing excess for export by 2032.

Green ammonia and fertilizers made with green ammonia form the backbone of Morocco's international renewable energy supply chains. With the completion of the several foreign private sector projects currently under development, Morocco could export over 1-3 million tons of green ammonia annually. Since fertilizers and hydrogen imports form two of the six initial sectors targeted under



Photo above: An aerial view of the solar mirrors at the Noor 1 Concentrated Solar Power plant, some 20 km outside the central Moroccan town of Ouarzazate on February 4, 2016. Photo by FADEL SENNA/AFP via Getty Images.

the EU's Carbon Border Adjustment Mechanism (CBAM), the development of green ammonia capacity is a matter of urgency for both Morocco and its European customers.

Morocco's agri-food sector accounts for about 21% of its exports by value and will form the basis of a Morocco-to-Europe renewable energy supply chain. Rabat's Green Generation 2020-2030 plan seeks to enhance agricultural production's sustainability through renewable energy use, particularly to power seawater desalination to provide sufficient water for the sector and to produce fertilizer, both basic inputs for Morocco's agri-food production, greening its agri-food exports.

EV manufacturing constitutes a rising industrial pillar of the kingdom's green energy ecosystem and is in the process of forming the basis of another Morocco-to-Europe renewable energy supply chain. The automotive industry already accounts for about 25% of the country's GDP. With annual production capacity soon to top 1 million vehicles, Morocco aims to produce 250,000

electric cars annually. The European market accounts for 90% of Morocco's exports, with Europe's two best-selling models – the Peugeot 208 and Renault's Dacia Sandero – made in the North African country. Manufacturing their EV versions on Moroccan soil is a near-term likelihood, as Germany's Opel and Italy's Fiat have both started producing EV models locally.

The European Commission's directive to phase out all fossil fuel-powered vehicles in the EU by 2035 makes green mobility another Moroccan national priority. The kingdom can leverage its massive phosphate reserves as the EV industry shifts from lithium batteries using nickel, manganese, and cobalt to lithium iron phosphate (LFP) batteries. By manufacturing LFP batteries, Morocco would enjoy a cost advantage of upward of 70% per kilogram, although this would first require it to expand its phosphate and phosphoric acid production. OCP's additional output of phosphates and phosphoric acid is likely to be powered by renewable energy, as the company reaches its 2040 carbon neutrality goal, forming

the basis for Moroccan EV exports to constitute another renewable energy export supply chain.

Since 2023, five Chinese EV battery manufacturers have made substantial investments in local EV battery production plants and battery metals recycling facilities, cementing Morocco's position in the EV battery supply chain. If these EV battery recycling ventures are powered with renewable energy, the country could further reduce the carbon footprint of its LFP batteries to achieve a significant market advantage.

Beyond battery metals, Morocco is developing other green metal production. In December 2022, steelmaker Sonasid, jointly owned by ArcelorMittal and Al Mada, produced the country's first consignment of green steel with 100% of the material recycled in Morocco and 85% of the processing powered by renewable energy. While Morocco has not yet produced green aluminum, it inaugurated an aluminum waste recovery plant in 2024. These green metals could also be used for automotive components and car bodies as well as in Morocco's aviation components exports.

## Green Manufacturing Entrepreneurship and the Evolution of Morocco's Start-up Ecosystem

The third wave of development of Morocco's start-up ecosystem is focusing on green industrial manufacturing and agri-food production, as well as sustainable solutions businesses that can service both domestic and international markets. The Moroccan government's forward-leaning initiatives for improving business conditions for MSME start-ups over the past 20 years have spurred the three phases of advancement in its innovation ecosystem.

From 2000 to 2010, Morocco's innovation ecosystem focused on developing start-ups in the information and communication technology (ICT) sector, assisted by the creation of the National Agency for the Promotion of Small

and Medium Enterprises, later renamed Maroc PME. In 2010, Morocco moved into the second phase with steps like the Maroc Numeric Fund (MNF), focused on high-growth potential start-ups in ICT along with 20% of its capital invested in other innovative deep technologies, including green technology sectors. This and other second wave developments occurred concurrently with the advent of a concerted drive for industrial-scale renewable power production.

As Morocco's renewable power efforts reached greater maturity, Rabat assisted second wave start-up development, notably entering into a 2016 strategic partnership with the country's central guarantee fund, Caisse Centrale de Garantie (CCG), to create the Innov Invest Fund for seed, early stage, and venture capital financing services. In the third wave of development, the CCG transformed in 2021 into a state-owned national company for guarantee and financing of entrepreneurship named Tamwilcom. StartUp Maroc, an accelerator since 2011, became certified by then CCG in 2016 as part of the Innov Invest Fund, and now operates its StartUp Maroc 2030 incubator to help high-potential start-ups align their business trajectories with Morocco's strategic 2030 sustainable development goals — reflecting the transition toward a third wave orientation focused on industrial-scale green manufacturing and sustainable solutions business.

## The Third Wave Green Manufacturing Entrepreneurship in Morocco

The third wave in Morocco's start-up ecosystem was heralded by the 2022 formation of OCP-affiliated InnovX and several subsidiaries to efficiently utilize existing resources to create multibillion-dollar green industries. Combining second wave venture-building with industrial company management, InnovX is developing its own SMEs for industrial-scale green manufacturing and the provision of turn-key sustainable solutions. A subsidiary of the OCP-funded UM6P, InnovX is charged with utilizing UM6P's assets to support OCP in meeting its net-zero objectives. Using in-house technological development

to foster renewable energy and green-tech related businesses, InnovX seeks to de-risk its operations as it aims to become a global sustainable solutions provider.

Outside the OCP/UM6P constellation, the Green Innov Industry Investment holding company (Gi3) takes a similar but more limited third wave approach by manufacturing components and equipment related to renewable power production, storage, and use.

The robustness of the third wave ecosystem will be influenced by the availability of financing. CDG Invest, the investment arm of Caisse de Dépôt et de Gestion (CDG) that manages long-term savings, is playing a pioneering role. Mandated to invest in export industries where there is a gap in private equity funding, CDG Invest recently created its Generation d'Entrepreneur Fund for industry and services aimed at achieving a demonstration effect by proving a use case for such investments. Determining the correct scale of investment, CDG Invest acts as both gatekeeper and quality assurance mechanism of the third wave start-up ecosystem. The fund is a promising development and could serve as a precedent for other financing mechanisms to expand Morocco's green industrial manufacturing ecosystem.

## The Green Energy Ecosystem and Extending Employment Opportunities to Women, Youth, and Rural Populations

Expanding employment opportunities requires targeting three distinct segments of Morocco's population: highly educated women, urban women and youth with lower levels of education and training, and women and youth with low levels of education and training in rural areas. Closing the gender gap in Morocco's labor force participation over the next 50 years would increase income levels by about 20%. Morocco's New Model of Development has oriented the new green industrial manufacturing toward expanding the proportion of citizens engaged in formal, long-term employment. The 2021 report of the Royal Commission on the New

Model of Development established quantitative targets, including doubling by 2035 both GDP per capita and women's labor force participation and reducing the share of informal jobs from 60% to 20%.

Morocco's third wave shift toward green industrial manufacturing and sustainability solutions has shown promise when it comes to generating employment opportunities for highly educated women, although often as senior executives and managers due to a general lack of research positions.

Green industrial manufacturing driven by renewable energy has significant potential to employ individuals with low levels of education in urban areas, provided they acquire appropriate technical vocational training. A large proportion of youth are unemployed, outside the educational system, or not engaged in any skill training — a population known as NEETs (not in employment, education, or training). Morocco's 2023 youth unemployment stood at 22.61%, with at least 28% of youth being NEETs. Expanding employment requires providing the NEET population with skills appropriate for green industrial manufacturing and adjacent retail service and sales sectors.

MSMEs in green industrial manufacturing and adjacent retail services and sales also require individuals who can perform open-ended tasks that require critical thinking, resilience, and the ability to constructively interact with a complex professional environment. These "soft skills" are a gatekeeper for entry into the third wave ecosystem for those without technical skills. The ability to avoid falling into the NEET population or to transition out of it is heavily determined by the possession of soft skills.

The NEET population is disproportionately female, with some estimates ranging as high as almost 75%. Women experienced a net loss of about 500,000 jobs between 2014 and 2021. Morocco's 2023 female labor force participation was 19.8%. The structural obstacles to women's labor market participation include cultural factors relating to gender norms. Additionally, Morocco's technological advancements in both agricultural

production and industrial manufacturing have had a disproportionately negative impact on women's employment. Entrepreneurship can be conducive to women's economic empowerment, enabling them to choose forms of work that fit their personal preferences, skills, and constraints.

For the most destitute women, a more holistic approach that focuses on family systems is required. A uniquely successful example is the Oum Keltoum Social Complex operated by the El Ghali Berrada Foundation in the slums within the Sidi Moumen district in the east of Casablanca. Helping to ensure the next generation does not enter the NEET population, the Social Complex has graduated over 4,000 adults with vocational training certificates, while engaging 5,700 children through its nursery, preschool, and daycare services.

Agriculture accounts for 39% of Morocco's total formal employment. Despite agricultural modernization, farming in Morocco is still primarily a small business, with 71% of farms being less than 5 hectares. The Green Generation Plan's goal of elevating 400,000 farming households into the middle class while enhancing the sustainability of the country's agricultural production will depend greatly on the large-scale expansion of renewable power production for water desalination and green ammonia for fertilizer production. Renewable energy can boost small farmer crop yields by increasing the availability of more affordable green ammonia-based fertilizer.

The Al Moutmir organization plays a unique role in augmenting the value of small farmers' production and the expansion of entrepreneurial opportunities in Morocco's rural communities. Starting in 2018 as an OCP initiative to expand domestic fertilizer use, the UM6P-based Al Moutmir has evolved into an end-to-end extension services organization for farmers and rural populations, including market connections and capacity building in fertilizer-related retail sales and spin-off businesses, with specific programs for female entrepreneurship. Customizing its engagement to local needs, Al Moutmir provides equipment and training in technical, business, and soft skills to market agricultural products as sustainable businesses.

Al Moutmir is the conduit for the OCP constellation of green industrial manufacturing and sustainable solutions businesses to reach Morocco's rural farming communities, enabling the successful adoption of renewable energy-powered technologies to improve the agricultural economy, such as solar-powered storage units in communities of small farmers.

## Training Ecosystem

To meet InnovX's need for a large skilled workforce to staff its green manufacturing and industrial project development operations, the OCP/UM6P constellation is revamping OCP's hands-on training centers in the African Academy for Industrial Training (AAIT). Headquartered at UM6P's Benguerir campus, AAIT offers continuous training and certification in the four main geographical locations of OCP's industrial operations: Jorf Lasfar, Safi, Khourigba, and Benguerir. Utilizing the existing training infrastructure, AAIT is creating an Agriculture, Green Energy, and Water Institute to develop training programs for technicians to install, operate, and maintain InnovX's green manufacturing and sustainable solutions businesses.

For MSMEs outside of the OCP constellation — whether developed through holding companies like Gi3 or as independent start-up ventures — coordination with the training ecosystem is a more pressing issue. Morocco's training ecosystem already boasts successful private sector-based programs that can be harnessed through deliberate coordination with the green industrial manufacturing and sustainable solutions sectors. Two of these programs are INJAZ Al-Maghrib and Education for Employment-Maroc (EFE-Maroc).

## Current Attitudes Within MSMEs About Commercial Renewable Energy Use

Although the expansion of renewable power through Morocco's green energy ecosystem is giving rise to new MSMEs in the green industrial manufacturing and sustainability sectors, a survey conducted by the



Photo above: Women shell argan nuts to make oil near Morocco's western Atlantic coastal city of Essaouira, on October 15, 2022. [Photo by FADEL SENNA/AFP via Getty Images.](#)

Economic Research Forum (Cairo) for this study found a certain hesitancy about renewable energy use among current MSMEs outside these sectors. The survey data suggest that attitudes toward renewable energy among MSMEs are primarily influenced by each firm's experience with the electricity transmission system. Firms that experienced maintenance or service problems, received unexpectedly high bills, viewed their power costs as too expensive, or did not trust the supplier saw no benefits from the possible adoption of renewable energy. The same result was found for MSMEs that were unable to power heavy appliances. MSMEs that experienced wasted perishable products or discarded damaged goods held a negative view of renewable energy adoption, presumably assuming renewable energy use would lead to even less reliability in the energy supply. Since MSMEs providing retail services and sales adjacent to the green industrial manufacturing and sustainability sectors represent a large potential source of private sector employment, these concerns need to be understood and addressed.

## Recommendations

- Green mining, metals processing, and manufacturing powered by renewable energy will require components and equipment that can be manufactured by SMEs or serviced by them. Similarly, the components involved in the storage and transport of green hydrogen and green ammonia, such as short-distance pipes, compressors, pumps, and heat exchangers, can be manufactured or serviced by SMEs in Morocco. Training and finance should be facilitated to help the creation of these businesses as well as the adjacent sectors of retail services, such as installation and maintenance, as well as retail sales.
- Renewable energy to power water desalination, green ammonia-based fertilizer production, water irrigation, and food storage can directly enhance the value of output from small farms, in turn stimulating more green industrial manufacturing by requiring the production of climate-smart irrigation and food

storage systems. More affordable green ammonia-based fertilizers and green agricultural equipment will also promote the expansion of retail services and retail sales MSMEs.

- While the provision of technical skills training should be expanded, entrepreneurial and soft skills need to be made more widely available to promote retail services and sales.
- The extension of financing for adjacent retail services and sales MSMEs will be important to expand private sector employment opportunities more broadly.
- Morocco's ongoing industrial transformation will continue introducing disruptive technologies that alter the labor market. Female entrepreneurship should be regarded as a social insurance policy. While anchored in the green energy ecosystem, start-ups led by women in the service and sales sectors, as well as auxiliary service sectors such as MSMEs that provide childcare, food delivery, or transportation services for employees in the green industrial manufacturing and sustainability sectors, should similarly be supported by an array of start-up services from incubation to financing.

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Main photo: A Moroccan flag flies next to a wind turbine on June 28, 2010, at a wind farm near Tangiers shortly after its inauguration by Moroccan King Mohammed VI. [Photo by ABDELHAK SENNA/AFP via Getty Images.](#)

## Conclusion

The synergistic convergence of renewable energy, sustainable development, and expanded employment envisioned by Morocco's New Model of Development and its Generation Green Plan is becoming manifest through the country's green energy ecosystem. Renewable power generation capacity will continue to expand with the growth of Morocco's international supply chains based on the export of green industrial and green agricultural products. With appropriate oversight and coordination with its training ecosystem, the country's third wave of start-up development led by the green industrial manufacturing and sustainable solutions sectors can significantly expand employment opportunities among women, youth, and rural populations. In this manner, renewable energy will further contribute to the realization of Morocco's national ambition to become a more prosperous society through sustainable human development.