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Alexandra Gritz and Guntram B. Wolff*

CBAM, Hydrogen Partnerships and Egypt's Industry: Potential for Synergies

This article examines the hydrogen partnerships between Germany, the EU and Egypt in the context of the EU's Carbon Border Adjustment Mechanism (CBAM). Germany, the largest future hydrogen importer in the EU, and Egypt, a country with an ambitious hydrogen strategy, are developing a partnership to boost renewable hydrogen production in Egypt. However, high funding costs are a barrier to capital-intensive investments in hydrogen projects, in particular in emerging economies. CBAM provides an incentive to decarbonise but faces resistance in emerging economies as it may undermine the competitiveness of emission-intensive local production. Combining industrial development with hydrogen production could be a more promising partnership strategy than a narrow one focused only on producing hydrogen for export to the EU. By aligning hydrogen partnerships with local development goals, CBAM acceptance can be improved, as industrial development could be climate-friendly, making exports into the EU easier while creating new value chains to the benefit of EU producers.

The development of hydrogen partnerships between Germany and Egypt, as well as between the European Union (EU) and Egypt, coincides with the roll-out of the EU's Carbon Border Adjustment Mechanism (CBAM), which serves to prevent carbon leakage (Regulation (EU) 2023/956, 2023). This article uses the partnerships with Egypt as an illustrative example, shedding light on both the opportunities and challenges inherent in such collaborations with emerging economies.

The German government's stance on hydrogen partnerships lacks clear articulation, leaving open whether the

priority lies in promoting hydrogen production for export or for industrial usage in hydrogen-producing countries. The assumed focus has been the support of hydrogen production for exports to and use in Germany. However, the necessity of integrating local industrial development into these partnerships, as emphasised by Chancellor Olaf Scholz at the November 2023 G20 Compact with Africa summit, appears to be gaining traction (Alipour, 2023).

Many emerging economies hope to leverage green hydrogen to decarbonise emission-intensive sectors such as steel, which would ensure products are exempt from CBAM. The decision whether to produce energy-intensive goods in an emerging economy or in the EU thus would not be influenced by CBAM; instead, it would be determined by the relative production costs and transportation costs of hydrogen versus those of the products themselves.

We propose that the strategic alignment of hydrogen partnerships with CBAM can serve as a catalyst for green industrial transformation in emerging and advanced economies. This requires identifying sectors for renewable hydrogen use in partner countries. Drawing insights from the partnership with Egypt as a reference, we explore an approach that seeks to harmonise the functioning of the hydrogen partnership and the implementation of CBAM for potential mutual synergy.

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The remainder of this article is structured as follows: the next section provides an overview of the existing partnerships. Subsequently, Egypt's hydrogen plans and potential are outlined. Finally, the impact of CBAM and its interaction with the partnerships are discussed.

Hydrogen partnerships

Germany signed a memorandum of understanding with Egypt to facilitate the production of green hydrogen in the run-up to COP27 (Federal Ministry for Economic Cooperation and Development, 2022). Discussions on joint activities and cooperation began with meetings of a delegation from the German Federal Ministry for Economic Affairs and Climate Action with numerous involved Egyptian Ministries, representatives from firms and other stakeholders. The Hydrogen Partnership is to be implemented by the German Corporation for International Cooperation (GIZ) in collaboration with the German Chamber of Commerce (German Embassy Cairo, 2023a).

Hydrogen is key to decarbonising energy-intensive industrial processes that do not lend themselves to electrification as well as long-distance, heavy-load transportation. Germany plans to procure 95 to 130 terawatt hours of hydrogen and derivatives in 2030, of which between 50% and 70% will need to be imported, in order to replace fossil fuels in the so-called hard-to-abate sectors in the German economy (Federal Government, 2023).

The German government is looking for ways to procure this “fuel of the future” as soon and as inexpensively as possible. Building a hydrogen market is, however, proving challenging. Germany is building a global network of hydrogen partnerships in an attempt to accelerate the development of the hydrogen market to secure future supplies (Nunez and Quitzow, 2023). With H2Global, Germany has created a financial instrument to provide long-term certainty of its demand to global suppliers of green hydrogen while offering short-term contracts to domestic consumers (Bauer et al., 2023). The EU has approved large state aid spending by the German government for the purchase of green hydrogen – including from non-EU countries – through the H2Global auction mechanism (European Commission, 2021a). The German government has recently committed a further €3.5 billion for new auction rounds until 2036, underlining its dedication to imports (Federal Ministry for Economic Affairs and Climate Action, 2023). This mechanism would allow Egyptian producers of green hydrogen to undertake necessary investments as long-term demand at an established price would be provided by the H2Global mechanism. The German Ministry for Economic Affairs and Climate Action and the EU Directorate General for Energy have a close ex-

change and cooperation, including on plans for the hydrogen market ramp-up.

In 2023 it was announced that the German H2Global auction model would be rolled out on an EU-level. Firstly, the mechanism will be used for joint European tenders for hydrogen imports. The first such auction round was launched in November 2023 for producers in the European Economic Area (European Commission, 2023a). Secondly, the H2Global mechanism will be made available for use to all EU governments; these activities are part of the European Hydrogen Bank, an EU initiative to secure a total of 20 million tonnes of renewable hydrogen by 2030 through production in the EU and through imports (Federal Ministry for Economic Affairs and Climate Action, 2023).

An important concern in the development of hydrogen production outside of the EU is the higher cost of funding due to a variety of risks. In Egypt, country risk and cost of funding resulting from external debt and relatively high inflation are substantial (see e.g. Fitch Ratings, 2023). For external investors, returns on investment projects need to be sufficiently high to cater for political and exchange risks, which in a period of tighter financial conditions may make large projects unfinanceable. This could frustrate the efforts to accelerate the green transition and import increasing amounts of green hydrogen.

To deal with the funding cost issue, the right mix of public and private funding and cooperation needs to be found. As of now, the EU Commission and Egypt solidified their energy partnership in a memorandum of understanding at COP27 (European Commission, 2022a). At the signing of the partnership, both sides emphasised the role of renewable hydrogen in emission reduction, industrial cooperation, sustainable economic growth and job creation (European Commission, 2022a).

The Commission pledged up to €35 million in support of a clean energy transition through Egypt's Energy Wealth Initiative (European Commission, 2022b). Germany has also made its own commitment of over €250 million to the initiative (German Embassy Cairo, 2023b). The Energy Wealth Initiative is a collaborative effort between the Egyptian Government and the European Bank for Reconstruction and Development (EBRD) and has the dual goal of shutting down inefficient gas-based power generation capacity and installing new renewable energy capacity. The EU, EBRD and Egyptian state institutions are an important trio driving the hydrogen sector's development and strategy (European Commission, 2022c). These actors also collaborate through the Africa-Europe Green Energy Initiative, which is part of the implementation of the Global Gateway in Africa (European Commission, 2023b). The project list

of the Global Gateway initiative for 2023 included support of methanol production for green shipping in Egypt (European Commission, 2023c). The US \$110 million grant for a hydrogen power plant project in Morocco, implemented through a public-private partnership, illustrates not only what may still be to come in Egypt, but also how closely the EU and German hydrogen strategies are aligned. The project is part of the Africa-EU Green Energy Initiative and is facilitated by German involvement in the initiative (European Commission, 2023b).

At this stage, the fundamental question of whether the German government wants to focus its hydrogen partnerships on promoting hydrogen production for export or promoting hydrogen production for industrial usage in hydrogen-producing countries remains unanswered and support is accordingly unspecified.

Egypt as a hydrogen partner

There is a huge growth potential for the low-carbon hydrogen market, which could reach a value of US \$1.4 trillion per year by 2050 (Deloitte, 2023). Egypt is hoping to capitalise on this market. The national hydrogen strategy Egypt announced at COP27 was approved in November 2023 (Curry, 2023; State Information Service of Egypt, 2022). It outlines the aim of capturing 5% of the global market share, enhancing energy security, bolstering GDP by up to US \$18 billion and generating 100,000 new jobs by 2040 (Dokso, 2022; Egypt Today, 2023). The efforts of the Egyptian government to attract investments have resulted in over 20 memoranda of understanding for projects worth over US \$83 billion (Parkes, 2023).¹ Many have since been transformed into framework agreements and some have taken up operations (Samir, 2023). Most projects are located in the Suez Economic Zone due to its proximity to manufacturing sites and ports, and many are developed in cooperation with ammonia production plants to replace fossil fuel usage. For example, the Ain Sokhna green hydrogen plant, a consortium project, is Africa's first integrated renewable hydrogen facility (Scatec, 2023). In November 2023, Fertigllobe sent the first-ever certified renewable green ammonia, produced from renewable hydrogen in the Ain Sokhna plant, to India for use in laundry powder production (Martin, 2023). Egypt has also recently pioneered green methanol bunkering for ship refuelling along the Suez Canal (Bahtić, 2023). Investments have not yet begun on a large scale.

In addition to its ambitious policy objectives and support for the hydrogen economy, Egypt is an attractive partner due to its high potential for the expansion of renewable energy and green hydrogen production (Habib and Ouki, 2021). Egypt has the added advantage of proximity to the EU and the existence of export infrastructure, from which a hydrogen economy could benefit (Esily et al., 2022). However, the economic landscape in Egypt presents considerable challenges. The nation's substantial borrowing has led to a significant escalation in external debt, surging from US \$48 billion in 2015 (Central Bank of Egypt, 2016, VI) to US \$165 billion in 2023 (Central Bank of Egypt, 2023a, 10). Decreasing foreign reserves raised concerns about debt servicing, leading to a portfolio outflow of around US \$20 billion in 2022 (OECD, 2023), and the Egyptian pound has been devalued three times since early 2022 (Magdy, 2023).

Currency devaluation risks add to the usual project and political risks for international private investors. They may be reluctant to invest, fearing downgrades and further depreciation. Green hydrogen production is a relatively capital-intensive investment and is therefore strongly affected by funding costs. The International Energy Agency estimates that an increase in the cost of capital from 6% to 15% would result in a 70% higher cost of production (IEA, 2023, 82). With a short-term interest rate of around 20% (Central Bank of Egypt, 2023b), Egypt may face difficulties competing with producer countries in which capital costs are more favourable.

Impact of the Carbon Border Adjustment Mechanism

The high energy intensity and resulting emissions intensity of the Egyptian industrial sector means that exports from Egypt would be affected by CBAM, which initially covers seven products: cement, iron, steel, aluminium, fertilisers, electricity and hydrogen. At the same time, CBAM seeks to encourage the uptake of green technology, and in Egypt, the switching from gas to green hydrogen could bring about a significant transformation.

The aim of CBAM is to prevent carbon leakage resulting from higher taxes on domestic emissions. Emissions from the aforementioned products in the EU are, by now, substantially taxed via the EU's emission trading systems, and remaining free allowances are gradually being phased out (European Commission, 2021b). CBAM is viewed with scepticism by some nations in the Global South, including Egypt (Pauw et al., 2022).

The Egyptian industrial sector, one of the largest in the region, accounts for one-third of the Egyptian gross domestic product and is the second-largest gas user af-

¹ The Egyptian government is attempting to further promote investments in hydrogen by offering "golden licenses" for a single project approval and tax exemptions ranging from 33% to 55% of taxes due (Ivanova, 2023; Enterprise, 2022).

ter the power sector (CIA, 2023; Habib and Ouki, 2021). Among industrial uses, fertiliser production, followed by iron, steel and petroleum production are the primary gas users (OECD, 2021).

Chemicals hold a crucial place in Egypt's export landscape alongside petroleum. In 2022, out of approximately US \$52 billion in total exports, fuels accounted for 35%, while fertilisers and plastics constituted 10% (State Information Service of Egypt, 2023). Notably, exports to the EU surged from US \$9 billion to US \$16 billion between 2021 and 2022. Chemical exports nearly doubled during this period, soaring from US \$2 billion to US \$4 billion (European Commission, 2023d). This increase is partly due to the EU's efforts to diversify away from Russian supplies and the relocation of fertiliser and steel production from Germany and the EU after the energy shock of 2022, benefiting emerging economies such as Egypt. Egypt recorded an over 300% increase in overall fertiliser exports in 2022 (State Information Service of Egypt, 2023). Further market expansion opportunities exist for iron, steel and aluminium production (Mitsui & Co., 2023).

However, CBAM could disrupt some possibilities for exports from Egypt to the EU. Around 6% of Egypt's exports fall under CBAM, including three-quarters of exports in the iron and steel sector, 70% of aluminium exports and half of fertiliser exports (Baker et al., 2022, 13). Export losses are estimated to be highest in the electricity transmission, oil and chemical (including fertilisers) sectors. These are estimated to be between 4% and 8% (World Bank Group, 2022, 60). On the African continent, Egypt ranks second after South Africa in estimates of adverse effects of CBAM, with Morocco following closely behind (Baker et al., 2022).

Green hydrogen can facilitate decarbonisation of, among others, fertiliser and steel production, making them eligible for exports without being affected by CBAM. The economic decision to produce steel and fertilisers in an emerging economy or in the EU would thus not be affected by CBAM but rather by the relative costs of production and relative transport costs of hydrogen versus fertilisers or steel.

While hydrogen can be an important tool to decarbonise and adapt to CBAM, many questions remain. For one, it is possible that the exports of goods affected by CBAM may be diverted to other markets while low emission exports would be targeted at the EU market (Pleek and Mitchell, 2023). Furthermore, it is unclear how fossil fuel usage would respond to increased hydrogen production and usage in Egypt. Egypt has substantial natural gas reserves – the sixteenth largest globally (British Petroleum, 2021,

34), which are being drawn on to meet the country's fast-growing energy demand. It is possible that industrial production of goods for domestic consumption and exports to non-EU markets may still rely heavily on fossil fuels or that exports of fossil fuels will rise. These potential effects raise questions about the overall effectiveness of CBAM and suggest that its implementation in combination with a partnership focused solely on hydrogen exports might inadvertently impede the timely decarbonisation of industry in emerging economies.

Conversely, support in upgrading industrial processes by introducing hydrogen through the hydrogen partnership can play an important role in complementing CBAM's incentive for decarbonisation. If orchestrated effectively, CBAM, complemented with appropriate partnerships, could bolster the necessary, broader green industrial transformation.

To this end, it is necessary to identify potential mutually beneficial areas for development, which could include the decarbonisation of existing industries and support for nascent ones. Egypt serves as a prime example, showcasing the potential to decarbonise existing sectors like fertilisers and chemicals and fostering nascent industries such as e-fuels.

Many countries of the Africa Green Hydrogen alliance, in particular Morocco and South Africa, are in a similar situation to that of Egypt, with substantial renewable energy potential and challenging investment environments (Green Hydrogen Organisation, 2023). Both Morocco and South Africa are attractive hydrogen partners for Germany, and both are estimated to experience adverse economic effects as a result of CBAM. The pursuit of synergies in these collaborations becomes pivotal, focusing on growing industries employing green hydrogen, enabling CBAM-compliant exports, and fostering employment and economic growth. Such partnerships effectively address concerns surrounding CBAM while navigating worries related to the potentially extractive nature of certain partnership models.

Conclusion

While the political support for the development of the hydrogen sector, potential for renewable energy generation and geographic proximity make Egypt an attractive partner for the EU, country risks and high funding costs suggest that a strategy focusing solely on hydrogen exports may be ineffective. For European policymakers, it may therefore be useful to also support production sites that use hydrogen as an input to advance Egyptian industrial developments and benefit from comparatively low labour

costs and the proximity of Egypt. CBAM is not an obstacle in this regard. On the contrary, it would incentivise the production of green industrial products in Egypt.

CBAM is, rightly or wrongly, a cause for concern for many European hydrogen partners. This appears particularly true for those located on the African continent, which the African Climate Foundation estimates to be most negatively affected by CBAM (African Climate Foundation and LSE, 2023). Yet, CBAM is a mechanism to reduce carbon leakage and may well accelerate decarbonisation efforts. Partnership frameworks like the German-Egyptian hydrogen partnership as well as the collaboration between the EBRD, the EU and Egyptian institutions could serve as formats to discuss Egypt's concerns regarding the consequences of CBAM.

By promoting industrial developments based on green hydrogen, the partnerships can counteract potential export losses resulting from the EU's stricter rules on carbon-intensive imports, for example as concerns steel. This form of coordination of hydrogen activities in line with CBAM-conform industrial development can serve as an example for partnerships with other states. The conditions described, namely the difficulty spurring investment in the hydrogen sector due to high funding costs despite good potential for hydrogen production and political support for hydrogen in combination with broader development goals, are not unique to Egypt. They can also be observed in other countries with which cooperation in the field of hydrogen has been agreed, including, for example, Morocco. This approach to co-operation with Egypt can serve as an example for future partnerships.

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