



POLICY OPTIONS TO DE-RISK INVESTMENTS IN MOROCCAN RENEWABLE ENERGY

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Introduction

This white paper will examine Morocco's innovation system, focusing on the country's push for renewable energy (RE) through the wind, solar and fog sectors. Morocco's potential for RE can be driven by three factors: a) the global shift towards sustainable energy usage; b) Morocco's desire for energy independence, given the increasing cost of importing oil and gas; and c) the potential to profit from supplying electricity for Europe's green transition.

Despite these factors pushing Morocco's RE potential, challenges are impeding progress. Morocco risks falling into a middle-income trap, where it has become too advanced to compete in the manufacturing sector but cannot keep up with more developed countries (Moreira, 2019). Morocco also faces challenges in sustaining long-term innovation surrounding RE. Existing efforts to address this challenge are largely dependent on government support with little academic engagement or private sector investment (Vidican, 2015). Morocco's current investment context in RE is dominated by large-scale projects, such as the Moroccan Agency for Sustainable Energy (MASEN), which is supported by the Moroccan Royal Palace (Vidican, 2015). Because technology-intensive firms are the ones investing in organisations like MASEN, small and midsize enterprises (SMEs) are unable to participate in Morocco's RE system (Vidican, 2015). Overall, the non inclusive nature of Morocco's RE sector has meant investing in this innovation system is too risky for many firms (Okpanachi et al., 2022). These risks hinder Morocco's innovation system, threatening its escape from the middle-income trap.

To address these challenges and foster a more inclusive RE sector in Morocco, we propose a de-risking strategy that takes a three-fold approach: 1) the use of feed-in-tariffs (FITs) to promote long-term RE investment by guaranteeing producers a price that is above the market-price; 2) regulatory change to the Moroccan energy market that would encourage more private-sector investment; and 3) engaging local communities to encourage trust and reduce the perceived social risk of RE projects. Our paper will weigh these de-risking strategies with alternative policy options, such as maintaining the status quo, to illustrate the nuance and inevitable gaps of our approach. The main argument of our paper posits that the Moroccan RE sector would thrive with a de-risking policy approach. Taking a de-risking approach would allow Morocco to become a key player in wind, solar and fog sectors globally, escaping the middle-income trap.

To present our analysis and argument, this paper will first discuss Morocco's goals surrounding RE. We will thereafter examine the barriers to progress impeding Morocco's RE system. Following, we will weigh our policy against policy alternatives. Next, we will situate our policy in a detailed analytic framework and discuss our policy at length. We will then present our proposed implementation plan, and finally offer some concluding thoughts on Morocco's pathways forward.

Goals

Morocco, like many countries in the Global South, has long relied upon domestic manufacturing to employ its population and drive economic growth (Ait Ali, 2018). Since the turn of the millennium however, Morocco has experienced a consistent decline in its manufacturing output despite increases in labour productivity (Ait Ali, 2018). This dynamic has resulted in a significant fall in the Moroccan manufacturing share of employment, leaving 13.5% of the overall population unemployed in 2021 (Asharq Al Awsat, 2023).

The contraction of the Moroccan manufacturing sector has raised concerns about the country falling into a middle-income trap. This phenomenon occurs when economic advancement renders engines that previously spurred growth unsustainable, leaving developing countries struggling to compete with more advanced economies. The Moroccan economy has experienced significant development over the past few decades, with GDP growth averaging 3.9% annually since 1990 (World Bank, 2022). Consequently, however, rising wages have diminished Morocco's competitive edge in labour-intensive manufacturing, leaving the state unable to compete with labour-abundant manufacturing giants such as Indonesia and Bangladesh (Agénor & El Aynaoui, 2015). Having been displaced from its former position within the global value chain, Morocco must transition towards high-productivity modern sectors, or risk stagnating at its current level of growth.

Agénor and El Aynaoui (2015) argue that to avoid falling into the middle-income trap, Morocco must better position itself to compete in international markets that are intensive in technology and skilled labour. Adopting such a strategy is particularly critical if Morocco wishes to retain young,

university-educated job seekers, 25.9% of whom were unemployed and 20% of whom left the country in 2021 and 2017 respectively (MEM, 2017; Statista, 2022). To escape the middle-income trap, developing countries must identify and invest in sectors that allow them to compete on the world stage. As Morocco seeks new sources of competitive advantage, clean energy presents itself as a promising avenue through which gains lost from manufacturing can be recovered. Morocco is naturally endowed with massive potential in the clean energy sector; abundant desert land and direct, year-round sunshine create an ideal environment for solar megaprojects, while exceptionally high wind speeds in northern and southern regions offer opportunities for wind energy installations (Birnbaum, 2023). Moroccan policymakers first began to invest in solar and wind infrastructure during the mid-2000s as part of a strategy to reduce the country's dependence on foreign energy imports. This project has been successful, with domestic clean energy projects currently meeting 35% of Morocco's energy needs (as opposed to 0.24% in 2003) (Shahan, 2020).

Consumption of Morocco's energy output remains largely confined to the domestic sphere, with limited exportation (Birnbaum, 2023). However, as the European Union seeks to divest from Russian energy and meet its goal of zero net emissions by 2050, Morocco is uniquely well situated to become a major clean energy exporter. Previous proposals have suggested that with sufficient private and multilateral investment, North African energy projects could meet up to 15% of Europe's electricity demand (Birnbaum, 2023). As the only African country with a power cable link to Europe, Morocco has the opportunity to capture the lion's share of this emerging market and establish itself as a key player in the European clean energy landscape (Birnbaum, 2023).

The expansion of the clean energy sector promises to provide new employment opportunities for skilled workers, reduce dependence on foreign fossil fuels, and establish a niche for Morocco within the global value chain. The policy proposals detailed below are therefore designed to maximize growth in the sector by encouraging private investment, with the ultimate aim of increasing both total energy production and exports as a share of output.

The Problem

The Institutional Basis of Moroccan Innovation: Big Changes, but Falling Short

The Moroccan government has gone to great lengths to promote RE innovation, creating new institutions and mobilizing existing ones. As per Vidican (2015), these changes have been pushed forward by the substantial political influence of Morocco's Royal Palace, which has been the primary force behind Morocco's pursuit of RE innovation.. Despite some notable successes, this strategy has faced major challenges in creating a broad, dynamic, and self-sustaining innovation system that can exist without the support of key government actors.

The approach to RE innovation outlined in the 2008 National Energy Strategy (NES) and elaborated on in the 2009 National Plan to Tackle Global Warming. (El Bakali & Harbouz, 2022; Vidican, 2015) has involved numerous reforms and institutional changes. Central to RE innovation have been various government agencies and ministries with complementary mandates. Existing ministries, the Ministry of Industry, Commerce and New Technologies (MCINT) and the Ministry of Energy, Mines, Water and Environment (MEMEE), have both been recruited into the RE development effort. MEMEE works closely with MASEN on its solar projects, while MCINT operates an incentives program for private RE projects (Vidican, 2015).

Morocco has also created two new agencies to assist with the adoption of RE. The first is the "Agence pour le Développement des Énergies Renouvelables et de l'Efficacité Énergétique" (ADEREE), which proposes new project sites, undertakes pilot programs, conducts equipment checks and trains specialists. The second is the "Société d'Investissement Énergétique," (SIE) the main agency for RE financing in Morocco, with an endowment of 1 billion Dirhams (approximately \$120 million USD) (Vidican, 2015).

Nonetheless, the most important Moroccan institution working on RE is MASEN, which was established in 2009 to oversee the development of major solar projects. MASEN is a joint-stock company, with a director who is appointed directly by the King of Morocco. It was originally created to develop solar generation capacity under the Plan Solaire, a plan for solar development mainly focused on large projects. However, MASEN's mandate has expanded over time, and today it is involved in all activities, including R&D.

MASEN's success has come from being able to get projects built. It has succeeded in attracting major investments and has overseen the construction of major projects in solar, wind, and hydroelectric energy (Vidican, 2015). Morocco may have missed its goal of producing 42% of its electricity by RE by 2020 (set in the 2008 NES), but is on track to meet a goal of producing 52% of its energy with RE by 2030 (Christofaro, 2022). MASEN has further gained a reputation for being a competent and professional organisation (Vidican, 2015).

Behind the influence of these organisations lies Morocco's Royal Palace, and the court of King Mohammed VI. Morocco is a constitutional monarchy, with an elected legislature. Nonetheless, political power rests not with elected officials but instead with the King, who sets domestic and foreign policy. The Royal Palace maintains its control over policy through a variety of formal and informal means. Critical to Royal influence are the Makhzen – the King's close advisers and associates, who hold vast political and economic power (Freedom House). It is the Royal influence that oriented Morocco towards RE, and that gives institutions like MASEN the political weight to be able to get things done.

Despite the successes of MASEN and related institutions, their actions amount to a top-down intervention in Morocco's energy market by the Royal Palace. Decision-making in RE is centralised, leading to a situation where large RE projects are being made, but such projects have limited innovation value to the broader economy. This has made systemic changes including multiple stakeholders, which would be necessary to a self-sustaining innovation system, difficult to achieve.

Institutions such as MASEN have only limited linkages with other stakeholders who would be needed for an RE innovation system, including the private sector and academia. Programs to promote such linkages, such as MICINT's incentives program, have in many cases been poorly used and fallen short of their goals (Vidican, 2015). To further promote RE as a driver of growth and unlock the potential of innovation in this technology for Morocco, the limits of this institutional framework will have to be overcome.

Domestic Private Players: High Entry Barriers

RE power generation is both capital and technology intensive, two factors of production which are often lacking in developing countries like Morocco. According to Schinko et al. (2019), developing countries lack up to 8% of the necessary GDP for RE infrastructure deployment, and Morocco is no exception (p.2). The main challenge for Moroccan private players is to divert conventional investment from high-carbon technologies to RE technologies, and also to attract new investment for RE (p.2). However, from the perspective of investors, high entry barriers make RE sector investment highly risky. RE's capital and technological intensity, together with Morocco's highly centralised institutional structure, have created a RE business model wherein large-scale projects are developed and implemented primarily by consortia in cooperation with national technology and energy related departments. Morocco fails to engage commercial banks, SMEs, and local entrepreneurs.

Private stakeholders have attempted to circumvent these issues by starting with smaller-scale power plants, aiming to accumulate technology and capital until they grow to become industry leaders. Unfortunately, this enterprise has proved difficult, as few of them can integrate into the value chain due to limited market capacity and technology constraints. Private energy company Nareva Holding, however has proven that it is not impossible; Nareva Holding invested in the wind power sector while strategically selecting its international parents and carving a niche for itself within the value chain. Unfortunately, such a joint development effort is not duplicatable for solar power private companies. The Moroccan solar energy market, which produces 7.58% of domestic power generation, is little more than half the size of the wind sector, which sits at 13.37% (U.S. Department of Commerce, 2022), and the market is less liberalised (as explained previously). In addition to the market size, the integration of RE electricity into the electricity grid poses an additional technological challenge. Because the highly centralised institution prioritizes limited grid resources for national-led mega power plants, small-scale power plants (10 kW to 1 MW) lack grid access (Vidican et al., 2013, p.93). As a result, much of the surplus power generated by small-scale power plants is wasted. The reality faced by Moroccan SME and entrepreneurs is that lack of grid access means that the electricity generated cannot be converted into profits. Unpredictable grid integration processes, coupled with limited intra-sector cooperation (Moisseron & Guesmi, 2018), high capital and technology entry cost, lower SMEs willingness to enter the Moroccan clean

energy market. This explains why only a few Moroccan based RE firms have been able to attract private investors.

Foreign Investors: Financing Risks and Sustainability Issues

Morocco, with its geographical proximity to European markets and abundant natural resources like solar and wind energy, holds great potential for advancing renewable electricity generation. This allure has attracted foreign investors from Spain, the United Kingdom, and Nordic countries. The main challenges for Morocco in reducing European investor risks lie in ensuring stable export electricity prices and safeguarding the rights of local residents in the power plant deployment areas.

Constructing solar power infrastructure requires intensive financial and technological investment. Under current technological conditions, the majority of electricity produced in Morocco cannot be stored and must be either wasted or integrated into the grid. British-based startup Xlinks, has proposed a project to transit wind and solar power from Morocco's Guelmim-Oued Noun region to Europe via undersea cables and special batteries. The project plans to supply the UK's 8% electricity needs from 2029, supporting the UK's 2050 net-zero goal.

High fixed costs among European producers have become a deterrent for European energy purchasers. Since 2019, Xlinks has been looking across Europe for sponsors for its £20 billion project. In September 2023, the project was deemed a matter of "national significance" by the British government (Parker & Millard, 2023). In addition to construction costs, the electricity price match is another concern for foreign investors. In the Xlink negotiating with the UK government in 2022, the UK offtake price was lower than the acceptable price Morocco could take. If Morocco fails to stabilize or reduce its export price, the UK government would need to invest in significant subsidies to match that price, they might reject investing in Xlinks due to the anticipated public backlash over increased taxation. Xlinks is now negotiating with the UK government over a 25-years guaranteed purchase price of electricity, to make it profitable for both the firm and Morocco (Xlinks, n.d.; Parker & Millard, 2023). To position RE as a catalyst for Morocco's growth, stabilizing the export prices will be crucial and will rely on the overall optimisation of electricity generation and grid capacity.

Sustainability concerns also complicate the foreign fundraising process. Despite high anticipation, Xlink has yet to disclose the deployment sites for its massive power plants. The chosen region, Guelmim-Oued Noun, includes not only deserts but also areas inhabited by nomadic populations and regions near territorial disputes with Western Sahara (Pearce, 2023). Concerns regarding the vulnerability of the local communities have cast shadows upon the power plant deployment as foreign investors and governments express hesitation. Similar concerns have been voiced regarding the state-led Noor Power Plant, which, despite its promises, caused disruptions during construction and fell short on local employment and infrastructure development commitments (Pearce, 2023). To further attract foreign investment, it is crucial that Morocco has a plan in place to address sustainability issues and protect vulnerable communities.

Policy Alternatives

Discussing policy alternatives begs an understanding about the main RE stakeholders across Morocco, allowing us to weigh who the best actors are for implementing Morocco's RE sector. Historically, MEMEE and the National Office of Electricity have dominated Morocco's energy sector (Tsikalakis et al., 2011). These organisations have often worked in tandem, developing projects in the electrification and solar energy sectors between 1963 and 2010 (Tsikalakis et al., 2011). Great strides were made as they grounded these projects in rural development, gaining large grants from various sources such as the KfW German Bank and the French Fund for the World Environment (Tsikalakis et al., 2011). However, the intentions of these policies did not always translate in practice. For instance, despite the great effort to increase the electrification rate across rural Moroccan communities, the interconnected grid that sought to distribute electricity across different regions did not improve the Moroccan electrification rate (Tsikalakis et al., 2011).

Plans aimed at centralizing the grid systems of power plants and solar systems, and encouraging funds from private investors, were implemented to accelerate Morocco's RE (Kousksou et al., 2015; Tsikalakis et al., 2011). In response, Law 13-09 was implemented in February 2010 to increase accessibility to the centralised electrical grid. In terms of solar power, MASEN was developed in January of 2010, incorporating a number of stakeholders to form public-private partnerships (Kousksou et al., 2015). Looking at the most recent policies from the Global Data (2022) Handbook, it is evident that an emphasis on de-risking, specifically in regard to community

engagement, is lacking. Morocco's recent RE policy, known as Green Bonds, was issued by MASEN through private investments in 2016, for the purpose of financing a high-speed railway where all trains will be powered by clean energy (Global Data, 2022; Office National, 2022). This project is recent so the long-term sustainability and consequences are tough to uncover. However, at first-glance, the Green Bonds project policies include improving capital market gain through “environmentally sound and sustainable development” (Office National, 2022).

These objectives are meaningful, geared at economic prosperity, and could assist in bringing Morocco out of the middle-income trap. However, Green Bonds' policy contains gaps that our approach addresses. Our derisking policy targets community engagement as an integral component of research, development and innovation, which has been overlooked both historically and presently across Morocco's RE policies. (Tsikalakis et al., 2011; Okpanachi et al., 2020). Additionally, our policy is geared at accelerating investments from public and private partners as a way to diversify and sustain RE across Morocco. Green Bonds' objective to improve Morocco's economy has merit. However, we cannot improve the economy by keeping communities absent from development projects. By taking a nuanced de-risking approach, combining FITs, private sector partnership and community involvement, our policy goes beyond a solely market-driven goal. Ultimately, improving Morocco's economy is an important end, but we cannot get there with only a market-driven approach.

Analytic Framework

The effectiveness of our policy recommendations will be determined by technical, economic, social, political, interaction, risk, and environmental criteria. Generally, energy policy should be centered on improving energy efficiency, reshaping energy infrastructure, and improving industry structures (Chen, 2011). The process of adopting energy policy therefore requires a multidimensional approach which considers a variety of perspectives (Abotah & Daim, 2017). A multi-criteria analysis allots policy makers comprehensive pathways to implement changes. Thus, we will use an analytical framework reflective of diffusion innovation theory, specifically that energy installed capacity can be used to obtain diffusion parameters that reflect the adoptability of energy policy (Abotah & Daim, 2017).

Critically, the central problem we have outlined reflects the institutional basis of Moroccan innovation and altering perceptions of risk among investors. To ensure we address these two overarching problems, we have employed an analytical hierarchical process (AHP) which demonstrates a flexible and intuitive method for decision makers (Appendix A; Algarín et al., 2017):

Technical Criteria. Investing in renewable infrastructure is technological innovation. The effectiveness of these policies therefore requires an analysis of the technological capabilities of these investments.¹

1. Efficiency: How are Moroccan clean energy sources suited to conversion efficiency of primary energy into RE?
2. Maturity of Technology: What is the stage of development of RE?
3. Infrastructure: What are the current infrastructures in Morocco and how are they suited to a RE transition? How does the available infrastructure impact the potential success of policy implementation?
4. Reliability: Is Morocco prepared to design energy systems to support failures?

Economic Criteria. Economic criteria considers the scope of costs and benefits incurred in implementing the project.

1. Investment Costs: Who are the primary investors our policy will target? How will it derisk their investment? What is the opportunity cost of investing in RE policies over other alternatives?
2. Payback Period: At what point will Morocco break-even? How long will it take this policy to move Morocco out of the middle-income trap?

Social Criteria. This criteria considers how policy will engage or harm local communities, especially in rural areas. RE systems often require the engagement of communities in remote regions and effective policies must address these barriers.

¹ While a specific analysis of technical criteria is outside the scope of this paper, our policies still consider each question to iterate Morocco's capacity to adopt clean energy from a technological perspective.

1. Acceptability of Local Residents: Are local communities willing to accept the implementation of RE systems in their localities?
2. Cultural Considerations: How will the RE infrastructure adapt to local and cultural contexts? How will the project engage with Indigenous authorities?
3. Local Job Creation: How many local jobs will be created for installation, maintenance, and repair of the RE? How will the creation of these jobs positively impact communities and Moroccan general society?
4. Local Impacts of Energy Adoption: Will the energy systems supply electricity in schools and health centers in the rural community? What diffusion effects will this have on younger Moroccan generations?

Political Criteria. Morocco is unique because of its political structure. Our policy must consider how the concentration of power resides with a few individuals.

1. Reduced Market Share: How likely are Moroccan politicians to adopt RE policy that reduces their market share in the industry?
2. Adoption Efficacy: How can our policy mobilise wealthy elites to see the positive trade-off of adopting energy derisking strategies?

Interaction Criteria. In adopting a multi-dimensional approach, our policy necessitates the involvement of multiple stakeholders and needs to consider those impacts.

1. Institutional Interaction: What local, national, and international institutions do we need to engage to implement a successful energy policy?
2. Moroccan Social Institutions: Do Moroccan social institutions have the capacity to capitalise on this new infrastructure? How will our policy engage them?

Risk Criteria. This criteria engages the general risks of adopting energy policy in Morocco.

1. Natural Phenomena: Would the energy systems built be at risk of natural phenomena such as storms, earthquakes, or floods?
2. Armed Conflict: Does the Western Sahara conflict impact the effectiveness of our policy implementation?

3. Investment Risk: Beyond the specific risks associated with RE investment in Morocco, how does the current market expose investment risks?

Environmental Criteria. Environmental criteria considers how our policy will increase green energy production in Morocco.²

1. Climate Change Impacts: How will the growing threat of climate change enhance the effectiveness of our energy policy?
2. Comparative Advantage: Will our policy increase Morocco's comparative advantage in the green energy sector?
3. Competition: Will Morocco face competition in green energy exports? How will that impact the potential long-term success of our goals?

The seven criteria listed above offer a comprehensive framework upon which we can evaluate the impacts, trade offs, and opportunity costs of our policy. However, a strong analysis of our policy's effectiveness requires consideration of its long-term impact. To address long-term impact, our criteria must successfully promote de-risking measures, changing the institutional basis of Moroccan clean energy, and most critically, improving the economic conditions in Morocco to help them escape the middle-income trap. Thus, the ability of our recommendations to create social, institutional, and economic growth will be the most stringent framework upon which to evaluate their effectiveness.

Discussion

Feed-In Tariffs

Creating sustained growth in Morocco's clean energy sector will require additional financing from the private sector. The Moroccan government can increase confidence among potential investors through the introduction of a feed-in tariff, which is a derisking strategy that establishes a guaranteed, above-market price for producers of wind and solar energy. This price remains set for between ten to twenty years, providing a stable and predictable stream of revenue for investors. Feed-in tariffs attract private capital by ensuring a modest return on investment while mitigating

² While there are other environmental criteria which could be considered (i.e. greenhouse gas emissions, hazardous waste, visual impacts, the requirements of resources), these are outside the scope of our policy paper.

risks associated with market fluctuations, high capital intensity, and uncertain regulatory environments. They also ensure access to the grid for any company, household, or individual seeking to contribute energy, thereby encouraging a wide range of stakeholders to participate in and profit from the development of the RE sector.

Feed-in tariffs have been enormously successful at encouraging long-term investment throughout both the developed and developing world, particularly during the early stages of clean energy transition. Germany and Japan introduced feed-in tariffs in 2000 and 2012, respectively. In both countries, this derisking measure produced a “renewables boom,” resulting in the rapid proliferation of wind and solar installations (Hager, 2020). Low income countries have also found success through the use of feed-in tariffs; in Kenya, the 2008 implementation of a solar tariff is estimated to have stimulated approximately 1,300 megawatts of electricity generation capacity throughout the country (UNEP, 2010).

Moroccan policymakers have expressed reluctance to implement a feed-in tariff, citing concerns about additional energy costs from the tariff that must be passed on either to the state or to energy consumers (Vidican, 2015). It is true that the Moroccan state is overburdened. We therefore propose a mixed model, wherein new costs are borne jointly by the central government and by energy consumers. Under this scheme, the government will step in to eliminate the effects of the tariff for Morocco’s poorest households, while other consumers will see an increase in their energy bills.

To mitigate the long-term burden placed upon consumers and encourage public support for the initiative, we recommend that feed-in tariffs be paired with a loan program to help finance solar panel installation in Moroccan households. As established earlier, under a feed-in tariff structure, everyone is guaranteed access to feed energy into the grid at the rate specified by the tariff. This program would allow Moroccans to generate income by installing rooftop solar panels and contributing surplus electricity production, thereby recovering or eliminating some of the additional costs from the tariff. Morocco, a country with exceptionally high rates of home ownership, is particularly well-suited to such a program (Center for Affordable Housing Finance, 2020). In Germany, efforts to incentivize individual and community level energy production

significantly increased public support for feed-in tariffs, and by 2014, nearly one-half of the country's green energy was generated by citizens (Sutton, 2021). In Morocco, similar efforts to encourage public participation can more equitably distribute the gains from feed-in tariffs, expanding Morocco's clean energy production capacity through a combination of private, state, and citizen investment.

Electricity Regulation Reform

A second de-risking strategy that Morocco could implement would be regulatory change to the Moroccan electricity market that would encourage more private-sector investment. As discussed above, much of Morocco's RE strategy has taken a top-down approach focused on large state-led projects. This approach has limited opportunities for the private sector and other actors to get involved in RE projects, limiting the innovation potential of this area.

Institutional barriers extend to the governance structure of the Moroccan electricity grid, which has inhibited the market for small-scale RE projects, especially in solar energy. These smaller-scale projects are exactly the type of projects that would make it feasible for local companies (whether aiming to meet their own energy needs or seeking to sell to the grid) to participate in RE innovation (Vidican, 2015).

Morocco's energy distribution is fragmented between the state utility, municipal agencies, and 13 private energy distributors. These distributors have resisted independent solar projects, fearing that it will lead to a loss of customers. Law 13-09, developed to encourage RE projects, allows independent companies to build, operate, and connect their own power plants to the grid (Vidican et al., 2013). However, the market is still constrained, and lacks net metering as well as the ability to feed surplus energy into the grid, further reducing the feasibility of small-scale solar.

To address this issue, Morocco should create a centralised, independent energy regulator. Such an entity, if given the necessary powers and political backing, would be able to make reforms to electricity grid governance despite the opposition of private distributors and other vested interests (Vidican, 2015). This, in turn, would promote more small-scale projects, which would encourage Morocco's RE innovation.

This is seen when small-scale projects are compared against the analytic framework. Such projects are beneficial when examined against the environmental, economic, and risk criteria. Environmentally, this will encourage the further adoption of RE, helping Morocco to reduce its emissions and position itself as a climate leader. Economically, this will also encourage more private sector participation in the RE sector, furthering the RE innovation that Morocco hopes to unlock as an economic driver. Finally, regarding the risk criteria, small-scale projects such as household solar panel clusters have been found to play a crucial role in post-emergency resilience (Ceferino et al., 2020). This is particularly significant given Morocco's vulnerability to natural disasters such as the devastating September 2023 Earthquake.

Nonetheless, challenges to this approach are suggested by the interaction and political criteria. The institutional limits of Morocco's approach to RE innovation so far demonstrate the difficulties in creating interaction among components of an economy where none existed before. Further, as many of the Makhzen have interests in the status quo of the energy market that could be disrupted by reform, they may resist much-needed Royal support for these changes (Vidican, 2015).

Community Engagement

Local engagement is critical to the acceptance and sustainability of RE in Morocco. For example, some RE projects have trust-building requirements with local communities where they hold up to 5% of stakes in projects (Waissbein et al., 2013). Thus, forming positive and long-term relationships with these communities cannot be overlooked when they have a part in the advancement of RE projects. Given this, our paper will evaluate our derisking policy—specifically, our point about engaging the local community to promote trust and reduce perceived risks of RE projects—against the frameworks above. We will pay specific attention to the social, institutional and economic frameworks as these have salient impacts on the overall political ecosystem of Morocco and its ability to shift out of the middle-income trap.

Engaging the community in wind, solar and fog projects has shown itself to have more benefits than costs. Dar Si Hmad is an NGO in Southwest Morocco that promotes local culture in hard to reach communities in Morocco through sustainable initiatives (FDSH, 2023). When putting forth our policies, we aim for communities to be involved in future projects in a similar way to how Dar Si Hmad included rural Aït Baâmrane communities (Agrawal et al., 2022). Dar Si Hmad

approached this project slowly and intentionally to gain the trust of the local community, specifically women and girls, because they are traditionally viewed as the guardians of water. The Aït Baâmrane communities struggle with the effects of climate change-induced droughts (Agrawal et al., 2022). To address this issue in a renewable way, large fog collector nets, which resist wind up to 120 km/h, were built on mount Boutmezguida (Agrawal et al., 2022). The nets catch fog, which is collected into potable water and then distributed to rural communities (FDSH, 2023).

Certainly, this project had many positive externalities, such as improving girls' school attendance because they did not have to spend time collecting water (Agrawal et al., 2022). However, do the major players in Moroccan RE always take a slow approach to overcome social and cultural resistance? A recent study by Okpanachi et al. (2020) noted that Morocco's potential for RE is not being met because they are scratching the surface of engaging local communities. "Sporadic local development projects" (Okpanachi et al., 2020, p. 8) and alienating the public on the implementation, costs and future of RE projects are plaguing Morocco's potential for being a major player of RE. By not deeply addressing the local community's needs and innovation potential, Morocco risks losing funds from public and private investors (Okpanachi et al., 2020). Given how costly installation of RE plants can be, such as three power plants requiring investment of up to \$6 billion (Charouif & Lehnert, 2023), those taking risks in these projects have to feel confident that economic returns will be felt.

Community engagement is a salient factor in our de-risking policy for Morocco's RE sector. The success of Dar Si Hmad's fog harvesting project highlights the benefits that result from a slow approach grounded in community knowledge and trust. However, the existing gap, as noted in other studies (Charouif & Lehnert, 2023; Okpanachi et al., 2020), suggests that Morocco's full RE potential does not take a long-term approach. Sustained engagement with local communities, can help Morocco overcome the challenges in obtaining critical investment, and ultimately stray from the middle-income trap.

Case Study: Tunisia

To contextualise our proposals, we can look to Tunisia, another North African country seeking to establish itself within the emerging RE market. The Tunisian clean energy sector is currently

operating at a much smaller scale than its Moroccan counterpart, with RE representing only 3% of Tunisia's total energy consumption. Despite this discrepancy, a comparison between the two nations remains valuable. As they attempt to scale up clean energy production, the two states have encountered a similar obstacle: both Morocco and Tunisia source the majority of clean energy funding from the central government, and have struggled to attract private investment due to high perceptions of risk among investors. In 2014, the United Nations Development Programme released a report containing recommendations aimed at derisking clean energy investment in Tunisia. Many of the recommendations outlined in the report have been adopted, with mixed results. Findings from Tunisia's clean energy derisking program can inform similar initiatives in Morocco, offering insight into both potential challenges and promising strategies for growth.

The 2014 UNDP report called for the implementation of feed-in tariffs in Tunisia, which were introduced three years later by the Tunisian government. While it is challenging to pinpoint the specific impact of the tariff among the numerous adopted recommendations, investors have indicated that its implementation contributed to an increased willingness to invest in Tunisia's clean energy sector (Saadaoui, 2023). However, this policy has necessitated a trade-off, with Tunisians expressing frustration with rising electricity costs (World Bank, 2019). Morocco, being a comparatively wealthier country per capita, may have a higher capacity to absorb additional energy costs than Tunisia. Nonetheless, this finding underscores the importance of involving citizens in clean energy production and equitably distributing gains from growth in the sector.

While the appointment of an independent regulatory authority for Tunisia's energy sector is underway, the state's clean energy sector currently falls under the regulatory purview of the Minister in Charge of Energy (African Development Bank, 2021). The transmission, distribution, and marketing of electricity is conducted by the Tunisian Company of Electricity and Gas (STEG), a public company which exercises a near-total monopoly over the Tunisian energy sector. STEG represents 91.1% of total installed capacity in Tunisia; Carthage Power Company, the country's only independent power producer, accounts for the remaining 89.9% (African Development Bank, 2021). The 2014 UNDP report identified the lack of an independent Tunisian regulatory authority as a major inhibitor of clean energy growth, pointing out that electricity regulation reform would promote a fair and transparent environment for private producers. As Morocco considers its own

path toward sustainable energy development, the Tunisian experience serves as a cautionary tale. Once Tunisia's new regulatory body is appointed, Moroccan policymakers should pay close attention to evaluate the merits of adopting a similar strategy.

STEG has been roundly criticised for its repeated failures to form responsible relationships with communities affected by clean energy installations (El Amine, 2023). In 2010, STEG neglected to consult with local stakeholders before beginning construction on wind farms in the governorate of Bizerte (El Amine, 2023). The installation created major noise disturbances and produced few jobs or tangible benefits for affected actors. Consequently, several attacks were launched upon facilities in the region, and production was halted for over six months. In the nearby municipality of Borj Essalhi, residents began refusing to pay their electricity bills after turbines were built on collective lands that villagers relied upon for agricultural production (El Amine, 2023). The village has remained plagued by intermittent blackouts. As Moroccan policymakers look to accelerate growth in the clean energy sector, STEG's failures to engage local actors underscore the importance of fostering responsible relationships with affected communities.

Risks of Disrupting the Status Quo

Enhancing community engagement, in addition to promoting development and providing a stable environment for the RE industry. It brings two-way knowledge transfer (domestic–foreign; intra-sector and inter-sector) whose split effect benefits the industry with more transparency and value added. We therefore believe that the potential social controversy of this part is much smaller than its benefits.

However, we do admit that changing the status quo may bring profit risks and mismatches between institutions. For example, the above mentioned Xlinks project itself once stalled in negotiating a price-match with the UK government. Feed-in tariffs and grid/transmission reforms dramatically change electricity prices, adding difficulty in changing existing agreements and subsidies between ongoing flagship electricity export projects and exporting countries. Constructing a centralised, less fragmented energy regulator may lead to a lack of cooperation among departments, reducing administrative efficiency. We therefore propose an experimental and phased solution that incorporates implementation to minimize risk related to exporting and profit.

Implementation

Political Feasibility

Morocco is a constitutional monarchy with a parliamentary national legislative system. Under this system, ultimate authority rests with King Mohammed VI who shares executive authority with the Head of Government, Aziz Akhannouch. The implementation barriers faced on the political side are those previously mentioned in the analytic framework: reducing elite market share of RE and convincing government officials to adopt policies. Of our recommendations, we foresee the largest barrier existing in adopting Feed-in Tariffs as they will require government legislation. However, the adoption of these policies are not novel nor unique to countries globally. From 2004 to 2016, 83 countries implemented RE FITs and premiums (Fernández, 2023). Of these countries, more than half are developing (Vagliasindi, 2012).

As established, Morocco would not be piloting a completely foreign program. FITs have been practiced for nearly twenty years with varying levels of success. For example, in Germany, the operation of RE facilities was a major source of revenue in 2011, earning 13.8 billion Euros and achieving consistent growth in employment (Leidreiter & Boselli, 2015). Highlighting the successful results of FIT systems globally, such as Germany, to policy makers through local and national advocacy programs is one way to overcome this barrier to adoption.

While the successful implementation of our policy necessitates mitigation strategies to overcome political barriers, it is also critical to note that Morocco has been open to adopting similar policies in the past. Although Morocco has never implemented a FIT, the “EnergiPro” project operated by ONE is a similar system. This program was launched in 2006 to promote independent production of electricity from renewable sources (Leidreiter & Boselli, 2015). By offering producers of RE a fixed rate to distribute their electricity through the large national network controlled by ONE (Leidreiter & Boselli, 2015) and through ensuring that ONE repurchases any surplus electricity with a twenty percent bonus, Morocco has already established some degree of institutional framework for FITs. Therefore, analysis of existing FIT success globally and existing frameworks in Morocco highlights that adoption of a FIT policy would not be an immense barrier to overcome.

Institutional Capacity

It is critical to consider the institutional capacity of Morocco's private sector and government partners regarding the adoption of our policies. Specifically, if partners have the capacity to acknowledge electricity regulation reform and community engagement.

Electricity Regulation Reform

In considering the adoption of Electricity Regulation Reform, Morocco faces a significant institutional barrier. Privately owned energy distributors, who benefit greatly from current regulations, would likely intervene in any government process to create a centralised, independent energy regulator (Vidican, 2015). If there are continued institutional barriers, policy makers can mitigate the risk by offering incentives to cooperate to opposing entities. For example, offering a certain percentage of export contracts to these distributors on the condition that they comply with regulation reform, is one way of facilitating cooperation.

Community Engagement

As mentioned, effective policies will engage the local community to increase acceptance and sustainability of RE in Morocco. Therefore, before any renewable infrastructure is built, Morocco must form partnerships with leaders of the communities who are most affected. Notably, Morocco has been successful in ensuring that new renewable projects have considered the necessary infrastructures to engage local communities. For example, when MASEN built the Noor Solar Power Station in the Ouarzazate desert in northwest Morocco, there was a strong consideration of how the plant would affect local communities and also how it could positively impact them in the future. At the time of commission, Noor was the largest concentrated solar plant in the world (Smillie, 2021). To mitigate the risk created by such a large infrastructure project, MASEN constructed the plant in a non populated area where no resettlement was required and no culturally important sites were disturbed (Wuppertal Institute & Germanwatch, 2015).

Moreover, the Government of Morocco and MASEN considered how neighboring communities, specifically the rural Commune of Ghassate and the City of Ouarzazate would be affected by the construction of the project (Smillie, 2021; Wuppertal Institute & Germanwatch, 2015). This engagement was strengthened by offering community members a formal stake in the project which

led to overwhelming resident support (Smillie, 2021; Wuppertal Institute & Germanwatch, 2015). The Noor project did face constraints in community engagement, specifically that the local context was not well considered as much of the plant material was not translated into local dialects (Smillie, 2021; Wuppertal Institute & Germanwatch, 2015); future community engagement efforts must improve upon the failures of the Noor project to ensure that local communities have all the tools necessary to collaborate on RE projects.

Ultimately, the general success of engaging local communities throughout when implementing the Noor Complex proves that Morocco has the institutional capacity to engage local communities in RE projects. Thus, our recommendation is already in line with Moroccan best practices and therefore has a high feasibility of implementation. To ensure the success of these partnerships, policy makers should consult local communities, as well as private and government RE organisations, to ensure that local engagement practices are as effective as possible.

Follow-Up Measures

If our policy passes the implementation phase, we propose the following standards to ensure effective monitoring and evaluation of impacts.

Feed-In Tariffs

The success of Feed-in Tariffs to promote RE will be evaluated on what the internal rate of return (IRR) is for the distributed energy resource (DER). IRR is the discount rate value where the net present value of future cash flows becomes the same as the initial investment cost of the project (Manabe, 2016). If the market price of energy created by FITs is stable, the policy is effective. Additionally, the intention to adopt FITs is to accelerate investment in RE systems. Therefore, the increased adoption of renewable infrastructure and investment offers another method for evaluating policy effectiveness.

Electricity Regulation Reform

The goal of implementing electricity regulation reform is increased private-sector investment into renewables. At the time of this report, Morocco's energy distribution is composed of municipal agencies, the state utility, and 13 private energy distributors (Vidican et al., 2013). Therefore, if

there are an increased number of private energy distributors entering and participating in the market, our policy will have succeeded against this measure. Increased adoption of small-scale RE projects, especially in solar, suggests that reforms have allowed new players, notably SMEs, to enter the market.

Community Engagement

Evaluating the engagement of the local community will require policy makers to speak directly to community members affected. Through surveying the community and analysis of employment records, policy makers can determine local community impacts. If members of the local community have a strong participatory role in renewable infrastructure construction and adoption, we could deem our policy successful under this measure. Additionally, an increase in employment, specifically in renewable sector jobs, could signify the success of our policy in delivering long-term positive impacts.

Escaping the Middle-Income Trap

The strongest measure upon which to evaluate all our policy recommendations is if they can help Morocco escape the Middle-Income Trap. Thus, analysis of our policy's impacts against key measures such as economic growth rates, economic diversification, technological advancement, human capital development, infrastructure development, trade and export performance, financial sector development, innovation and research will provide the strongest mechanisms for evaluation.

If data finds that our program is not improving the economic and social landscape in Morocco, we have built mechanisms into our policy to adjust actions if necessary. First, we propose adopting these recommendations over a given time period. Generally, the contract period for a Feed-in Tariff is 20-25 years. Every five years, policy makers will evaluate the impacts of the FITs on adoption and investment into renewables. These evaluations will also include analysis of RE exports, Moroccan profits from renewables, and how local communities have been altered (positively or negatively) by the adoption of policies. If these evaluations find that policy adoption has been non-profitable or that the opportunity cost of investment outweighs its profits, Moroccan policy makers will have to adjust. If necessary, we propose adjustments through raising the IRRs on Feed-in Tariffs to make them profitable and then using these profits to address problems on grids, and

opening increased lines of communication between RE companies and local communities to close the asymmetry gap.

Conclusion

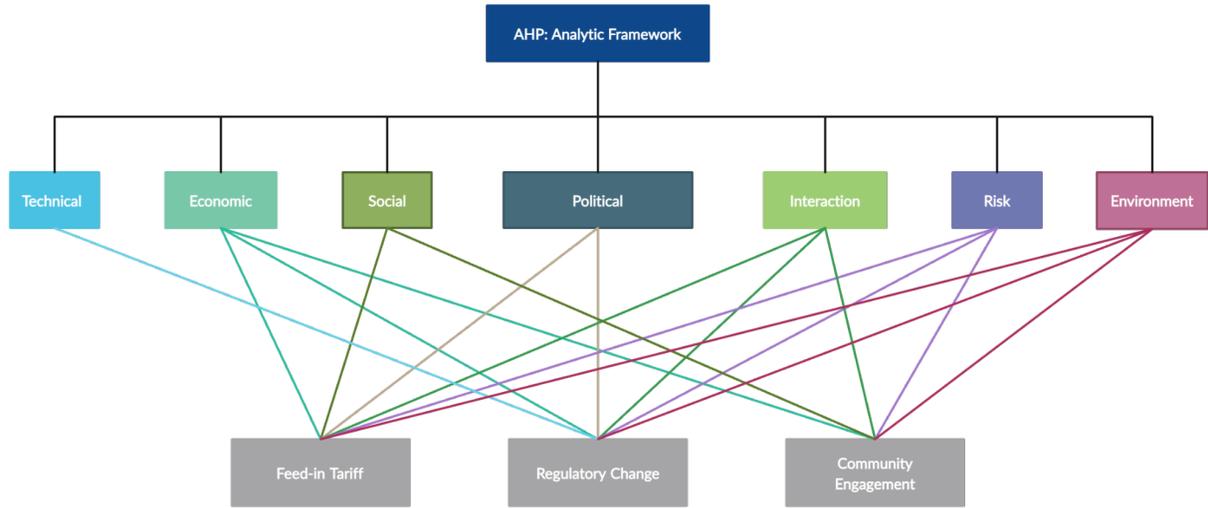
Morocco's pursuit of RE is both promising and challenging. The global shift towards sustainable energy, coupled with Morocco's quest for energy independence and the opportunity to profit from Europe's net-zero transition, underscores the importance of this endeavor. However, three major obstacles—bureaucratic institutions, high market entry barriers, and lack of local engagement—have potential to contribute to Morocco's middle-income trap.

To overcome these challenges and promote a profitable and sustainable RE sector innovation, this paper proposes a de-risking strategy bundle that includes three key elements: implementing FITs, regulatory reforms, and enhancing community engagement. These strategies are carefully evaluated against other policy options and against cases of other countries. In summary, this paper suggests that de-risking strategies require an experimental, incremental implementation roadmap and that we need to adopt different communication strategies depending on who we are persuading. Facing national institutions, we need strong lobbying to convince governmental agencies to accept regulatory institution reforms and market liberalisation reforms with long-term rather than short term profits. In the face of localities, a helpful and listening attitude is essential to build social bonds and knowledge transfers. In doing so, we contribute valuable perspectives on Morocco's RE landscape, guiding informed decision-making for its stable and prosperous future.

Word count: 7695

Appendices

Appendix A: Analytical Hierarchical Process



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