

The case for Morocco to be a key player in regional Climate Compatible Growth

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Key Messages

- Morocco can be a key supplier to EU and UK markets for green hydrogen, electric vehicles, green ammonia, low carbon fertilizers, and renewable electricity.
- Development of phosphate value-adding to fertilizer has made Morocco into a large ammonia consumer, precipitating strategic moves in green hydrogen/ammonia.
- Lithium-Iron-Phosphate (LFP) battery technology will increase demand for phosphate, increasing Morocco's importance as a supplier to carbon-constrained markets.
- Morocco's experience in renewable energy development, resource value-adding, education, and manufacturing is being shared, benefiting other African countries.
- Morocco, with existing trans-Mediterranean power lines, could help other North and West African nations access Northern electricity markets.



Morocco can be a regional hub for clean energy and low carbon materials. EV: electric vehicles; GA: green ammonia; LCF: low carbon fertilizer; RE: renewable electricity; GH: green hydrogen

Introduction

As High Income Countries (HIC; particularly in the European Union, Canada, and the USA) commit to net zero carbon emissions by 2050, geopolitical implications are expected, particularly for those that supply energy and materials to feed the transition. This briefing provides insights into how one Low to Middle Income Country (LMIC), Morocco, has turned the challenge into opportunities for successful, just, and climate compatible economic growth.

Thanks to natural endowment and visionary policies, Morocco is primed to be both a beneficiary of the low carbon transition, by becoming a key resources and services exporter, and an agent for change in greater Africa through South-South co-operation.

This briefing is a literature review of relevant Moroccan strategies in the context of energy system and transport decarbonization, and an outline

of their geopolitical implications for Morocco and greater Africa. The briefing also discusses the shifting trends associated with Morocco's greatest material resource: phosphate.

As HIC regions undertake low carbon transition, there are opportunities for Morocco to benefit as HICs adjust their demand profile for materials to deliver their strategies and achieve the common goal of net zero emissions by 2050.

Context

In response to the Paris Agreement, many markets close to Morocco have committed to deep emissions cuts over the next 30 years. Considering the four main sources of man-made carbon emissions – electricity, mobility, heavy industry, and agriculture, Morocco is well positioned for economic growth as Europe, the UK, the USA, and Canada seek to lower emissions in all of these areas. As

carbon border taxes come into force, low carbon supply chains will become key beneficiaries.

In this context, Morocco — a stable North African country — has three key advantages: 73% of the world's phosphate reserves [1], some of the world's best renewable energy resources [2, 3], and a location on the doorstep of major international markets seeking low carbon products.

Electricity

Morocco is already a large producer of renewable energy, including the world's largest concentrated solar power plant: the Noor Complex in Ouarzazate [4]. Morocco achieved its 2020 goal of 42% installed renewable electrical generation capacity [5, 6] and is enacting strategies to achieve its next stated goal of 52% renewable electrical generation capacity by 2030 [6, 7]. With two high voltage direct current (HVDC) connections to European grids [8], and a possible additional HVDC connection to the UK in planning [9], Morocco's success in green electricity could be an exemplar for other LMICs, especially in the Middle East and North Africa (MENA) region.

Mobility

Europe's movement toward ending internal combustion engine (ICE) cars by 2030 [10] has seen rapid growth in the electric vehicle (EV) market in Europe. Indeed, in 2020, Europe overtook China in new EV registrations, and showed the largest global year-on-year increase [11]. Morocco can benefit from this in two key ways.

Firstly, Morocco is a significant car manufacturer, with 2019 export revenues of USD\$10.5b [12], making it well-placed to meet the expanding EV manufacturing market over the next decade. Car makers established in Morocco have strategies for EV production for European markets [e.g., 13, 14].

Secondly, a shift in battery chemistry strategy is emerging where, due to issues including safety, cost and resource availability (particularly for nickel and cobalt) the lithium-iron-phosphate (LFP) battery type is being flagged as an alternative chemistry of choice for EVs [15, 16].

If the trends of both EV and LFP battery demand continue, Morocco's importance as a phosphate supplier will increase.

Heavy Industry

For sectors such as cement and fertilizers, with process heat requirements and significant process CO₂ emissions, Morocco is set to benefit from

trends in lowering emissions from heavy industry. To address this challenge, technologies favoured include carbon capture, utilization, and storage (CCUS) and electrification and hydrogen [e.g., 17].

Regarding CCUS, the potential for geosequestration in Morocco and neighbouring Algeria has been given a modest but improving assessment [18].

Phosphate and Hydrogen

Today, industrial hydrogen comes from fossil fuels, but having plentiful renewable energy means Morocco can be a large-scale producer of green hydrogen, both in pure form and as a precursor to chemicals such as methanol, ammonia, and fertilizer.

Morocco's commitment to reduce its carbon impact, and the little sovereign fossil fuel resources at its disposal, precipitated green hydrogen research. This has put it strategically ahead of many other nations [19]. The recently announced strategy to use green ammonia in fertilizer production [e.g., 20] will place the country at the forefront of green hydrogen production and increase the competitiveness of Morocco's fertilizer exports into carbon constrained markets.

This has the added advantage that Morocco, rather than importing ammonia for fertilizer production, can now become a sovereign producer, and capitalize as European markets seek green ammonia.

Europe and the UK are flagging massive demand for green hydrogen for mobility markets such as cars, trucks, trains and buses [21, 22], and the EU is a leader in the emerging market for hydrogen in iron making [23]. Morocco is geographically and logistically an ideal supplier. As stated internationally, the key to a strong hydrogen export capability is to start with a strong domestic hydrogen industry [e.g., 24].

Collaboration

The EU has a Green Partnership with Morocco, aiming to "*strengthen their cooperation in the fight against climate change, and to work together on advancing their energy transition, protecting the environment and boosting the green economy*" [25].

Morocco is one of the most active countries for South-South Cooperation. Regarding phosphate and fertilizer development, Morocco has several international collaborative partnerships [e.g., 26]. Morocco is also active in education and training for students from many countries in Africa. According

to the Moroccan Agency for International Cooperation, 9,000 foreign students from 44 African countries were studying in Morocco across all disciplines in 2017 under their program, 75% of whom were on scholarship [27].

Morocco, through South–South Cooperation, could be the conduit to allow other African LMICs to access European electricity markets by assisting them to export renewable energy via Morocco’s HVDC connections. The cooperative exemplar for this is the upcoming Nigeria–Morocco Gas Pipeline project, set to bring gas to Europe from 16 West African Countries [28]. While the movement of gas in this manner is not necessarily climate compati-

ble (although it can be argued that gas is a “transition fuel” and has a lower carbon footprint than coal or oil), it is an example of how Africa can become an energy supplier to neighbouring HICs, providing energy supply alternatives to other suppliers.

Power purchase agreements (PPAs) are the key to securing energy development finance. If other West African LMICs can secure — with Morocco’s assistance — PPAs with European and other geographically accessible markets, this can become a basis for economic investment within those countries. This could lead to local infrastructure development and, in time, in-country energy security — a key pillar in economic development.

Conclusions and Recommendations

- As African, European, North American, Middle Eastern, and UK countries set emissions reduction targets, Morocco can be a key supplier of low carbon imports, including green hydrogen, green ammonia, low carbon fertilizers, renewable electricity, and electric vehicles.
- The EU is acting, establishing a Green Partnership with Morocco. The UK could/should also build a Green collaboration with mutual benefit.
- As with the Nigeria–Morocco Gas Pipeline Project, which should allow 16 West African countries to access European energy markets via connections at Tangier, HVDC connections through West African regional grids could bring renewable electricity from LMICs into European and UK markets.
- We recommend UK–Morocco strategic trade in low carbon energy, fertilizers, and manufactured products to help the UK achieve its emissions reduction targets, with mutual benefit to the UK and Morocco.
- We recommend the UK and Morocco partner in research dealing with green hydrogen, innovative ammonia, and fertilizer production;
- We recommend that, rather than dealing with many African LMICs individually, the UK work with Morocco — which has already established South–South relationships — as a hub for driving climate compatible growth across Africa, benefiting from Morocco’s existing strong collaborations with many African LMICs in education, agriculture, energy, and mineral resources projects.

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Notes

Climate Compatible Growth

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