Whose Sustainability?
Political Economy of renewable energy transitions in Morocco and Algeria

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Abstract

The Middle East and North Africa (MENA) region has one of the highest potentials for renewable energy in the world, yet this potential remains poorly exploited. Applying Unruh's carbon lock-in as analytical framework, I attempt to answer the following questions. How do the different political economy environments of oil-importing Morocco and oil-exporting Algeria influence the deployment of sustainable energy strategies and vice-versa? To what extent does access to fossil fuels interfere with renewable energy development? To what extent does resource scarcity support a fast transition towards renewables? While fuel rich countries are held back by numerous technical and institutional barriers to decarbonisation, those who lack resources and need to import them often have stronger incentives to diversify their energy mix. The interference of Western actors in both renewable and conventional energy production might lock in the interdependence of the two. Intervening Unruh's carbon lock-in, I show that although the transition towards renewable energies leads to environmentally sustainable outcomes, it can also induce the deployment of technologies which are as socially unsustainable as fossil fuels in the way they create path dependency in unequal structures of power.

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“The project is only proven feasible if people in power imagine it to be so, yet the actors continue to see feasibility as an objective measure of the likelihood of success.”

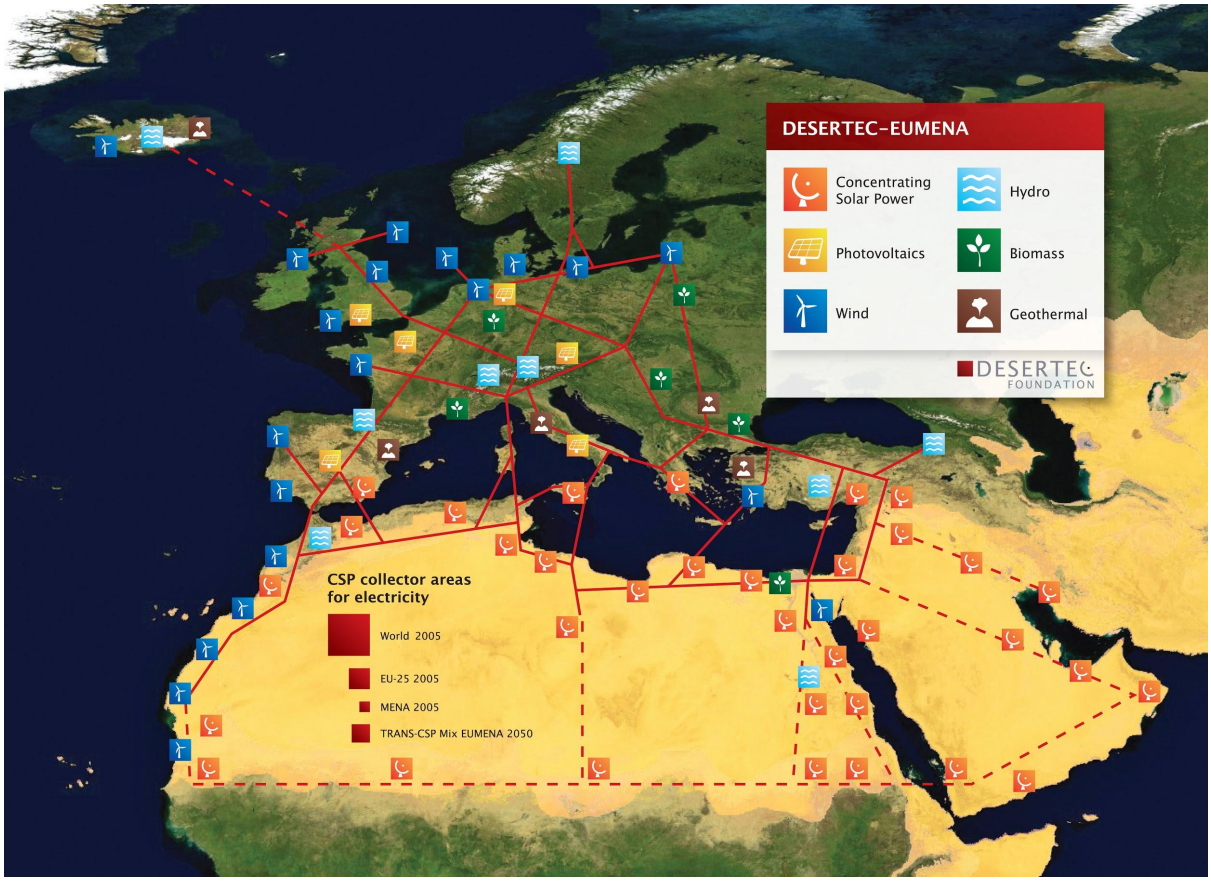
(Moore, 2019: 128)

Introduction

The Middle East and North Africa (MENA) region has one of the highest potentials for renewable energy in the world, yet this potential remains poorly exploited. To understand the current aspirations of renewable energy strategies in MENA countries, a brief look into the first attempts at exploiting the region's abundant renewable resources is needed. Not so long ago, there was a vision that if a relatively small fraction of the Sahara was covered with solar power plants, it could cover the energy needs of all European countries. Driven by this idea and the lack of local resources available to finance renewable energy technology and infrastructure, the imaginary of an integrated supergrid providing solar electricity from MENA to Europe was born (see Fig.1). Desertec started in 2003 as the Trans-Mediterranean Renewable Energy Cooperation (TREC) Network, an initiative that soon gained political support in Germany. In 2007, during the German presidency, the White Book of Desertec was introduced to the EU Parliament. The vision to bring solar power to Europe was presented as a win-win situation allowing profound North-South cooperation and delivering countless social and environmental benefits.

Desertec developed in parallel with the creation of the Union for the Mediterranean (UfM) under the European Neighbourhood Policy (ENP) in 2008. In the same year, the Mediterranean Solar Plan (MSP) was launched. The main objective of the MSP was an installment of 20 GW renewable energy capacity around the Mediterranean Sea by 2020. This was to be ensured by support from a technical assistance project reaching €5 million from EU funds (ENPI, 2009), and further financed by the CSP Investment Plan of the Clean Technology Fund. The feasibility of the concept was further facilitated by Article 9 of the 2009 Climate action renewable energy (Care) legislative package granting member states the possibility of importing electricity generated from third countries' renewable sources.

Fig.1 Map of the Desertec grid



Source: Wikipedia[1](2020)

In 2009, Desertec split into two parts: firstly, TREC was replaced by the Desertec Foundation, a non-profit focusing on the promotion of the Desertec concept; and secondly, a group of 12 (mostly German) private companies founded the Desertec Industrial Initiative (Dii). As Dii (2013) themselves state, their aim was to realise the Desertec vision by 2050, focusing mainly on wind and CSP (concentrated solar power)[2]. The Desertec activities soon attracted the attention of different publics (Lubbadeh, 2009; Hickman, 2011).

[1] This image was originally retrieved from the website of the Desertec foundation (www.desertec.org) in 2009. However, it is no longer available there, probably because of the failure of the original vision of Desertec. It is nevertheless used here because it illustrates well both the approximative structure of the grid and the original idea behind the vision - that is, a seemingly small proportion of the Sahara could power the entire EU.

[2] CSP technology will be further explained in Chapter 4.

However, within just a few years of its creation, Dii relocated to Dubai, leaving the vision of a mediterranean supergrid. Likewise, the MSP has not achieved much success in fostering wide regional cooperation. The reasons why projects of Mediterranean renewable energy cooperation failed are many. For Desertec, the 2014 fall in global oil prices decreased the benefits of renewable energy investment and caused the defection of important industrial shareholders (Carafa, 2015; Cantoni and Rignall, 2019). As identified by Moore (2019), the ambitious megaproject lacked a clear vision and failed at providing policy makers with the image of its own feasibility. Most importantly, a vision for an integrated energy system in the Mediterranean region required complex intergovernmental cooperation to enable clear governance of the grid. Geopolitical tensions in such a diverse area fostered conflicts over issues of security, management, regulation or control, which have proven highly difficult to resolve (Carafa, 2015; Moore, 2019). Although the initial goals of Desertec or the MSP were not met, renewable energy projects in individual countries prevail, keeping the idea of electricity flows from MENA countries to Europe alive.

The deployment of renewable energy in the region is urgently needed for mitigating effects of the climate crisis and lowering of global emissions. All MENA countries are faced with a rapidly growing energy demand, driven especially by electricity consumption (Menichetti et al., 2018). Yet, what is the renewable energy situation now, more than a decade after the Desertec vision? Have some countries succeeded at developing renewable energy strategies independently? The aim of this dissertation is to analyse the relationship between the transition to renewable energy and the different political economy environments of two MENA countries, Morocco and Algeria. Considering that “turning the Moroccan Solar Plan from concept to reality occurred at an incredibly fast pace” (Cantoni and Rignall, 2019: 26) while “Algeria has been too slow in implementing its renewable energy program.” (Haddoum et al., 2018: 1), I attempt to answer the following questions. How do those different political economy environments of Morocco and Algeria influence the deployment of sustainable energy strategies and vice-versa? To what extent does access to fossil fuels interfere with renewable

energy development? To what extent does resource scarcity support a fast transition towards renewables?

Most importantly, applying Gregory C. Unruh's concept of 'carbon lock-in', I observe the Algerian and Moroccan energy strategies and I attempt to identify the policies, both locally and regionally, that might enable developing countries to 'leapfrog' or alternatively adopt the carbon lock-in. I argue that the analysis of two countries helps to assess what the realities of carbon lock-in may look like. In the first section, a review of the literature on current energy transitions will be presented, followed by an introduction into the theory explaining the specificity of energy transitions in the MENA region. In the second section, I will explain that Algeria is unable to effectively implement its renewable energy program because the country suffers from mutually reinforced effects of the 'carbon curse' and 'carbon lock-in' stemming from institutional problems in the face of a growing energy demand. The third section explores the political and social measures that enabled Morocco to escape or 'leapfrog' carbon lock-in, while acknowledging that this trend cannot be maintained for long due to increases in national energy demand and a lack of regional cooperation. In section 4, I will further discuss the concept of lock-in and its wider institutional and geopolitical transformations in the two countries.

While renewable energies are a relatively new topic, I observed that not only is there more than enough literature relating the topic but it often comes from Moroccan and Algerian authors. In most part, my work is based on peer reviewed papers and books. My arguments are also supported by primary sources such as reports and data available from agencies and institutions, including the World Bank, the International Energy Agency etc. Lastly, I need to acknowledge in advance the work of Sharlissa Moore whose book *Sustainable Energy Transformations, Power, and Politics* (2019) explores the Moroccan energy journey through deep empirical and ethnographic research which has proved highly productive for my dissertation.

The current energy transition: perspectives, drivers, barriers

In this section, I aim to map some of the literature relevant to energy studies and more concretely the transition towards renewables. While the literature remains vast and diverse, amongst the recurring themes are: the pace within which the transition is imagined and enacted; north-south relations both in epistemic and material terms; the need of contextualization of specific transition into the sociocultural realities of the area; or the role of public discourse. While gesturing towards specific authors that further explore these topics, key terms in energy studies such as “carbon lock-in”, “oil curse” and “leapfrogging” will be briefly introduced. First, theory regarding the character of such transitions in general will be drafted, whilst the second part of this section will focus on its figurations specifically in MENA countries.

Theories of transition

In theory, the unsustainability of fossil fuels and the need of a transition towards renewable sources of energy has been debated already in the first half of the 20th century (Hubbert, 1949). In practice, the momentum for large scale development of renewables came about only recently as a part of wider debates on mitigating the climate crisis. Since the transition to renewable sources of energy is only at its beginning, the literature concerned with its potential successes and failures turns to the analysis of the past (Hughes, 1987; Smil, 2010; Fouquet, 2010). Drawing from experience of past transitions from one source of energy to another, studies often suggest that these transitions are long, taking at least a significant number of decades to unfold (Wilson and Grubler, 2011; Fouquet, 2010). Sovacool (2016) offers a thorough summary of the debate on past energy transitions, enabling us to understand the mainstream argument against a rapid global energy transformation. One of the most vocalised opinions in this line of thought belongs to Vaclav Smil, who emphasizes that our civilisation is still “fossil-fueled” and will remain this way for a long period of time, as renewables are developed too slowly and they mostly cover electricity, not all energy needs (2016: 195-196).

A work of Gregory C. Unruh proves a productive analytical framework for my line of argumentation, not only for its understanding of the pace of transition as dependent on the availability of new technologies but also for his situating of the transition within wider sociocultural context. In his theory of 'carbon lock-in' (2000, 2002) modern technologies constitute systems that co-evolve with social and institutional contexts. This coevolution leads to the creation of a techno-institutional complex composed of many systems which can be material (road networks, cars, industries) and institutional (regulations, taxes, subsidies, research). According to Unruh, in a technological system, which is defined as “inter-related components connected in a network or infrastructure that includes physical, social and informational elements” (2000: 819), an inferior technology can become locked-in and new, more efficient (or more carbon-saving) technologies are thus prevented from being deployed. The reasons why a technology becomes locked-in are many, but rather than technical, they tend to be organisational, social, and institutional (2002). Unruh argues that industrial countries have locked-in carbon (or fossil-fuel) intensive technologies in their systems, which creates a situation of path dependency and inhibits a faster transition to low-carbon technologies, even though these are proven to reduce both costs and environmental damage in the long run (2000: 818-819).

Yet, despite the overall pessimism of global energy studies, there are various recent examples of countries where transitions unfolded rapidly. For instance, Solomon and Krishna (2011) analyse Brazil's transition from oil-based transportation to biomass and France's transition to nuclear. They find that under favorable political context, transitions can happen within a few decades. In the same line of thought, I emphasise the importance of politics in our current energy transition. Whereas in the past, the succession of energy sources and technologies were guided by geopolitical asymmetries and the myth of unlimited growth, today, the unprecedented climate crises ought to influence the pace at which our systems will transform in the near future. Some scholars, such as Fattouh et al. (2018) or Sovacool (2016) even argue

that the transition to renewable sources of energy will probably be accelerated by the pressure from civil society, academia, and policy makers both on the local and the global level.

Our current energy transition is embedded in large international, regional and global cooperation schemes concerned with the mitigation of present and future impacts of climate change. The Paris Agreement, which is currently ratified by 189 out of 197 Parties to the United Nations Framework Convention on Climate Change (UNFCCC), aims at keeping global temperature rise in the 21st century at 2°C above pre-industrial levels. In their nationally determined contributions (NDCs), signatories of the Paris Agreement set targets to reduce their greenhouse gas (GHG) emissions, which in large part requires the gradual removal of fossil fuels from their energy mix. Being an important strategy to fulfill emission targets, the transition to renewable energies is needed for a country's compliance with local and global, legal and political commitments. Additionally, it was already acknowledged in the Kyoto Protocol of 1997 that while developing countries should have the possibility to “catch up” economically, industrialised countries of the global North should assist them in adopting sustainable pathways in development. This involves, for instance, the Clean Development Mechanisms (CDM) through which industrialised countries can meet their emissions targets by financing low-carbon projects in developing countries (see Lloyd and Subbarao, 2009; Kim and Park, 2018).

The global dimension of climate governance opens the opportunity for developing countries to become drivers of the transition towards renewable energy. Scholars such as Bridge et al. (2013) debated whether developing countries which are not yet industrialised and lack infrastructure for conventional sources of energy could “leapfrog” the carbon lock-in and switch to low-carbon technologies more rapidly. According to Unruh and Carrillo-Hermosilla (2006) the “leapfrog” effect is hampered by multiple factors, including: the power of multinational corporations which hold the dominant technology; the expected returns for private investors which are higher for fossil fuels compared to renewables; the fact that multilateral banks such

as the World Bank continue to finance fossil fuel projects alongside renewables; and the short-term development solutions offered by fossil fuels which create path dependence. More recently, this argument has been supported by Blank and Zachow (2014) who point out the fact that coal power plants are still being constructed in developing countries. Ansari and Holz (2020) further point out that the infrastructure's longevity either creates new carbon lock-in for developing countries or results in stranded assets, that is the material investments no longer useful in current energy production.

While solutions of North-South cooperation such as the above mentioned CDMs can provide for a win-win situation securing both climate crisis mitigation and socio-economic development goals, their implementation is far from perfect. For instance, Kim and Park (2018) have demonstrated that CDMs contribute to effective deployment of renewable energy technologies in developing countries with “poor financial markets”. Nevertheless, they also find that CDMs are deployed more often in emerging economies than in least developed countries, where they would be needed the most. This argument is supported by Loyd and Subbarao (2009) and further explained by Kolk (2015). Kolk finds that data used for climate-related investment of large multinationals is predominantly based on developed countries and emerging economies. This means that policy recommendations for investment emphasise the need for a strong institutional background which is present in developed countries but often absent in least developed countries, which in turn discourages foreign direct investments. Although Kolk is rather optimistic about future developments, the issues of what countries remain predominantly analysed point out the epistemic imbalances of the climate change debate which in turn perpetuate the North-South power relations.

When searching for data on technology transfer needed for the leapfrogging of carbon lock-in, one makes a similar observation Indeed, most of the literature concentrates on case studies of rapidly industrialising emerging economies such as China or India (Gallagher, 2006; Lema & Lema, 2012; Binz et al., 2012; Kainuma et al., 2017). For instance, in the context of

renewable energy, Watson & Sauter (2011) identify policy frameworks that enabled China to increase its capacity of manufacturing wind turbines. On the contrary, Blank and Zachow (2014) question China's leapfrogging by demonstrating that while the country is the world's leader in photovoltaics, it keeps opening new coal plants to satisfy an increasing energy demand. Yet, to my knowledge, there are no such studies for low and middle-income countries, although in theory, they are identified as being most urgently in need of international cooperation aimed at innovation (Eis et al., 2016). It is therefore in part the purpose of this dissertation to enlarge the knowledge about leapfrogging carbon lock-in through the study of energy transitions in two countries of the MENA region.

Energy dynamics in the Middle East and North Africa

The MENA region has been of particular interest to authors in the field of energy transition studies as it holds both the world's largest reserves of oil and the world's largest potential for renewable energy, especially solar and wind. In various forms, the literature uses their abundant oil reserves to explain lack of democracy in MENA countries. According to Michael Ross' “oil curse” (2013), oil rich countries tend to be more authoritarian which hampers their socio-economic development and as a result, their economic growth is not in accordance with what would be expected of their wealth. Timothy Mitchell (2013) expands Ross' argument onto global North-South dynamics. He demonstrates that while in industrialised countries of the West democracy has developed alongside coal, these same industrialised and democratic countries are now preventing the spread of democracy in the Middle East. While this does not directly explain the lack of renewable energy investments in oil rich countries, it sheds a light on the fact that neither local political elites nor powerful actors of the West have much interest in changing the status quo.

While MENA countries have overall committed to ambitious targets in the Paris Agreement, the journey towards them proves complex. By 2030, the sum of the region's efforts should result in 192 GW installed capacity from renewable sources of energy, of which the largest

share should be taken by solar PV followed by wind and concentrated solar power (Menichetti and El Gharras, 2017). However, the current share of renewables in the energy mix does not exceed 5% (Mahlooji et al., 2020). Similar to Unruh's carbon lock-in, Jörg Friedrichs and Oliver Inderwildi (2013) make the connection between the “carbon curse” of fossil fuel-rich countries and their high green-house gas emissions. They identify mechanisms which prevent these countries from decarbonizing their economies rapidly enough. Among these are, for instance, emissions generated at extraction which often constitute a high proportion of the overall emissions; crowding out of both non-extractive industries and investments in alternative sources of energy; the lack of incentives to invest in energy efficiency; and the social pressure for fuel subsidies caused by oil or gas abundance. Furthermore, they acknowledge the wider geopolitical lock-in of the region by stating: “There may even be a carbon curse at the planetary level” (2013: 1365).

There is a difference between oil exporters and oil importers in the region. While fuel rich countries are held back by numerous technical and institutional barriers to decarbonisation, those who lack resources and need to import them often have stronger incentives to diversify their energy mix. This is in line with the fact that oil importing countries of the region are the forerunners of renewable energies (see Menichetti et al., 2018). Focusing only on North Africa, Marktanner and Salzman (2011) explain that “the nature of the relationships between government and citizenry are a determinant factor of a country’s energy policy” (4481). According to them, oil exporters generally do not tax much, and therefore have weaker relationships with citizens and are under less social pressure to address issues connected to energy production. This also resonates in Mitchell's observations that pro-democracy uprisings of the Arab Spring have predominantly touched those countries of the region which could not “pacify” their populations with money generated from oil exports (2013). As access to fossil fuels determines the dynamics between the state and its citizens, the power of civil society to push for a sustainable energy transition as suggested by Sovacool (2016) is deeply uncertain in oil exporting countries.

Contrasting oil exporters and oil importers in the MENA region can considerably broaden the debate on what leads developing countries into carbon lock-in or out of it. Although it might be difficult to fully leapfrog carbon lock-in, MENA countries arguably “missed the earlier boat on industrialization” (Belhaj & Arezki, 2019) and could potentially embrace low-carbon technologies for their future development. For the purpose of this dissertation, two North African countries were chosen on the basis of their geographic proximity, comparable population size and income level, and most importantly on the basis of their difference in access to fossil fuels. In the field of energy, Morocco and Algeria are rarely analysed together[3], yet it is important to note that this dissertation does not attempt to offer a comparative study. Rather, the purpose is to analyse opposed concepts of one theoretical framework. First, the case study of Algeria as an oil exporter will allow us to understand more deeply the relationship between the 'carbon curse' and 'carbon lock-in', as suggested by Ansari & Holz (2020). Second, the analysis of oil importing Morocco will provide an insight into potential mechanisms of 'leapfrogging carbon lock-in', as theorized by Unruh & Carrillo-Hermosilla (2006).

[3] There has been, nevertheless, an interesting comparison of the two countries where access to fossil fuels is linked to more rigid patriarchal structures in society. In this sense, Morocco and Algeria are given as examples to illustrate the argument that the more a country is dependent on its oil exports, the less it fosters gender equality, despite the political regime in place or wealth measured in GDP per capita (see Ross, 2013). This argument seems to be confirmed by the fact that oil importing countries of the region are the most progressive in their approach to couple climate change and gender policies (see Haddad, 2016). While this debate is out of scope of this dissertation, it might be valuable, in the future, to look at whether more gender equality in oil importing countries (such as Morocco) has a role in the adoption of more effective climate change related policies, including the faster deployment of renewable energy (compared to those of oil exporters such as Algeria).

Algeria's struggled path away from fossil fuels

Algeria is a country rich in hydrocarbons, it has large oil and natural gas reserves. Algeria ranks 11th in the world's natural gas reserves and has the 3rd largest oil reserves in Africa (based on author's calculations from EIA and BP for 2019). Fossil fuel revenues have enabled the country to invest in infrastructure, reduce poverty and decrease its external debt over the past few decades. However, the economy is overly dependent on oil and gas which constitute 95% of the country's exports. Recent decreases in global oil and gas prices have significantly impacted Algeria's export revenues and currency reserves (World Bank, 2020a). Additionally, as the country's population growth rate is high, there is more energy demand at the national level and less is left for export. The increased demand is also caused by the income growth of Algerians which increases electricity consumption (Bouznit et al., 2018). The Algerian government is faced with the challenge to diversify both the country's energy mix and the economy (Bounoua and Matallah, 2014; Abada and Boukharat, 2018). In this section, I make an argument that Algeria struggles to envision possibilities outside of “carbon lock-in” by queuring its recent political and economic actions concerning energy management of the country.

Algeria's efforts for renewable energy

Algeria's National Renewable Energy Program was first adopted in 2011 for the period 2011-2030. The first phase of the program was dedicated to research in the field of renewable energy potential, it included a few pilot projects mostly located in the province of Adrar, in the Sahara. These projects included a wind farm and a solar PV plant which are now operating under the subsidiary of Algeria's electricity and gas company Sonelgaz SKTM, and a Renewable Energy Research Unit in the Saharan Region (URERMS) to test new technologies such as solar energy use for water heating or water pumps powered by solar PV (see Bouraiou et al., 2020). The national program was updated in 2015 for the period 2015-2030, and a target has been set by the government to provide 22,000 MW from renewables by 2030 for national market needs. This would save Algeria 300 billion m3 of natural gas used for electricity and

provide for 27% of the total power generation (CDER, 2020). Yet, Algeria has now completed only 1.8% of this target, reaching around 400 MW in renewable capacity instead of the 4,525 MW projected to be realised by 2020 (Hadjam, 2020).

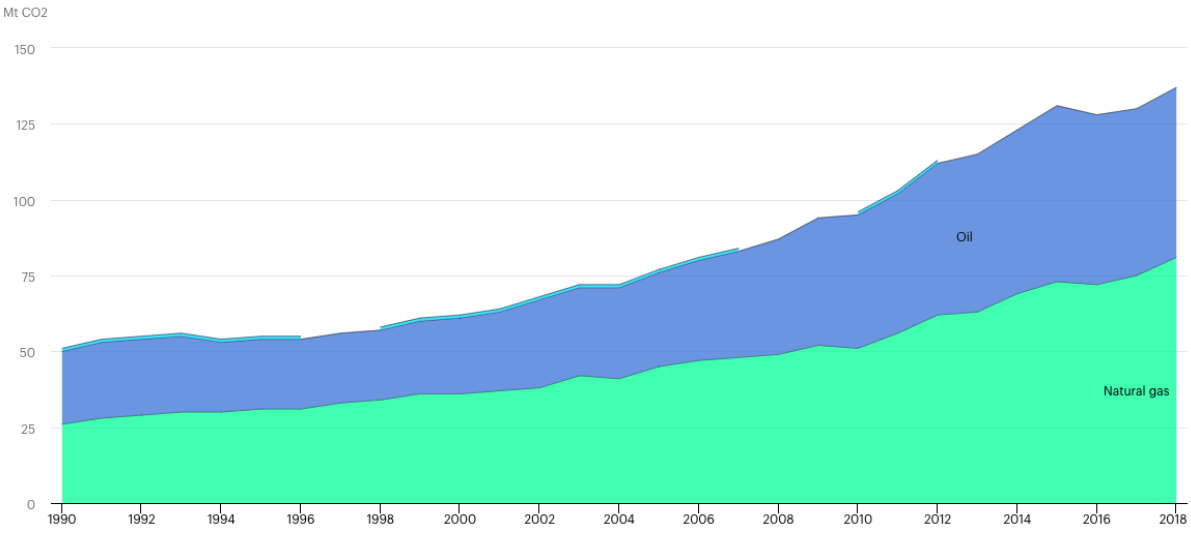
Algeria has adopted a set of well intended measures to stimulate the use of renewable energy for electricity generation. Over the past two decades, a number of laws have been adding up to create a clear legislative framework for the deployment of renewable energy and the fulfillment of sustainable development targets (see Bouznit et al., 2020; Bouraiou et al., 2020). An important step was the creation of the National Fund for Renewable Energies and Cogeneration (NFREC) financed by 1% royalties from the state's oil revenues (among other sources). The Fund provides financial aid to projects of electricity generation from renewable energies and to projects of energy management. To attract both national and foreign investors, generous feed-in tariffs as well as tax incentives were introduced. However, Algeria's tender scheme for large scale RE projects is considered problematic, as it is conditioned by a ratio of 51% to 49% securing the majority of Algerian companies or the establishment of an Algerian company by the investor. Bouznit et al. (2020) find that while the updated Algerian National Renewable Program of 2015 and the establishment of the NFREC have stimulated the increase of installed capacity, the introduction of the above mentioned tender scheme in 2017 has had the opposite effect.

The issue of natural gas

The deployment of renewable energy is part of Algeria's strategy to mitigate the climate crisis. In its Intended Nationally Determined Contributions, Algeria announced a target to reduce its GHG emissions by 7% unconditionally or by 22% conditionally before 2030 (INDC submission portal, 2020a). Nevertheless, while the country has ambitious plans to reduce greenhouse gas emissions as part of fulfilling the Paris Agreement, the reality looks different. Although oil production and export have seen a decrease in the past years, energy demand is growing fast and oil is replaced by large amounts of natural gas. Algeria is now the 3rd largest emitter of

GHG in Africa (Bouznit et al., 2018) and it is argued that the Algerian government prioritises the exploitation of natural gas over the deployment of renewable energies (Bouznit et al., 2020; Hadjam, 2020). While natural gas might be less polluting than other fossil fuels, it is now the most important contributor of CO2 emissions of the country, as seen in Fig.2.[4]

Fig. 2 CO2 emissions by energy source, Algeria 1990-2018



Source: IEA (2020b)

In this context, it might seem amusing that the national gas company Sonatrach has allegedly embarked on a sustainability journey. The company's website as well as its 2018 annual report introduce an “ambitious program in renewable energies”, which in reality means powering 80% of its gas extraction sites by solar energy (see Sonatrach, 2018: 32). In turn, this strategy should lead to the possibility of exporting the gas saved at extraction (Sonatrach website, 2020). This raises two important concerns. First of all, such promotion of environmental friendliness of a hydrocarbon company exactly fits into the definition of greenwashing as “a specific subset of symbolic corporate environmentalism in which the changes are both ‘merely symbolic’ and deliberately so” (Bowen, 2014: 3). Secondly, it supports the argument that in

[4] This trend is true for the overall CO2 emissions of the whole MENA region, where emissions from natural gas have exceeded/surpassed those from oil in 2016. (see IEA, 2020b)

fuel-exporting countries, investments in renewables are not necessarily triggered by the view of environmental benefits such as decarbonisation but rather by the profitability of exporting preserved fossil fuels (Ansari and Holz, 2020).

Energy efficiency and subsidies

The increase in gas use and the relative emissions is caused mainly by Algeria's skyrocketing energy consumption. Indeed, the country's natural gas exports have shrunk because the resource is needed to satisfy national demand. Bouznit et al. (2018) argue that this is mainly caused by residential electricity demand enhanced by the growth of incomes in recent years. Yet, residential electricity demand also rises because of stagnant low prices. Haddoum et al. (2018) point out that energy prices have not been revised since 2006, while incomes have increased significantly. This further leads to the problem of energy efficiency. Haddoum et al. add that as energy demand grows more rapidly than GDP per capita, a large part of the electricity consumption is non-productive, hence hampering long term economic growth. In turn, energy prices in Algeria are extremely low because of heavily subsidised fossil fuels. Algeria has the 8th highest fossil fuel subsidies in the world, and scores 4th in the proportion of subsidies to GDP (IEA, 2020a). This severely impacts the government budget and reduces possibilities of spending in socio-economic development.

Fossil fuel subsidies are often identified as the main barrier to the deployment of renewable energy in the MENA region because they cause underinvestment in the energy sector, prevent existing companies from innovating or, to use Unruh's terminology, lock out new firms and technologies (Menichetti et al., 2018; Menichetti and El Gharas, 2017; Fattouh and El-Katiri, 2013). This is also the case of Algeria, where prices for diesel and gasoline as well as electricity tariffs have seen minor increases since 2016 but still remain extremely low (Haddoum et al., 2018). Subsidies in Algeria are financially unsustainable: as national energy demand grows and export revenues shrink, the majority of the country's fossil fuel production is sold at prices below global market levels. Thus, there are lesser resources to finance

opportunities of innovation in low-carbon technologies. This is what Unruh and Carillo-Hermosilla (2006) identified as one of the possible transfers of carbon lock-in in developing countries: rapid growth enhances energy demand, which in turn creates the need to increase capacity, and because carbon-intensive technologies are low risk, investments flow in them, thus creating further path-dependence. As argued by Ansari and Holz (2020), because the 'carbon curse' touches all sectors of the resource exporting economy, it also intensifies the carbon lock in.

The Algerian government is faced with the increasingly difficult challenge to reform the subsidy system, both due to the decrease of oil prices in recent years and the current Covid-19 economic crisis. It is acknowledged that for fossil fuel exporters, reforming the subsidy system is a “politically and economically delicate task” which needs to adequately address issues of social protection in the situation of increased prices (Fattouh and El-Katiri, 2013: 114). However, Haddoum et al. (2018) suggest that the government missed the opportunity to reform the subsidy system when Algeria's revenues were increasing alongside higher oil prices, between 2004 and 2014. Empirically, this was confirmed by El-Katiri and Fattouh who analysed subsidy reforms in a number of MENA countries and found that “it is better to reform energy subsidies before a political or economic crisis point is reached” (2017: 80). Given the political turmoil following mass protests demanding the resignation of former president Bouteflika and the economic recession caused by the Covid-19 pandemic, Algeria's subsidy reform will be a difficult, yet in my view necessary, task to accomplish.

Corruption and rent-seeking

Another factor influencing the deployment of renewables is the corruption depleting Algeria's energy sector. Even though it is difficult to quantify the full amount of corruption, there have been various scandals in recent years. They involved high ranking managers of both Sonatrach and Algeria's gas and electricity utility Sonelgaz, who were charged for corruption associated with the construction of new power plants by foreign companies (see Bounouna

and Matallah, 2014). Multinationals have been involved in cases of bribery to win contracts in Algeria, and in 2011, a corruption investigation connected to Sonatrach even led to the fall of the Minister of Energies Abdelmadjid Attar (Hamouchene and Pérez; 2016). Most recently, after the long pro-democracy protests in Algeria, many government officials were sentenced to jail for corruption, among them the Minister of Industry Abdeslam Bouchouareb or the Minister of Energy Youcef Yousfi (Jibril, 2020). Sonatrach also suffered from more corruption leading to a constant shuffle of CEOs of the company over the past year (see Calik, 2020; Butler, 2020). Since energy companies in Algeria are state owned and high officials are also corrupt, it seems clear that the issue transcends all parts of the country's energy sector as Hamouchene et al. (2014: 18) wittily state: "The rentier nature of the economy has made corruption the defining characteristic of Algerian affairs."

The presence of corruption and rentierism in the Algerian economy should be considered an important factor to why the country fails to attract foreign investors. Corruption is a policy risk which creates a situation of unpredictable changes in 'rules of the game' and the level of policy risk is considered to be the most important factor of decisions on foreign investments in the MENA (Carafa, 2015). Hence, high levels of corruption and a lack of transparency have presumably had an effect on the current situation, in which Algeria struggles to find investors for its renewable energy tenders (see Bouznit et al., 2020: 10). Moreover, as Algerian politicians are strongly dependent on their rents generated from hydrocarbons, regional cooperation on renewable energy seems complicated. Specifically, Katsaris found that negotiations on a future renewable energy market cooperation between Algeria and the European Commission were rather unsuccessful. One of the reasons was that “the interference of a Commission-led network promoting an antagonistic market could jeopardize the privileges of the Algerian elite with regard to the country’s conventional energy resources” (2016: 668). I would argue that this suggests that Algerian policymakers might be less inclined to make steps towards energy transformation and hence that a power-play both internally, within local government, and externally, towards global actors, further locks-in Algerian future.

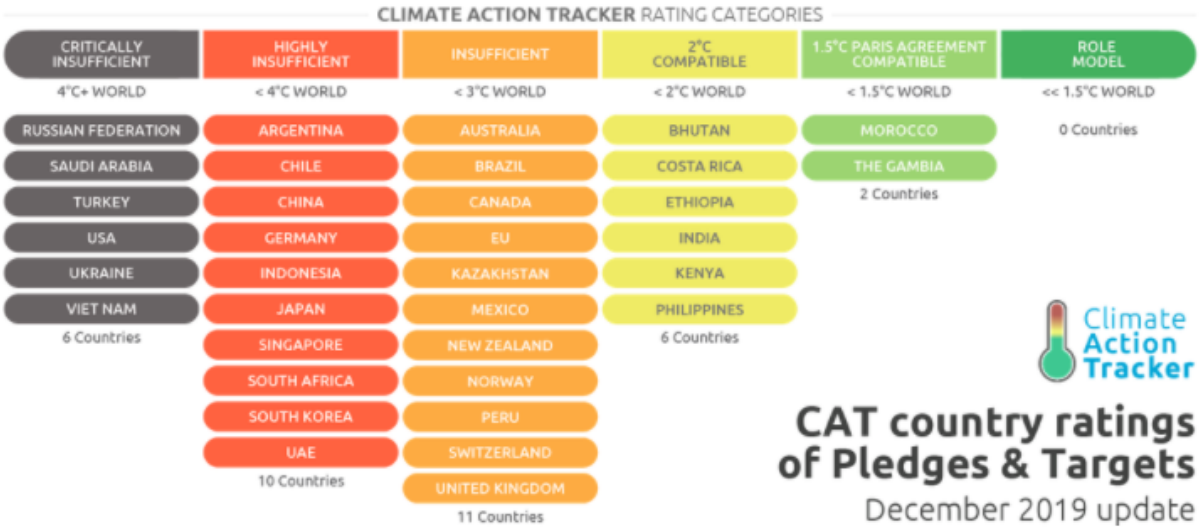
Morocco: A story of success

Morocco is a net energy importer. Its energy mix consists of 90% fossil fuels which are all imported. Energy demand is rapidly growing, and especially demand for electricity, which increased significantly over the past few decades, partly alongside the successful implementation of the Moroccan rural electrification program (El Gharras and Menichetti, 2018). Indeed, rural electrification in Morocco went from only 18% in 1995 to 93% in 2007 and almost 100% in 2019 (ONEE, 2019). Since 2009, the country has started deploying important efforts to diversify its energy mix by transitioning to renewable sources of energy. Between 2009 and the Paris Agreement, Morocco has already pledged to generate large amounts of electricity from renewables, aiming at 42% of installed capacity by 2020. This target was then augmented during the COP21 in Paris, where the king Mohammad VI. introduced an increase to 52% of installed capacity by 2030: “Morocco has become a major actor in the global energy transition, and especially in the African continent” (Speech of His Majesty the King, 2015). The following COP22 was held in Marrakech, which further emphasised and popularised Morocco's active involvement in the fight against climate change (see Vardey, 2016).

Morocco has become the region's leader in renewable energy (El Gharras and Menichetti, 2018). On 17th November 2016, after the COP22 in Marrakech, an article titled “Morocco lights the way for Africa on renewable energy” appeared in The Guardian (Hicks, 2016). This seems to be valid until today - the country's strategy of energy transition and mitigating climate crisis is generating near-to-perfect results. Between the years 2018 and 2019, Morocco has reached 35% of its installed capacity from renewables (ONEE, 2019; Abderrahmane, 2019). Morocco is also considered exemplary in regard to its compliance with the Paris Agreement. An unconditional reduction in emissions of 13% until 2030 compared to “business as usual” was promised in the country's intended nationally determined contribution, this number elevating to 32% under conditions of sufficient foreign financing (INDC submission portal, 2020b). According to calculations of the independent scientific analysis “Climate Action Tracker” (2019b), Morocco is one of the only two countries in the world adopting effective

policies to curb their emissions by 2030 and thus be in compliance with the below 1.5°C global temperature increase. See Fig.3. for a comparison with other countries.

Fig.3. Morocco in the Climate Action Tracker country ratings of Pledges and Targets



Source: Climate Action Tracker website (2019a)

Adopting efficient policies to foster renewables

Since 2010, Morocco has started putting in place its renewable National Energy Strategy (NES), which includes the Moroccan Solar Plan (MSP) and the Integrated Wind Energy Program (Cantoni and Rignall, 2019). Morocco has set out a strong legal and regulatory framework to promote investments in renewables, their production, distribution and export (see Carafa, 2015; El Gharras and Menichetti, 2018). At the same time, important institutional changes occurred. First, it was the transformation of the Centre for the Development of Renewable Energy (CDER) into the National Agency for Development of Renewable Energy and Energy Efficiency (ADEREE). Second, and most importantly, the Moroccan Agency for Solar Energy (MASEN) was created. MASEN acts as the main contractor for renewable energy projects and its mandate was further enlarged in 2017 to include all renewables. Moore (2019: 154) describes MASEN as the “entity guiding sustainable energy development in

Morocco". MASEN is managed as a private company, yet it is partly state-owned, specifically by the national utility company ONEE and two national investment institutions. This allows the political support necessary for the development of energy projects within the centralised governance system of the Moroccan state (Vidican, 2015).

The Moroccan energy transition was also supported by further structural changes such as a reform of subsidies. The Moroccan government started preparing for a subsidy reform in 2013 by increasing prices on liquid petroleum products such as gasoline, diesel and fuel oil, linking them to international prices. Subsidies on gasoline and industrial oil were removed in 2014 with the exception of industrial oil used for electricity generation which was gradually phased out over a period of three years, until 2017. Diesel subsidies were removed in 2015. The subsidy reforms were deemed progressive and effective: they did not cause an increase in poverty and saved the government budget some 5.5 billion MAD (Verme and El-Massnaoui, 2015). El-Katiri and Fattouh (2017) emphasise that the government has shown great political capacity, especially by clearly communicating the effects of the price increases to the population. This approach allowed the reforms to unfold smoothly, without causing significant outcry.

Elements of the Moroccan vision for sustainable development

Given Morocco's lack of access to fossil fuels, exploiting locally available sources of energy is a priority of the country's national agenda. This resonates in a number of symbols linked to renewable energy promotion. Traditionally, Moroccan kings are expected to leave a legacy - to be remembered by what they built (Elsheshtawy, 2008: 108-109). For the former ruler King Hassan II., who reigned from 1961 until 1999, this legacy took the form of modern dams. Dams were initially built by the French for irrigation and hydroelectricity, but after independence, the project was enlarged by King Hassan II. with "La politique des barrages" (politics of dams) which forged Morocco's national identity. Now, King Mohammad VI. builds his legacy on "Morocco's wealth of sunlight" collected through large solar power plants (Moore, 2019: 145-

149). Moreover, the Moroccan government incorporated religious symbols in the country's renewable energy strategy. Specifically, it launched a “green mosque” project to link renewables with Islam and with socio-economic development in rural areas. The project is co-financed by the Ministry of Islamic affairs and the German Corporation for International Cooperation (GIZ), and it is accompanied by an awareness campaign on the benefits of energy efficiency and green technologies led by Imams (see Ceurstemont, 2017; Haghamed, 2016; Nelsen, 2016).

Through the portrayal of renewable energies as symbols of the country's development pathway, Morocco is fostering environmental consciousness of its population. According to Unruh, carbon lock-in can be escaped only if politicians facilitate the recognition of environmental degradation at the social and political levels (2002: 323). Although Morocco does not suffer from the same lock-in as industrialised countries on which Unruh based his theory, the large-scale promotion of renewable energy and environmental sustainability seems like a good precautionary measure to avoid the possibility of future institutional lock-in of carbon intensive sources of energy. According to Moore (2019), Morocco promotes a “renewable energy imaginary” (164) based on the belief that development through fossil-fuel-intensive strategies is not a necessary precondition to deploying environmentally sustainable alternatives. It is one of the core aims of MASEN to use renewable energy technologies as means to enable job creation, foster local manufacturing and facilitate knowledge transfer (Vidican, 2015). The “green mosque” project also involves training on how to install and maintain solar energy technologies or how to run energy audits, hence creating new job opportunities (Ceurstemont, 2017).

Facilitating technology transfer

Although the largest share of Moroccan renewable energy is generated by hydropower and wind (see MASEN, 2020), solar power projects have attracted most attention from international public and academia. With a total of 580 MW capacity, the large-scale solar power complex Noor located near the city of Ouarzazate is the largest solar power complex in the world (Abderrahmane, 2019). Noor's four plants combine solar PV and CSP technologies. Here, it might be valuable to briefly explain how concentrated solar power (CSP) differs from solar photovoltaics (PV): while PV directly transforms sunlight into electricity, CSP uses the concentrated sunlight to create heat which is then transferred to an engine producing electricity. There are different types of CSP technologies (see Kouksou, 2015: 52; Moore, 2019: 14), yet all of them revolve around the presence of a liquid which serves to absorb, transfer and most importantly, store heat. The storage capacity of a CSP plant differs according to the type of technology used but it can amount to eight hours, which means it can be used for peak demand after sunset (Carafa, 2015; Cantoni and Rignall, 2019). This makes CSP an attractive solution to the most important problem of renewables - intermittency.

Morocco seized the opportunity to become a leader in CSP as a strategy to secure investments and technology transfer into its emerging renewable energy sector. Considering the lack of public resources to finance large development projects, Unruh and Carrillo-Hermosilla argue that energy capital transfers to developing countries depend on preferences of profit-driven private organisations (2006: 1188). While Morocco did not initially have a technology preference, it adopted CSP in continuity of the Dii, which was predominantly German-based. Cantoni and Rignall (2019) as well as El Karmouni (2016) point out that German investors were more interested in CSP than in solar PV, as the latter was already deployed in Germany and the former would potentially generate higher profits. Thus, adopting CSP was the result of negotiations between the Moroccan government and private investors. In their analysis of the process, Cantoni and Rignall state that “the conjuncture of transnational and domestic interests enabled the Moroccan government to turn the restructuring of

Desertec's regional strategy into a national initiative that brought attention and financing to the government's emergent renewable energy policy" (2019: 24).

Morocco's ability to attract investment has been building up over decades. The country has adopted the World Bank's structural adjustment program as early as in 1983 (Cherkaoui and Ben Ali, 2007) and since then it has been reforming its economy and opening it to international trade. The technical capacity of the country's administration to implement large-scale development projects funded by the donor community, especially in the energy sector, has been demonstrated on the positive experience of the rural electrification program. This experience sets precedence for further international investment and loans to finance renewable energy development in Morocco (Carafa, 2015). Noor Ouarzazate was a lead project of the Moroccan Solar Plan and at the same time, it was identified as the flagship project of the Mediterranean Solar Plan (Katsaris, 2016). It was financed by equity capital from MASEN and concessional loans from foreign financial institutions including, among others, the African Development Bank, the European Commission, the Clean Development Fund, the International Bank for Reconstruction and Development and the German development bank Kreditanstalt Fur Wiederaufbau (KfW) (World Bank, 2020b). MASEN acts as the borrower for these loans and will repay them with profits from the electricity generated over 40 years (ibid).

Therefore, if it succeeds at reducing production costs, Morocco could become a niche economy for CSP, which Unruh identifies as an important strategy to evade technological lock-in (2002: 322). This means that renewable energies in Morocco would have to be "nurtured" until they become cost-efficient through economies of scale. However, electricity prices are still an issue. On one hand, Menichetti and El Gharras (2017) indicate that government backed tenders allowed for record low prices for wind energy in Morocco. On the other hand, Choukri et al. (2017) warn that prices of electricity generated by CSP still require subsidies which need to be eliminated by facilitating access to the grid by smaller private producers. Nevertheless, there are positive developments in this sense, as in August 2018, the National Authority for

Electricity Regulation (ANRE) was created. This regulatory body should be responsible for "licensing and setting tariffs, overseeing the electricity market, and enforcing regulations" (El Gharras and Menichetti, 2018: 4). This measure could also help solve the problem of overlapping competences of different energy agencies and create a more transparent system open to the entry of private producers (ibid).

Mediterrean interrelationality and demand-induced obstacles

Most importantly, the success of the Moroccan renewable energy strategy is dependent on regional cooperation. Morocco aims at evolving from fossil fuel dependence toward electricity interdependence with its neighbours. Over time, the country has demonstrated its commitment to regional cooperation in renewable energy development. Based on interviews with Moroccan energy policymakers, Moore found that they were all supportive of energy integration with the EU grid (2019: 184-185). Morocco was one of the first countries to support Dii (ibid) and reciprocally representatives of the Dii considered Morocco a key partner, given its strong commitment to integrate renewables into its energy mix (Ruchser, 2010). The country already has two electricity lines connecting it to Spain and it also aims at creating more connections and energy cooperation with African countries (El Gharras & Menichetti, 2018). Thus, given its strategic location between Europe and Africa, Morocco could become an important hub for regional cooperation on renewable energy.

Yet, without sufficient and early regional cooperation, Morocco will hardly be able to fully tap its renewable energy potential and leapfrog carbon lock-in. The country is faced with the challenge to satisfy a growing energy demand (El Gharras & Menichetti, 2018). Intermittency and storage concerns connected to renewables imply that without a system of interdependence with neighbouring countries, Morocco cannot rely on renewables only (Moore, 2019). At present, the country is increasing the capacity of coal powered thermal plants to deal with growing energy demand (ONEE, 2019). As coal now dominates electricity generation in the country (IEA, 2020b) this strategy has met large criticism. Almost

sarcastically, Moore mentions that Morocco has been “quietly building” extensions to existing coal plants and planning new ones (2019: 156). The “Climate Action Tracker” warns that coal-based electricity in the MENA region needs to be phased out by 2034 to stay below the 1.5°C temperature limit of the Paris Agreement, yet Morocco builds new plants planned to be operational long after this deadline (CAT, 2019b). Additionally, Blank and Zachow point out the absurdity of coal-based investments enhancing carbon lock-in in developing countries “without [...] own coal mining at scale” (2014: 3).

Nevertheless, although building new coal plants might contribute to the transfer of carbon lock-in, the issue sheds light on active reactions of Moroccan civil society to the deployment of new carbon-intensive technologies. Specifically, Schinke and Klawitter (2017) described mass protests that occurred against the construction of a new coal plant in the Moroccan coastal city of Safi. Observations of the protestors' arguments revealed that people were conscious of possible environmental impacts of the plant such as air and soil pollution. Moreover, residents of Safi articulated that they would prefer to have a solar project built in the proximity of their homes, rather than a coal plant (2017: 43). This shows that environmental sustainability and renewable energy have indeed penetrated the minds of the Moroccan population as suggested earlier in this chapter. On one hand, the current Moroccan energy strategy suffers from inconsistencies stemming from the increased use of coal alongside taking pride in renewable energies. On the other hand, because it promotes renewables so strongly, it might have also created a self-regulating mechanism against these inconsistencies.

Discussion: Extended dimensions of lock-in

Morocco's locked-in future

Notwithstanding the fact that Morocco faces the risk of carbon lock-in because it is building new coal power plants to satisfy its increasing energy demand, there are also significant flaws in the nature of its renewable energy transition. Specifically, scholars have pointed out that the centralised governance of Morocco's energy sector can be problematic. For instance, Vidican (2015) observes that almost all decision-making is concentrated with MASEN which directly answers to the king, and that thus far, there has been a top-down approach to renewable energy developments. While this might have accelerated the deployment of large-scale projects, it could become a problem in the future. According to Vidican's analysis, smaller private producers are met with constraints to feed-in surplus electricity to the grid and overall participate in the renewable energy sector. A lack of regulatory measures and market incentives to decentralise the energy sector limits the possibilities of local manufacturing and work opportunities, which prevents the system to develop organically and innovate. This resonates in Unruh's suggestion that if for any reason non-carbon technologies diffuse rapidly, policy makers should seek the creation of a *"flexible* techno-institutional complex" (emphasis mine) leaving enough space for future evolution (2002: 324).

Furthermore, the centralised nature of the Moroccan energy sector raises concerns about the continuity of colonial structures in the country's energy strategy. This relates to the choice of CSP technology for the Moroccan Solar Plan. Cantoni and Rignall argue that the centralised energy governance allowed Morocco to accelerate the renewable energy transition and mask some development issues connected to the large-scale CSP projects (2019). They emphasise that during negotiations between Moroccan policymakers and German investors, Moroccans mostly rejected recommendations of German advisors for small-scale, decentralised generation, and actually preferred centralised solutions. In turn, this enabled the Moroccan government to territorialize its power through renewables. Specifically, to acquire land for the

Noor plant, the Moroccan government used a strongly centralised legal framework inherited from the French colonial-era, which recognised tribal confederations as owners of the land but gave decision-making power over its use and allocation to a directorate of the Ministry of Interior. In short, it was used to facilitate land transfers to the protectorate. In the case of Noor, land was sold with the approval of only a few representatives of the collectivity and without consulting the residents of surrounding communities (28-29).

While the acquisition of collectively owned lands for the construction of Noor was formally legal, one question needs to be asked: “Who will benefit from the plant?” According to Moore, the most affected populations get the least from CSP, as the land was sold for cheap and profits were redistributed in a top-down fashion to development projects chosen by MASEN (2019: 214). Most importantly, she found that some stakeholders feared that “exports from CSP could result in a rentier model in which government elites will benefit from rents [...] and the economy will depend on a single natural resource” (221). Thus, while the rapid construction of Morocco's flagship project could contribute to technological leapfrogging, it also perpetuates existing power relations. There are various factors indicating that CSP might not be the best technology available: it is more expensive than solar PV; it requires more water for cleaning; and it implies the need for centralised governance (Cantoni and Rignall, 2019). It is important to recognise that the adoption of CSP was as much a political as a technical choice. As such, it might have locked-out other carbon neutral technologies and created a path dependence of a socially imperfect system.

Algeria and global energy: Limited opportunities for change

Abada and Boukharat (2018) state that while Algeria potentially has resources enabling it to develop renewable energies, it lacks the political will to do so. Drawing from this assumption, I try to answer why this political will cannot change. Empirically valuable work on this matter has been done by Hamza Hamouchene et. al (2014). Their analysis focused on the relationship between the British involvement in Algeria's gas sector and the persistence of authoritarianism of Algeria's government. In the 1990s, after trade liberalisation under the Washington Consensus, British Petroleum (BP) was the first company to enter the Algerian energy market with a contract for oil and gas fields in the special exclusion zone in the south of the country. To protect those fields, and under the premise of “security cooperation”, the UK started selling arms to the Algerian government. Hamouchene et al. argue that given the amounts and types of military equipment purchased by Algeria, this cooperation went far beyond protecting the extraction sites, and primarily serves the repressive regime to stay in power (2014: 10-12). Thus, they demonstrated that foreign corporations and governments driven by interests in Algerian gas hamper political development and contribute to maintaining the status quo in Algeria.

Because Algeria is a fossil fuel exporter, its energy sector is tied to complex dynamics of the global energy market. There are many conflicting interests which influence how and at what pace will the country be able to transition towards renewable sources of energy. An environment in which political will is exercised by an authoritarian and corrupt regime, backed by European governments and large multinationals (Hamouchene, 2016), offers limited opportunities for change. The deployment of renewable energy in Algeria depends on the country's relationship with the EU. While the EU seeks to find common ground for renewable energy cooperation, it also aims at using Algerian gas for its energy security (Grigorjeva, 2016). De Souza et al. argue that the EU policy framework is still tied to the conventional energy industry and its intense lobby. For them, a strategy which intends to develop renewable energies in Algeria in order to secure future exports of fossil fuels is a paradox because “it

maintains the energy entanglement with developed countries on the basis of fossil fuel resources" (2018: 98).

Natural gas as a bridge fuel

Overall, it seems unclear why the debates about renewable energies in MENA countries emphasise exporting surplus fossil fuels as a benefit to the transformation. In the case of Algeria, it is argued that a transition to renewable energy would allow the country to phase-out fossil fuel subsidies and export more natural gas to the EU. This, in turn, would allow the country to invest more into the development of new gas fields (Fattouh, 2018; Grigorjeva, 2016). In Morocco, there are initiatives to build a Moroccan-Nigerian gas pipeline which would diversify the country's energy mix and "eventually improve the European countries' energy security thus becoming less dependent on Algerian and Russian gas" (El Gharras and Menichetti, 2018: 9). This means that in the future, both Morocco and Algeria would export more gas to Europe. Yet, considering the targets set by the EU in its strategic long-term vision titled "A Clean Planet for All", natural gas should constitute less than 10% of the continent's energy mix and fossil fuel imports should decrease from 55% to 20% by 2050 (European Commission, 2018). In a situation of compliance with these targets, exporting natural gas to the EU seems to be profitable only for a very limited amount of time.

From an environmental perspective, the planned energy strategies involving gas exports from Algeria and Morocco also seem illogical. Despite the fact that natural gas emits half of the carbon dioxide that coal does, it is now debated whether it can act as a "bridge fuel" to a clean energy transition (Loomis, 2018). Natural gas is still a fossil fuel and as such it is far from being environmentally friendly, especially because of uncertain emissions of methane associated with its extraction and transportation (Borunda, 2020; Smith, 2019). There is strong evidence that big multinationals influence the perception of natural gas through intensive lobbying. For instance, the Norwegian Statoil as well as the Dutch Shell have been forced to change their misleading advertisements which portrayed gas as "clean energy" or "cleanest fossil fuel" to

acknowledge that gas, if anything, is only less polluting (Nelsen, 2017). While these companies have obvious interests in increasing the global use of natural gas, the Climate Action Tracker report states that “it is a misconception that switching to natural gas is a solution to climate change” (2019: 6). Therefore, in the long run, giving such importance to natural gas proves to be in contrast with both economic and environmental objectives.

Conclusion: Looking into the future

“Any new technological infrastructure or policy regime should not be seen as ‘the solution’ to the climate problem, but another step in the development path” (Unruh, 2002: 324). As Unruh's quote concludes, it is clear that energy transitions are complex processes. In my observations of renewable energy strategies in Morocco and Algeria I have focused on the political, institutional and social factors influencing the pace of their energy transitions. Through the study of the Algerian political economy, I identified some of the important structural drawbacks connected to the carbon curse that oil exporting countries need to overcome in order to escape carbon lock-in. Then, to enlarge the debate on leapfrogging carbon lock-in outside the context of emerging economies, I demonstrated that even a middle-income developing country like Morocco can attract enough capital for technology transfer and promote a low-carbon development strategy. However, the most rampant issue for the two countries, as well as for the rest of the region, is the rapidly growing energy demand. In theory, this should motivate governments to diversify their energy mix and improve energy efficiency but in practice it creates further lock-in of the cheapest and most low-risk fuels and technologies available.

Furthermore, I argue that the analysis of energy transitions can shed light on deeper development issues. First, although the transition towards renewable energies leads to environmentally sustainable outcomes, it can also induce the deployment of technologies which are as socially unsustainable as fossil fuels in the way they create path dependency in unequal structures of power. The interference of Western actors in both renewable and conventional energy production might lock in the interdependence of the two. Secondly, the lock-in that developing countries encounter is not only shaped by the institutional set-up, as in turn the lock-in itself shapes and sustains the status quo. Most importantly, the portrayal of future natural gas exports from the MENA region to developed countries displays persistent inconsistencies in the sustainable development narrative pushed by Western business interests.

In Morocco, future developments of renewable energies will mainly be influenced by the government's capacity to decentralise electricity production. Considering the continuity of improvements in the country's renewable energy policy framework and the widespread awareness about environmental issues among the Moroccan population, a decentralised future does not seem completely impossible. In Algeria, the 2019-2020 protests have shaken up the ranks of rent seeking politicians associated with endemic corruption in the country. Because the previous regime was intimately tied to oil and gas revenues, the outcomes of the recent protests are in large part going to determine whether Algeria will be able to reduce the share of fossil fuels in its energy mix and turn towards renewable energy. However, future policymakers will be faced with a difficult challenge to find compromises between the urgency to reform the inefficient energy sector and the need to minimise the impacts of the Covid-19 crisis.

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