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**Greening Electricity Governance in the MENA region:**

**Mapping the Role, Drivers and Impacts of Renewable Energies Agencies**

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*Abstract*. Since the early 2000s virtually all the countries in the MENA region have set ambitious targets for renewables energy generation, launching impressive investment plans for promoting their deployment and implementing specific supporting schemes, such as feed-in tariffs, net metering and tendering procedures. Despite the enormous regional potential – especially in the solar and wind sector – the practical results of these policy and regulatory efforts have often been disappointing. However, these efforts have been paralleled by the establishment, or upgrading, of specialised renewable energies agencies, that contributed to transforming the patterns of electricity governance in several countries. Against this background, this paper has two main goals. First, it offers a mapping of the emergent governance modes for greening electricity governance in the MENA region by looking at the role that renewable energies agencies play in different countries as well as at their interactions with other relevant sectoral actors, such as Ministries, former incumbent companies and IRAs. Renewable energies agencies’ role can vary from mere policy advising and information (e.g. Jordan, Lebanon, Saudi Arabia), to a more prominent stance in electricity governance through project development and/or endowed with (pseudo)regulatory functions (e.g. Morocco, Egypt, Tunisia and UAE). In these latter cases, the establishment of renewable energies agencies can result in a further centralization of electricity governance in the hands of governing elites (e.g. Morocco, UAE), favour decentralization with the empowering of new bureaucratic and social actors (e.g. Tunisia), or trigger conflicts that undermine renewables development (e.g. Algeria). Secondly, the paper, evaluates the outcome of these efforts and explains these divergent national patterns for greening electricity governance by looking at the interaction between domestic and international factors. These include variations in political regimes, path-dependencies related to the original set up for electricity governance as well as pressures and incentives coming from external actors and development banks.

**1. Introduction**

Climate change and energy transition have emerged as key challenges for the twenty-one-century governance, policy making and politics all over the world. In particular, scholars of energy transition have underlined the global nature of similar process while suggesting that the term should be used with the plural – ‘global energy transition(s)’ – to point at the varieties of forms, trajectories, and outcomes that a similar transformation can take in different geographical and geopolitical contexts (e.g. Smil 2016; Van De Graaf and Sovacool 2020). Although energy transitions are not a new phenomenon *per se* the current move from fossil fuels towards low-carbon technologies and renewables differs from the previous shifts in the patterns of energy production and consumption (Arndt et al. 2017; Van De Graaf and Sovacool 2020). Unlike the previous energy transitions the current one is explicitly driven by a complex mix of policies and governance arrangements at different scales from the local to the global. Moreover, its transformative effects have the potential to re-design systems of governance and power relations across those scales (e.g. IRENA 2019).

The bulk of the literature on energy transition, however, has mainly focused on industrialized countries in the West or on those emerging powers, such as China or India, that for their size and CO2 emissions are essential players in climate politics. Only recently scholars have begun to scrutinize the drivers, impacts and implications of energy transition for the developing countries of the Global South (e.g. Goldthau et al. 2020). A large part of this strand of literature, however, has mainly adopted a prescriptive approach, by analysing the problems that the Global South is facing in promoting renewables and low-carbon technologies and suggesting policy measures and best-practices tailored to the different local contexts. Usually, similar analysis point to the lack financial resources, weak political commitment and underdeveloped (of instable) regulatory and policy frameworks as the main barriers for the deployment and the diffusion of renewables in these countries. Only a minor part of this emerging literature, on the other hand, has started to reflect on the wider political, institutional and social implications of the current energy transition on the countries of the Global South. As an international and transnational phenomenon – rooted in the (new) global political economy of energy (e.g. Kuzemko et al. 2019) – the current energy transition is affecting the patterns of governance and politics in the Global South. Energy policy and politics in developing countries cannot be understood without taking into consideration these wider (and pervasive) global dynamics in which they are embedded. To be sure, it’s not the first time that energy governance in the Global South is heavily influenced by international and transnational dynamics. Especially in the electricity sector, since the 1990s, the liberalization-privatization agenda has been widely promoted as part of the broader neo-liberal package of the ‘Washington Consensus’. Regulatory reforms and the establishment of independent regulatory agencies (IRAs) in the electricity sector were key elements of the rise of the regulatory state in the Global South (e.g. Dubash and Morgan 2012, 2013). This implied a restructuring of state functions in several developing countries as well as the creation of new institutions and governance arrangements. Rather than a linear adoption of the regulatory model (and of the market-approach), however, hybrid forms of governance have (unsurprisingly) emerged as the external pressures mixed with domestic politics and policy legacy (e.g. World Bank 2019).

The global energy transition – and the politics climate change – is exercising a similar transformative effect on energy governance in the Global South. Unlike the liberalization agenda of the 1990s, however, the pressions for promoting domestic reform are less intense. The international (and donor) community is aware that energy transition cannot follow a ‘one-fits all’ model as variations in domestic contexts (political, economic, institutional, social and geographical) require a variety of approaches and policy tools. Moreover, the energy transition is widely influenced by the political economy of energy and by the interconnection between technological choices and social and political dynamics.

Despite these differences, the greening of energy governance in the Global South – i.e. the introduction of policy tools and governance arrangements for promoting renewables – will be still the result of the interaction among international and transnational dynamics and domestic forces. A similar interaction seems particularly interesting in the electricity sector. From a substantial point of view, the decarbonization of the electricity sector is an essential move for tackling climate change. In the Global South this challenge is (often) accompanied by the need to fight energy poverty and increase electricity supply, especially in rural areas. From an analytical angle, it is interesting to study how the move towards renewables is affecting electricity governance in the Global South as (in several countries) it is still in flux from traditional forms of direct state intervention towards hybrid models more open to market dynamics and new actors.

While the diffusion of policy tools and targets for renewables in developing countries has been monitored by scholars and international organizations – such as the IRENA and the IEA – the institutional implications of greening energy governance have been so far less studied. This phenomenon – that ranges from the establishment of dedicated line Ministries (or units) for energy transition and/or climate change to dedicated agencies for promoting renewables – is worth examining as it signals another important step in the transformation of the state in the Global South. Also, it offers an additional entry point for studying the internal-external nexus in the politics of diffusion of institutional innovations in developing countries.

Against this background, this paper focuses on an important region of the Global South – the MENA region[[1]](#footnote-1) – and on a specific type of institutional innovation; i.e. renewable energies agencies (REAs). In Section 2, the paper illustrates the basic features of the political economy of the energy transition in the MENA as they affect the pattern of energy governance in the region. Section 3 offers a mapping of the emergent governance modes for greening electricity governance in the MENA region by looking at the functions and role of REAs in different countries as well as at their interactions with other relevant sectoral actors, such as Ministries, former incumbent companies and IRAs. Section 4 focuses on the different modes of greening electricity governance through agencification in the MENA region. Also, this section further illustrates and discusses the emergence and role of REAs by focusing on four case studies: Egypt, Morocco, Tunisia and UAE. Finally, in the conclusions the paper offers insights on the interactions between domestic and international factors in the diffusion of REAs and in the greening of energy governance in the Global South.

**2. The Political Economy of Energy Transition in the MENA Region**

The MENA region occupies a very interesting position as far as the impact and politics of the global energy transition is concerned (Tagliapietra 2019). On the one hand, this region has enormous potentials in the area of renewables, especially solar and wind power. On the other hand, several MENA countries are highly dependent on fossil-fuels, that are a key component of the political economy and state-society relations across the region. A shift toward a more diversified energy mix where renewables play a much more prominent role, hence, will not come easy in the MENA, in spite of the widely demonstrated benefits and opportunities. The MENA region has been historically characterised by intense energy exchange (Leal-Arcas et al., 2017) and is currently heavily dependent on fossil fuels revenues (Figure 1). Together with former Soviet Union countries its GDP is severely linked to fossil fuels production, although this situation is scattered around the region with countries that present a different degree of dependency from fossil fuel (FF) rents.

Figure 1. Regional Fossil Fuel Export/imports as % of GDP. Green net importing regions; Red net exporting regions.

Chart, bar chart

Description automatically generated

Source: World Bank; IMF

The abundancy of fossil fuel reserves, while representing an important, and sometimes vital source of revenues in the region, can constitute a toxic legacy in a period of technological transition and low carbon revolution. Beside the well-known social and economic consequences of the resource curse (Ross et al., 2011) FF rents can alter or reduce the interest, appetite and consideration for the energy transition in oil exporting countries. Also, this global process tilts the interest of major economies toward fossil fuels, in favour of other cleaner energy technologies, leaving oil exporting countries depleted and enable to embrace (from a social, economic and technological point of view) the upcoming low carbon transition. If we look at the vulnerability of MENA countries to the low carbon transition (Figure 2) we can see, again, a multifaced picture. We indicate with vulnerability the combination of the dependency of the considered economies from FF Rents (Vertical axes) and the GDP per capita. In the wake of a low carbon technology transition, the most vulnerable countries are those located in the North West quadrant indicating situations where the countries is heavily dependent on FF Rents, while being characterised by a relatively low income (measured as GDP per capita). On the other hand, countries characterised by low FF Rents exposure and high resilience are those better equipped to face the low carbon transition. As we can see in Figure 2 several MENA countries do not appear in the South East quadrant and are mostly located in the West quadrants, thus being either greatly exposed to FF Rents or presenting a very low resilience.

Figure 2. Vulnerability of MENA Countries.



Source: World Bank (2021)

This situation entails a different set of problems for the MENA countries. North African and Levantine countries are low exposed and low resilient countries, with the exception of Algeria and Libya (see below). Their economy and political system is less reliant on fossil fuels making the shift towards renewables easier. In these countries, renewables can also be promoted to achieve energy security objectives as these countries rely on imports. However, their low level of GDP signals that they must attract foreign investment to finance their energy transition. Conversely, the Gulf monarchies, that are more exposed to the energy transition, have contrasting incentives. They have both the financial means and the motivation to develop renewables in order to re-design their economic model of development in anticipation of a post-fossil fuel world. However, as rentier states, the shift towards renewables put at risk the social contract that support the stability of the regime and the prominent role of the ruling elites. Finally, low resilient and high exposed country, like Algeria, Libya and Oman, should attract investment for an energy transition that would alter the stability of the regime and the prominent role of the traditional political actors.

The issue of financing the energy transition is particularly important in the MENA region. The cost of support schemes for renewables could potentially compromise government commitment, as subsidising renewables is expensive and pressurises already tight government budgets, given current fossil fuel subsidies which constitute a significant part of governments’ expenditures in the region.

Despite these problems, all the MENA countries have set ambitious targets for renewable electricity production (Table 1). Many of them have also introduced regulatory tools to promote their development (Table 1). However, greening the energy sector requires a complex combination of regulatory and governance innovations whose implementation is sometimes outside the responsibilities of the actors involved in the energy sector alone, targeting, in addition to renewable energy also energy efficiency, energy security and market design and sustainable finance measures. Moreover, the process of introducing a new technological capability in an otherwise mature sector, such as the power sector, does not happen in a vacuum, but is significantly influenced by the institutional structure and dynamics that shape the energy sector in each country. As a result, the diffusion of renewables is still limited in the region, although with important country-level variations (Table 1). In North Africa, Morocco and Egypt are leading in the deployment of renewable capacity. In the Gulf, UAE and Saudi Arabia are the leading countries.

*Table 1. RE targets, RE electricity installed capacity (in MW), technology choice and regulatory tools in MENA countries.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | *RE*  *(non-hydro) electricity installed capacity (in MW)* | *RE Target (in MW)* | *Technology Choice (1)* | *Regulatory tools* | | | |
| *Yes/No* | *FIT* | *QO/RPS* | *NM* | *Tendering* |
| ***Morocco*** | 1140 | 10000 | ✓ |  |  | X | X |
| ***Egypt*** | 809 | 60000 | ✓ | X |  | X | X |
| ***Jordan*** | 484 | 2000 | ✓ | X |  | X | X |
| ***Tunisia*** | 282 | 2000 | ✓ |  |  | X |  |
| ***Algeria*** | 260 | 22000 | 🗶 | X |  |  |  |
| ***UAE*** | 144 | 5000 | 🗶 |  | X | X | X |
| ***Saudi Arabia*** | 74 | 10000 | 🗶 |  |  | X | X |
| ***Qatar*** | 44 | 2000 | 🗶 |  |  |  |  |
| ***Kuwait*** | 41 | 8000 | 🗶 |  |  |  | X |
| ***Lebanon*** | 29 | 2000 | 🗶 |  |  | X |  |
| ***Palestine*** | 14 | 1000 | 🗶 | X |  | X |  |
| ***Bahrein*** | 6 | 2000 | 🗶 |  |  |  |  |
| ***Libya*** | 5 | 1000 | 🗶 |  |  |  |  |
| ***Oman*** | 2 | 2000 | 🗶 |  |  |  |  |
| ***Syria*** | 1 | 2000 | 🗶 | X |  | X | X |

*Sources:* For the RE installed capacity and targets: Menichetti et al. 2018. Notes: Target years; 2020 (Jordan, Lebanon and Palestine); 2023 (Saudi Arabia); 2025 (Libya); 2030 (Algeria, Bahrain, Kuwait, Morocco, Oman, Qatar, Syria, Tunisia, UAE); 2035 (Egypt). For the regulatory tools: IRENA (2016) and Griffiths (2017). Notes: FIT = Feed in tariff/premium; QO/RPS = Quota obligation; NM = Net metering.

(1) The factor “Technology Choice” is based on relative the evaluation of the patents filed in renewable energy (RE) technologies also considering the relevant subsectors (for solar energy and bioenergy) both at regional and national. We have evaluated the patents files recorded in the region in the period 2000-2019 and considered in possess of a technology choice policy those countries that have presented enough patents, also taking into consideration their market size and GDP. 4 countries qualified in terms of regional patents. Among those countries (Morocco, Egypt, Jordan and Tunisia) we have considered the two technologies that recorded the highest level of patent recording in each country. See details in table 3 in the appendix

Against this background, rooted in the political economy of energy in the MENA region, in the next sections we explore the different circumstances in which a specific type of institutional innovation – i.e. renewable energy agencies (REAs) – has emerged. Also, we analyse the different functions and roles of these agencies in greening (electricity) energy governance.

**3. Mapping Renewable Energy Agencies in the MENA Region**

The governance framework for promoting and deploying renewables in the electricity sector varies widely in the MENA region. Factors that contribute to this result include the different intuitional and political systems of the countries in the region, the level of political attention on renewables, the presence (or absence) of a regulatory agency, the political strength of the national utility – or of the national oil companies in producer states – and the level of involvement of the ministry responsible for energy matters over renewables (e.g. IRENA 2016; Atalay, Biermann, and Kalfagianni 2016; Jalilvand and Westphal 2017; Poudineh, Sen and Fattouh 2018). External factors have also shaped green electricity governance in the region, especially in the North African countries traditionally more exposed to European and EU policy developments and the intervention of several actors of the donor community such as multilateral and national development banks. With the exception of Bahrain and Oman, however, all the MENA countries have established specialised institutions – REAs – in the area of renewables (Table 2, end of the document). These institutions perform different functions that can be grouped in three main areas of activities: research and policy advising, project development and regulatory functions.

Research and policy advising pertains making studies on renewable technologies, both policy-focused and applied research, which can include the realization of (small) pilot and demonstration projects. Also, it involves providing governmental agents information and expertise on renewable energy policy and contributing to draft plans and initiatives on these issues. REAs involved in research and policy advising in the MENA usually are members of regional networks of renewable agencies and research centres, such as the Mediterranean Association of National Agencies for Energy Management (MEDENER) that was established in 1997 in the context of the Euro-Mediterranean cooperation, and that gathers national agencies from the northern and southern banks of the Mediterranean, or the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE), established by the Arab League in 2008 and based in Egypt. Moreover, these agencies are involved in the works of international energy and climate organizations such as the IRENA or the UN agencies.

Project development implicates a more activate participation in renewable energy projects’ implementation through ownership – at various degree and with different tools – of specific sites and installations. Finally, regulatory functions pertain the involvement of REAs in managing important regulatory aspects for renewable development such as tax and financial incentives, tenders, competitive auctions or FIT schemes.

The first REAs in the MENA were established in the 1980s in Tunisia, Egypt, Morocco and Algeria as governmental research centres focusing on renewables and energy efficiency. This pattern of diffusion was driven mainly by the activism of the research community, which had contacts with the other shore of the Mediterranean. In this period similar research centres were also established in the EU Mediterranean countries, like Italy (1982), France and Spain (1986). Additional drivers for the diffusion of these first MENA’s REAs were the efforts of the US and European development cooperation policy. In Egypt and Tunisia, the role of these original agencies in green electricity governance increased over the time in parallel with the development of national plans on renewables (Vidican 2015). When Egypt started to develop its renewable energy plan – in the late 2000s – the Egyptian National Renewable Energy Authority (NREA) gradually became a developer that owned and operated renewables installations and sites. Finally, it also acquired regulatory functions managing competitive biddings, tenders and the country’s FIT scheme. A similar pattern was followed by the Tunisian National Agency for the Promotion of Renewable Energy (ANME) that was gradually upgraded – starting from a reform issued in 2004 and later with the Tunisian Solar Plan initiated in 2010 – from a research centre and advising institution to an actor endowed with (some) regulatory functions in the area of renewables, such as granting financial incentive and tax. On the other hand, the original Algerian and Moroccan agencies, although reformed and upgraded in the 2000s, did not follow the same trajectory remaining focused on research and policy advising. The same situation characterised those REAs established in the 1990s in Palestine (Palestinian Energy and Environment Research Center, PEC) and Jordan (National Energy Research Centre, NERC) (Table 2, end of the document). The former in particular works under the auspices of the Palestinian Energy and Natural Resources Authority (PENRA), which was supported by the World Bank and other bilateral donors.

After a stagnation during the 1990s, the diffusion of REAs in the MENA region accelerated in the 2000s (Figure 3). This move was paralleled by a growing political attention on renewables first in North Africa and then in the Gulf. In this period, the promotion of renewables also entered more firmly into the global climate agenda as well as in the agenda of the development community. Energy security considerations also were pushing in this direction, especially for the importer countries of the region that were also witnessing an increase in electricity demand. However, many of these new REAs were endowed with limited functions, focusing on research and policy advising. This is the case of Lebanon and Syria. Lebanon’s Center for Energy Conservation (LCEC) and Syria’s National Energy Research Center (NERC) were established thanks to the support of the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP). The Libyan Renewable Energy Authority (REAOL) should have played a more important role by actively developing renewables projects. But the war and the subsequent instability in the country has hindered this possibility.

*Figure 3. REAs diffusion in the MENA region.*

Among North African countries, only Morocco followed a different path. In order to implement the Moroccan Solar Plan, in 2010, the government created MASEN as a state-backed private company tasked with project development functions. MASEN is also involved in organizing competitive biddings and coordinates the combination of grants and loans by multilateral and bilateral donors (Vidican et al. 2013). In 2016 this agency was renamed ‘Moroccan Agency for Sustainable Energy’ becoming responsible for the development of all renewables in Morocco. The same year the former National Agency for Renewable Energies and Energy Efficiency (ADEREE, established in 2010 as an upgrading of the CDRE and supported by German development cooperation) was renamed Moroccan Agency for Energy Efficiency (AMEE) and refocused only on energy efficiency. Indeed, in meantime, Morocco had established IRESEN, placed under the Ministry of Energy, with responsibilities for research on renewables and policy advising.

In the Gulf monarchies, REAs diffusion manifested later. A partial exception is the case of Kuwait. The Kuwait Institute for Scientific Research (KISR) was originally established in 1967 by the Japan’s Arabian Oil Company, in partial fulfilment of its obligations under an oil concession agreement with the country. Its goal was to conduct research on crude oil recovery, desert agriculture and marine biology. In 1981 it became a government agency responding to the Council of Ministers. Also, its competencies were expanded in the area of renewables, especially solar energy. Later on, the agency increased its focus on renewable technologies developing also small pilot projects. Its policy advising role was advanced in the late 2000s after the country launched its ‘State Vision Kuwait 2035’ and, since 2018, KISR representatives take part in the Kuwait Higher Energy Committee. The other Gulf monarchies as well established their REAs within the context of national plans for diversification from their oil and gas economies. UAE, however, has created a state-backed private agency, MASDAR – or ‘Abu Dhabi Future Energy Company’, wholly owned by the Abu Dhabi government’s Mubadala Investment Company – with research and policy advising and project development functions[[2]](#footnote-2). This agency increased its role with the launch, in 2010, of the ‘Vision 2021’ plan. On the other hand, Saudi Arabia and Qatar followed the path of Kuwait. Their new agencies were mainly focus on research and policy advising and their activities included other sectors in addition to renewables. Particularly, the Saudi K.A. CARE covers nuclear energy along with renewables[[3]](#footnote-3). Moreover, whereas K.A. CARE is a government agency, QUEERI is private entity supported by the state-backed Qatar Foundation covering renewables but also other environmental and energy challenges as well as water security.

**4. Greening electricity governance through agencification in the MENA region**

***4.1 REAs and modes of greening electricity governance***

Overall, as illustrated, after the first pioneers in the 1980s and early 1990s, since the mid-2000s almost all the countries of the MENA region have created a REA in parallel with other policy and governance innovations in the area of renewables. In North Africa, REAs diffusion was (often) supported by the donor community whereas in the Gulf’s resources rich monarchies new agencies were established (or upgraded) as part of national diversification plans initiated (and controlled) by the ruling elites. A partial exception is the UNDP support for the Bahrein’s SEA, which however is not a proper REA but a new Unit attached to the Ministry of Electricity and Water (Table 2, end of the document).

The new REAs are mostly government agency – like those developed by the pioneers – with the exceptions of Morocco, Qatar and UAE where REAs were structured as state-backed private entities. Moreover, the role of the REAs in national electricity green energy governance varies in different countries. In the Gulf, with the exception of the UAE, this role is limited. Responsibilities for renewables are in the hands of traditional state actors that have expanded their functions to cover renewables, such as energy ministries, national electricity utilities and regulators and national oil companies, which can also take part in projects development like in cases of Kuwait and Qatar (Table 2, end of the document). In North Africa the situation is more complex. Also, in this region REAs’ role in green electricity governance is often limited to research and policy advising functions. This is the case in both producer countries like Algeria and consumers like Jordan, Palestine or Lebanon. In 2002, Algeria created a dedicated state-owned company for the development of renewables: New Energy Algeria (NEAL). However, in 2012, NEAL was absorbed by the national utility Sonelgaz, which is involved in developing renewables through its subsidiary Sharikat Kahraba Takate Moutajadida (SKTM). Other important actors in the Algerian green electricity governance are the Ministry of Energy and the electricity regulator (the Gas and Electricity Regulatory Commission, CREG). In Jordan as well, important actors for renewables are the ministry responsible for energy and the electricity regulator, whereas in Palestine PENRA is involved in developing renewables along with the Palestinian Electricity Regulatory Council (PERC).

On the other hand, REAs’ role in green electricity governance is significative in Egypt, Tunisia and Morocco, although, as anticipated, in the latter case the REA is structured as state-backed private entity rather than a government agency placed under a minister. The significant role of the Egyptian and Tunisian REAs is also reflected in their major organizational capacity: about 1,000 employees work for NREA – that is also involved in project development – and about 150 for ANME. These numbers are much higher than those of the other REAs established as government agencies, which oscillate between 20 to 50 employees[[4]](#footnote-4). However, it is worth stressing that in both countries other actors have an important role in green electricity governance, including regulators and national utilities (Table 2, end of the document). Overall, only in four out of fifteen countries of the MENA region REAs play an important role in the national strategies for greening electricity governance; although in Morocco and UAE REAs were structured as state-baked private entities unlike Egypt and Tunisia that followed a more traditional path with REAs as government agency (Figure 4).

*Figure 4. Modes of greening electricity governance through agencification in the MENA region.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | | REAs’ role in greening electricity governance | |
| Low | High |
| REAs as | Government agencies | Algeria (CDER)  Jordan (NERC)  Palestine (PEC)  Lebanon (LCEC)  Saudi Arabia (K.A. CARE)  Kuwait (KISR)  Morocco (IRESEN) | Tunisia (ANME)  Egypt (NREA) |
| State-backed private entities | Qatar (QEERI) | Morocco (MASEN)  UAE (MASDAR) |

Notes: REAs’ role = related to their functions in green electricity governance (see Table 1): Low = Research and Policy advising; High = Project development and/or Regulatory functions. This figure does not include Libya and Syria’s REAs.

The greater degree of institutional innovation in Morocco and UAE has to be placed within the context of national strategies led by key actors of the ruling elites. In the case of Morocco, this strategy aimed at attracting foreign investment, address energy security issues and support the country’s regional (geo)political aspirations. On the other hand, in the resource and financially rich UAE the establishment of MASDAR – and the MASDAR initiative – aimed at diversifying national economy and increase the international visibility of the emirate of Abu Dhabi. Thanks to an active diplomatic campaign, and generous financial support, MASDAR city was selected to host IRENA. Moreover, MASDAR Clean energy gradually begun to develop renewables project not only in the UAE but also abroad (especially in the Middle East). In both cases, however, the radical institutional innovations in green electricity governance aimed to preserve the power structure of the regime: the role of the monarchies has extended to the renewable energy sector. Conversely, the path dependent and incremental trajectory for greening electricity governance through agencification of Egypt and Tunisia has triggered more pluralistic power and governance dynamics. The specific drivers and impacts of these different trajectories are further explored in the next sub-sections.

***4.2 Greening electricity governance trough governmental agencies: Egypt and Tunisia***

In Egypt and Tunisia, a path-dependent pattern of evolution has characterised the role of REAs in greening electricity governance. This development has allowed their REAs to gradually increase the scope of their actions despite the disruptive political events brought in these countries by the so-called Arab-Uprising. After a troubled period, Egypt shifted, in 2013-14, towards an authoritarian regime under the leading figure of the President Al-Sisi. This regime, however, is ruled by a fragmented elite and it is characterised by a fractured state bureaucracy that renders the country difficult to manage in several key policy areas (e.g. Rutherford 2018). In Tunisia, on the other hand, a democratic regime has emerged, celebrated with the 2014 first democratic and pluralistic election.

From an energy point of view, Egypt has been characterised, since the late 2000s, by a growing energy demand driven by growing population and a positive macroeconomic cycle. However, the country faced several problems related with fuel shortages (in particular starting in 2014) notwithstanding the recent natural gas discoveries. With a declining trend for fossil fuel rents over the last 50 years and a dramatic thirst for energy the Egyptian government has launched an energy diversification strategy in the late 2000s. In this context, NREA, originally created as a public agency for research and policy advising, gradually increased its role as a developer that owned and operated renewables installations and sites. This evolution further accelerated in the following period in parallel with the relaunch of the Egyptian renewable plans under the Al-Sisi regime. These new plans were centred around the Integrated Sustainable Energy Strategy to 2035 (ISES 2035), released by Egypt’s Ministry of Electricity and Renewable Energy (MoERE) in 2015 and approved by the Supreme Council of Energy the following year, a blueprint for the future of Egypt’s energy sector, as part of an EU-funded technical assistance cooperation project (European Union, 2015). This strategy involved stepping up the development of renewable energy and energy efficiency and a strong commitment to the widespread deployment of renewable energy technologies. In this context, NREA acquired regulatory functions managing competitive biddings, tenders and the country’s FIT scheme.

While NREA focuses particularly on wind and solar technologies, other institutions have devoted efforts to biomass development. Among those institutions are the state-owned electricity generation, transmission and distribution entities operated under the supervision of the Egyptian Electricity Holding Company (EEHC). NREA is coordinating Egypt’s process to reaching its renewable energy target of 20 percent by the year 2022. However, existing capabilities within NREA and its organizational structure pose big challenges to developing the renewable energy sector (both the deployment and localization of production and services capabilities). While the NREA functions independently from the EEHC and other state-owned electricity companies, it nonetheless reports to both the Ministry of Electricity and Renewable Energy (MOERE) and EgyptERA.

Overall, the Egyptian regulatory and institutional framework is characterised by a great complexity and fragmentation but pivoting around the role played by MOERE/EEHC, together with Egyptera that are always involved in the main stages of the RES deployment. NREA is involved in the process linked with the RES deployment authorisation procedures for each renewable scheme active in Egypt. However, MORE/EEHC and Egyptera maintain their historical institutional role now extended to renewable energy schemes, NREA is entrusted mainly with technical responsibilities instrumental to the Energy policies defined at MOERE/EEHC level and regulated through Egyptera.

This complex institutional paradigm is well connected to the energy goals defined in the Integrated Sustainable Energy Strategy (MOERE, 2015) that emphasize how security of supply and long term economic and technical sustainability are the two main goals to be achieved by the Egyptian electricity system by 2030 (Hasan, 2020). To this end the utilisation of RES technologies can be a useful addition to other proven (traditional) technologies. Therefore technical, regulatory and economic concerns have a greater priority compared to reaching ambitious RES installation targets. Moreover, the institutional fragmentation that characterises the greening of energy governance in Egypt is in line with the wider political and institutional environment of the country.

In Tunisia as well, the energy sector is facing economic, social and environmental challenges. In an effort to meet its emissions reduction targets under the Paris climate agreement and diversify its energy mix, Tunisia has set an ambitious goal of reaching 4.7 GW of installed renewable energy generation capacity (approximately 30% of the country’s power) by 2030. In order to reach its target, Tunisia is aiming to attract international developers to exploit its potential resources thought RES projects. Successful development and financing of these projects may play a role in improving the public’s trust in government services as Tunisia manages its ongoing transition to democracy and works towards greater stability.

Tunisia has made major progress over the past five years in terms of reducing political risk, increasing confidence in safety and security, and improving the overall investment environment. Tunisia’s authorities have also made steady efforts to promote RES by way of subsequent rounds of policy and regulatory amendments. The incumbent utility STEG (Société Tunisienne de l’Électricité et du Gaz), however, is still exerting excessive influence over private participation in RES, and the absence of an independent energy regulator makes it difficult to enforce a level playing field. Subsidized electricity prices are negatively affecting the financial sustainability of STEG and RES projects more broadly.

Indeed, national institutions proved dominant in defining energy policy orientations in respect of national interests such as securing supply-demand balance, energy autonomy, and addressing employment concerns. Since 2000, the problem of Tunisia’s energy autonomy has been a major preoccupation for the Tunisian authorities since the country is now in a situation of structural energy deficit because of the depletion of its oil and then gas reserves. This is one of the major reasons that prompted the development of an energy management policy, entrusted to ANME, which included goals such as the rational use of energy (energy efficiency, cogeneration) and the promotion of renewable energy. Even after the creation of ANME, however, STEG has remained in a position of strong influence over the energy landscape in the country (Rocher and Verdeil, 2013).

Tunisia, in contrast to other countries in the region (Morocco), has adopted a policy that currently mainly supports decentralized small-scale energy production (Steinbacher, 2015). The first attempts in this direction encouraging the solar thermal sector go back to 1985, but the development of this sector was not linear with frequent acceleration and delays articulated in three stages (Rocher and Verdeil, 2019). In 2009, ANME launched the Prosol Elec programme, an adaptation of the main features of the highly successful mechanism designed for solar thermal energy (Prosol) to photovoltaic technology. The Solar Roofs initiative consisted in permitting the installation of photovoltaic panels (some 100 m² maximum) on roofs of residential buildings, offices or other business premises. As in the case of solar thermal energy, acquisition of the equipment was encouraged through a purchase subsidy, amounting to 30% of the investment cost. The installation includes a net-metering system whereby electricity not consumed by the customer is sent to the grid and deducted from the electricity bill of STEG. Therefore, the focus, posed by the incumbent is on self-consumption. This subsidy was funded by the creation of the National Energy Management Fund (FNME) by the act of 2009, and supplemented by various taxes, along with 10% added by the Italian cooperation agency. These two instruments reveal how Tunisian renewable energy policy fits into the country’s broader energy policy, and its connection with a whole series of other public policies (employment, national independence, etc.), i.e. with a set of political values and choices that confirm the fact that the chosen instrument is inseparable from the institutional environment in which it is deployed.

Because of the design of these initiatives, the deployment of utility-scale wind and solar PV in Tunisia is limited, also for the relatively unchallenged role played by STEG. Private-sector developers have faced difficulties understanding the procedures to obtain authorisation for projects, given the considerable number of ministries and public institutions involved in renewable energy projects. In response, the government has taken preliminary measures, supported by international partners in the field, such as the United Nations Development Programme (UNDP).

Overall, the Tunisian energy system still suffers a number of institutional and regulatory shortfalls that limit the ability of the country to attract foreign investments and the establishment of ANME only partially close the gap with other countries in the region. The long and articulated procedures to create and establish an independent regulatory authority for the electricity sector are still to be finalised, as part of the Tunisia’s NDCs commitment to ensure the achievement of its renewable energy targets. As such private investments in the sector remain marginal also for the long lead time to obtain connection with the transmission grid, still owned and operated by the energy incumbent (STEG).

***4.3 Greening electricity governance trough state-backed private agencies: Morocco and UAE***

As anticipated the establishment of the Moroccan MASEN and the UAE’s MASDAR resulted from the interaction of domestic drivers and international and transnational dynamics. Moreover, in both cases the wider political and institutional setting was conductive to a similar strategy for greening electricity governance.

In the mid-2000s Morocco was facing an increase in electricity demand prompted by a steady economic growth. The country imported most of its energy sources, while renewables accounted for about the 13% of electricity generation (mainly hydropower). In this context, the government decided to improve the role of renewables in its energy strategy. However, in doing this the government also intensified its efforts to increase its regional influence and international stance (Fritzsche, Zejli and Tänzler 2011; Cantoni and Rignall 2018). Since the mid-2000s Morocco took part in several initiatives on renewables promoted by European countries and companies and supported by the European Union. These initiatives, like the Desertec or the ‘Paving the way for the Mediterranean Solar Plan’ financed by the European Commission, provided for ambitious plans based on large renewables installations (CSP technology) and regional energy networks connecting North African countries among them and with European markets. Similar plans were also supported by multilateral donors like the World Bank and the AfDB.

At the national level Morocco, in 2009, issued a National Energy Strategy focused on energy security, access to affordable energy for the population, energy demand management and environmental protection. This strategy was aligned with the international and transnational initiatives. The latter soon encountered several political and technical problems and were abandoned. However, Moroccan monarchy was able to keep the momentum and link its preferences with the ongoing international dynamics. The stability of the country during the so-called Arab-uprising coupled with political will of the monarchy, eager to increase its influence in the region and maintain its close relationships with the European players was conductive to a similar outcome (Cantoni and Rignall 2018).

In 2009-2010 the government launched the Moroccan Solar Plan, that envisaged important investments in CSP technology. In order to implement this plan, the government introduced legislative and institutional innovations. Among the latter a key aspect was the establishment of MASEN. The agency was part of a governance framework that aimed at improving Morocco industrial and research actors in the area of renewables and building capacities for the Kingdom’s technological diplomacy with the neighbouring countries (e.g. Choukri, Naddami and Hayani 2017). Moreover, this governance framework was intended to showcase to foreign investors and the donor community the political commitment of the country towards the renewables. Domestically, however, this governance framework was instrumental in asserting the ruling elite control over this new area of energy governance. MASEN, in particular, established as a limited liability company, was mandated by the state to develop renewables in the solar sector and implementing the Moroccan Solar Plan. Its target was installing a minimum capacity of 2,000 MW by 2020. Renewables, however, were also developed by ONEE, the state-owned utility and (quasi) sole buyer of electricity in Morocco. This dichotomy reflected path dependent pattern of electricity governance. However, it was resolved in 2016, when MASEN became responsible for developing all Moroccan renewables, especially larger installations in the solar, wind and hydropower sector. Thanks to an agreement signed in 2020, ONEE transferred its renewables assets to MASEN.

MASEN is managed by a President and steered by an Advisory Body. This body gathers the main Ministries (Minister of Economy and Finances, Minister of Energy, Mines and the Environment, Ministry of Industry, Minister of Interior), the Managing Director of the electricity utility ONEE and the director of the Hassan II Fund, a state-led fund controlled by the royal family. Initially, funding to renewable projects was also channelled through the Société d’Investissements Énergétiques (SIE), which was funded in 2010 as the Moroccan state’s financial arm for the sector of renewable energies and energy efficiency. Funding to the Moroccan renewable strategy was provided also by regional states (Saudi Arabia and UAE) as well as by international financial institutions such as the World Bank and the EU and European development banks.

However, later on, SIE was refocused on energy efficiency, leaving MASEN has the main tool for developing renewables in the country. The agency, in particular, works as an ‘energy catalyst’ to connect national and international stakeholder. This function is evident by looking at the major projects realised in the country and especially at the Moroccan flagship initiative, i.e. the NOOR solar complex. With a capacity of 582 MW, this project was designed to became the largest CSP plant in the world (a small part of the electricity, 72 MW, will be also produced by PV). For its different stages of development, it received financial support from several donors: the World Bank, the African Development Bank, the the European Investment Bank, the German KfW and the French AfD. The choice of CSP technology for developing the Moroccan solar strategy reflects the national tradition of centralized approach to policy making (Cantoni and Rignall 2018). Mega-projects such as CSP solar plants were hence preferred by the ruling elite instead of developing a large number of smaller solar installations. A similar preference for centralization over renewables electricity governance is reflected also in the progressive concentration of responsibilities and decision-making power in the hands of MASEN. This choice was also favoured by the international and transnational environment as MAESN emerged as an interlocutor for the donor community. Finally, MASEN acted as an instrument for the kingdom ‘green’ diplomacy by signing partnerships with international companies (e.g. Alcen Group) and non-state actors (e.g. United Nations Industrial Development Organization, RES4Africa foundation) and taking part in the events organised at the global conferences on climate (e.g. the COP22).

MASDAR was established in 2006 as part of a larger initiative encapsulated in the MASDAR city flagship project (Reiche 2010; Cugurullo 2013; Toufic and Park 2017; Crot 2013). This project was promoted and supported by the ruling elite and was in line with the politics of ‘mega-projects’ that characterises the rentier states of the Gulf. These mega-projects are rooted in the governmentality of the Gulf monarchies and their top-down approach to ‘modernization’. They serve different goals. Domestically, mega-projects reassert the control of the ruling elite on economic development and promote the prestige of the rulers vis-à-vis the internal public. Externally, mega-projects function as pole of attraction for foreign investments as well as levers for economic diplomacy and for increasing ruling elite connections with the international community. In the case of the MASDAR initiative the efforts of the ruling elite focused on climate change, renewables and low-carbon technology. This initiative has to be placed within the context of the UAE’s efforts to start diversifying its oil-dependent economy. MASDAR was established also with the goal of developing research capabilities and new companies in the area of renewables and low-carbon technologies. Unlike the case of Morocco, the problem of attracting investments for supporting the deployment of renewables was not on the agenda for an oil-rich emirate like Abu Dhabi. MASDAR Clean Energy invested in renewables projects in the UAE (11 projects) and abroad. It also took part in the Moroccan Noor Midelt project (Phase 1) along with other international companies. In the UAE, MASDAR developed both smaller projects, like the solar PV rooftop programme in cooperation with the government, and larger ones based also on CSP technologies. For these latter, MASDAR established consortiums with other government institutions and foreign companies, such as in the case of the Mohammed bin Rashid Al Maktoum Solar Park developed with the Dubai Electricity and Water Authority and French EDF Renewables (with a planned capacity of 5,000 MW by 2030 this park will be the largest single-site solar park in the world). MADSDAR is managed by a Board of Directors that include representatives of the ruling elites that are also involved in other government institutions, such as Ministries and state-owned companies. Overall, the UAE’s strategy for greening electricity governance centred on MASDAR reasserts the leadership role of the ruling elite in the country as well as reproduces traditional pattern of top-down and vertical steering of economic development. This strategy also has low political costs, compared to other approaches based on regulatory reforms or higher tariffs to promote renewables in the electricity sector. This latter perspective would undermine the social contract of the UAE’s rentier state possibly opening the space for criticising the authoritarian power or asking for more political representation. Finally, this strategy reduces the problems of coordination among the actors involve in energy governance as members of the ruling elite are represented in all the bodies of the UAE.

**5. Conclusions**

The global energy transition (and climate politics) is affecting the patterns of energy governance in the Global South. The countries of the MENA region have large potentials in the area of renewables, especially wind and solar energy. Many of them, however, have contrasting incentives in promoting low-carbon technologies as fossil fuels are key elements of their domestic political economy and for the stability of the ruling elite. Despite these limitations, virtually all the countries in the MENA region have set ambitious targets for renewables electricity generation and implemented specific supporting schemes, such as feed-in tariffs, net metering and tendering. The practical results of these policy and regulatory efforts have so far been disappointing. However, these efforts have been paralleled by the establishment, or upgrading, of specialised REAs. The emergence of these institutions has been driven by a combination of international and transnational dynamics with domestic preferences. In most cases, however, the role of REAs in greening electricity governance has remained limited to the area of research and policy advising. Only in four countries they have acquired a more prominent role taking (some) regulatory functions and/or a direct role in developing renewable projects.

In these cases, however, the trajectory of REAs’ development has been widely affected by the specific institutional and political setting at the country level. In Morocco and UAE, REAs have been created *ex-novo* as state-backed private entities drastically innovating sectoral renewable energy governance. However, this institutional innovation has been instrumental in maintaining the control of the ruling elites on an emerging policy area. In Morocco, the linkage between international dynamics and internal preferences has been a key factor behind the decision of establishing (and upgrading) MASEN. In UAE as well, external factors have played an important role, although attracting foreign financing was less important for the Abu Dhabi emirate. In both cases, however, agencification was instrumental in confirming a top-down approach to greening energy governance. This approach is also confirmed by the technological choice of CSP that resonates with the dominant governmentality the Moroccan and UAE monarchies. Conversely, in Egypt and Tunisia, REAs’ development – and renewable electricity governance – has followed a pattern showing a strong path-dependency. In Egypt the growing role of NREA has contributed to further increase the complexity of an already fragmented institutional and regulatory framework for the promotion of renewables. In Tunisia, the establishment of ANME has not challenged the prominent role of the incumbent utility, although this REA has acquired an important role in the promotion of small renewable installations. These in turns are important as connect Tunisian renewable energy governance with wider national policy goals in the area of employment and job creation. In both cases, the wider institutional and political setting has been conductive to similar outcomes. External factors have been less influential in orienting domestic choices respect domestic policy legacy and bureaucratic incrementalism.

Overall, the analysis of the diffusion of REAs in the MENA region confirms the transformative effect of the global energy transitions on the Global South. However, it also reasserts how the forms and trajectories of institutional and governance innovations are strongly influenced by the interplay between international and national dynamics. Domestic actors, in particular, have a key role in shaping the greening of electricity governance that resonates with the wider institutional and political environment in which it is embedded.

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Table 2. Renewable Energy Agencies (REAs) in the MENA region.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Country | Agency | Year | REAs functions | | | Notes on country’s renewable energy governance |
| Research &Policy advising | Project development | Regulatory functions |
| Tunisia | National Agency for the Promotion of Renewable Energy (ANME) | 1985 | X |  | X | ANME was upgraded in 2004. Responsibilities for promoting renewables fall under the auspices of the Ministry of Industry, the Commission Superieure de la Production Independante d’électricite (CSPIE), ANME, and the national electricity operator Société Tunisienne d’Electricité et du Gaz (STEG) through its subsidiary STEG-ER, which was created in 2010. ANME is under the Ministry of Industry |
| Morocco  (see also below) | Center for the Development of Renewable Energy (CDER) | 1986 | X |  |  | See below for Moroccan renewable energy governance and recent developments.  In 2010, CDER was upgraded with creation of the National Agency for the Promotion of Renewable Energy and Energy Conservation (ADEREE). In 2016, ADERE was transformed into AMEE with a mandate refocused on only energy efficiency |
| Egypt | New and Renewable Energy Authority (NREA) | 1986 | X | X | X | Important actors for the promotion of renewables are the Ministry of Electricity and Renewable Energy (MOEE) – under which NREA operates – the Egyptian Electricity Holding Company (EEHC), the Egyptian Electric Transmission Company (EETC) and the Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA) |
| Algeria | Renewable Energy Development Centre (CDER) | 1988 | X |  |  | CDER was reformed and upgraded in 2003. Responsibility for various aspect of the promotion of renewables is shared by the Ministry of Energy, the electricity regulator (the Gas and Electricity Regulatory Commission, CREG) and the state-owned company Sonelgaz through its subsidiary Sharikat Kahraba Takate Moutajadida (SKTM) |
| Palestine | Palestinian Energy and Environment Research Center (PEC) | 1993 | X |  |  | PEC works under the auspices of the Palestinian Energy and Natural Resources Authority (PENRA), which along with the Palestinian Electricity Regulatory Council (PERC) has the main responsibilities for promoting and developing renewables |
| Jordan | National Energy Research Centre (NERC) | 1998 | X |  |  | The main activities relating to renewable energy promotion fall under the responsibilities of the Ministry of Energy and Mineral Resources and the Electricity Regulatory Agency. |
| Lebanon | Lebanese Centre for Energy  Conservation (LCEC) | 2002 | X |  |  | The LCEC is affiliated to the Ministry of Energy and Water that along with the national utility  Electricité Du Libani is the key actor in electricity governance. |
| Syria | National Energy Research Centre (NERC) | 2003 | X |  |  | The instability in the country brought by the war has hindered the development of renewables and the (limited) activities of the agency |
| Libya | Renewable Energy Authority (REAOL) | 2007 | X | X |  | The instability in the country brought by the war has hindered the development of renewables and the activities of the agency |
| Morocco | Moroccan Agency for Solar Energy (MASEN) | 2010 |  | X | X | MASEN was upgraded in 2016 and renamed as ‘Moroccan Agency for Sustainable Energy’ becoming responsible for the development of all renewables in Morocco. Other important actors in green electricity governance include the Ministry of Energy, the national electricity utility (Office for Energy and Drinking Water, ONEE) and the National Energy Regulatory Authority (ANRE)  IRESEN, placed under the Ministry of Energy, focuses on research on renewables and policy advising |
| Institute de Recherche en Energie Solaire et Energies Noovelles (IRESEN) | 2011 | X |  |  |
| Kuwait | Kuwait Institute for Scientific Research (KISR) | 1981 (\*) | X |  |  | Key actors in green electricity governance are the Minister of Oil, the Minister of Electricity and Water and the national oil company, the Kuwait Petroleum Corporation |
| UAE | MASDAR | 2006 | X | X |  | Along with MASDAR other actors involved in UAE’s renewable development (for the Emirate of Abu Dhabi) are the Abu Dhabi Water & Electricity Authority (ADWEA) and the Abu Dhabi Energy Authority |
| Saudi Arabia | King Abdullah City for Atomic and Renewable Energy  (K.A. CARE) | 2010 | X |  |  | Main responsibilities for renewables are in the hands of the Office of Renewable Energy Projects within the Minister of Energy, Industry and Mineral Resources (large projects), the Electricity and Co-Generation Regulatory Authority and the Saudi Electricity Company (small projects) |
| Qatar | Qatar Environment and Energy Research Institute (QEERI) | 2011 | X |  |  | Main responsibilities for renewables are in the hands of the renewable energy units at the national utility Kahramaa and the national oil company, Qatar Petroleum Company |
| Bahrain | --- | -- | -- | -- | -- | Bahrain has not created a renewable energy agency. The Electricity and Water Authority is in charge of issues relating to power, including renewable energy. In 2014 the Sustainable Energy Unit (SEU) was created as a joint initiative between the Office of the Minister of Electricity and Water Affairs and the UNDP |
| Oman | --- | -- | -- | -- | -- | Oman has not created a renewable energy agency. Activities related to renewable energy promotion are handled by the Public Authority for Water and Electricity (PAWE) and the Authority for Electricity Regulation (AER) |

Sources: authors’ elaboration on agencies official websites and RCREEE (2009); GSE (2013); IRENA (2014a, 2014b, 2016, 2018, 2020); RESMED (2015, 2016, 2018); KEO (2019); Tagliapietra (2015); Vidican (2015); Marei (2017); Bouznit et al. (2020); Cantonia and Rignallb (2019). (\*) = See the explanation provided in the main text.

Table 3. Renewable Energy technologies patents cumulatively filed in the MENA region.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Patents(\*) | | | | | | | | | | |  |  |
|  | Tecnology Choice | | Bioenergy | | Cross Cutting | Geothermal | Hydropower | Ocean Energy | Solar Energy | | | Wind Energy | ***Total*** | Relative weight | |
|  | Yes/No | Type | Biofuels | Fuel From Waste |  |  |  |  | PV thermal Hybrid (PVtH) | Solar Photovoltaic (SP) | Solar thermal (ST) |  |  | WRT Region | Domestic WRT Technology |
| Morocco | ✓ | ST/SP | 41 | 32 | 6 | 4 | 24 | 56 | 64 | 126 | 547 | 186 | ***1086*** | 59% | 50% |
| Egypt | ✓ | ST/Wind | 20 | 11 | 2 | 3 | 9 | 16 | 27 | 22 | 80 | 36 | ***226*** | 12% | 35% |
| Jordan | ✓ | PVtH/ST | 0 | 1 | 0 | 0 | 1 | 0 | 15 |  | 13 | 3 | ***33*** | 2% | 45% |
| Tunisia | ✓ | ST/SP | 26 | 18 | 1 | 1 | 10 | 20 | 30 | 70 | 240 | 57 | ***473*** | 25% | 51% |
| Algeria | 🗶 |  | 1 |  |  |  | 1 |  | 2 | 2 | 1 |  | ***7*** | 0% | 29% |
| UAE | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Saudi Arabia | 🗶 |  | 4 | 2 | 0 | 0 | 0 | 0 | 6 | 9 | 9 | 1 | ***31*** | 2% | 29% |
| Qatar | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Kuwait | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Lebanon | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Palestine | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Bahrein | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Libya | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Oman | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| Syria | 🗶 |  |  |  |  |  |  |  |  |  |  |  | ***0*** | 0% |  |
| **Total** |  |  | **92** | **64** | **9** | **8** | **45** | **92** | **144** | **229** | **890** | **283** | **1856** |  | **48%** |

Sources: authors’ elaboration on IRENA INSPIRE (<http://inspire.irena.org/Pages/home.aspx>) based on data from EPO PATSTAT for years 2000-2019

1. There are different definitions of the Middle East and North Africa (MENA) region. In this paper we define MENA as including the North African Countries (Morocco, Algeria, Tunisia, Libya and Egypt), the Levant countries (Jordan, Lebanon, Syria and Palestine), and the Gulf Cooperation Council countries (Bahrain, Kuwait, Oman, Saudi Arabia, Qatar and United Arab Emirates). Israel is traditionally included in the Levant countries group. However, as the focus of the paper is on energy transition in the developing countries of the Global South, we do not consider Israel in our analysis. [↑](#footnote-ref-1)
2. The ‘MASDAR initiative’ is composed of several units. These include those involved in research and policy advising (e.g. The MASDAR Institute of Science and Technology) and ‘MASDAR Clean Energy’ that owns and develops renewable projects in the UAE and abroad. [↑](#footnote-ref-2)
3. In Saudi Arabia, in the 1980s, pilot joint research programmes on renewables (supported by the US and German development cooperation) were conducted by the Energy Research Institute placed within the King Abdulaziz City for Science and Technology. [↑](#footnote-ref-3)
4. This data on REAs employees have been retrieved from the website of MEDENER (https://www.medener.org/en/, accessed on 30 April 2021) and the websites of the agencies (accessed on May 2-5 2021). [↑](#footnote-ref-4)