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EXTENDING ECOLOGICAL MODERNIZATION TO DEVELOPING COUNTRIES:
THE CASE OF DESERTEC

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ACRONYMS

CDER	Moroccan Center for the Development of Renewable Energies
CDM	Clean Development Mechanism
CSP	Concentrated Solar Power
CTF	Clean Technology Fund
Dii	Desertec Industrial Initiative
DLR	German Aerospace Center
EIB	European Investment Bank
EM	Ecological Modernization
EMT	Ecological Modernization Theory
ENGO	Environmental Non-Governmental Organization
ENP	European Neighbourhood Policy
EU	European Union
EUMENA	European Union, Middle East, and North Africa
Eurosolar	European Association for Renewable Energy
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HVDC	High-Voltage Direct Current
IWMI	International Water Management Institute
MASEN	Moroccan Agency for Solar Energy
MENA	Middle East and North Africa
MOU	Memorandum of Understanding
MSP	Mediterranean Solar Plan
NESM	National Energy Strategy of Morocco
NGO	Non-Governmental Organization
PPMI	Program on Private Participation in Mediterranean Infrastructure
TREC	Trans-Mediterranean Renewable Energy Cooperation
UfM	Union for the Mediterranean
WTO	World Trade Organization

1. INTRODUCTION

It is not essential to predict the future, but it is essential to be prepared for it.
-Pericles (495–429 BC)

The twenty-first century brings with it the challenge of limits. Humankind must devise a way to provide the necessities of life to an exponentially growing population using a fixed set of resources. Developing countries are at the centre of our crisis with limits. They represent the intersection of proportionally high population growth rates and high levels of poverty (Bucknall, 2007). The result is that increasing amounts of people are unable to meet a basic standard of living while human demands on the environment continue intensifying. Our challenge as civilization is to find a way in which developing countries, along with industrialized countries, can attain a basic standard of living for all their citizens, without exceeding the environmental limits of our planet.

The Middle East and North Africa (MENA) is a region of developing countries facing the immediate challenges of humanity's clash with environmental limits. With about 23 percent of the 300 million people in MENA living on less than two dollars a day, the region struggles to meet human needs (Bucknall, 2007). MENA has the lowest level of renewable water resources in the world (Bucknall, 2007) and the present levels of depletion could lead to a physical water scarcity by 2025, meaning MENA countries will be unable to produce enough food for their populations because of water shortages. MENA is also one of the most susceptible regions in the world to the effects of climate change. The consequences of warming, reduced precipitation, and rise in sea levels will exacerbate water scarcity, threaten climate-sensitive agriculture, and leave urban coastal zones vulnerable to flooding (Bucknall, 2007).

MENA's water issues have an intimate relationship with electricity. MENA's water deficit and electricity demand is set to double between 2010 and 2050 (Desertec Foundation, 2009). The bandage solution to pressing water shortages in MENA is over-extraction of groundwater. However, the long-term costs of groundwater pumping, such as the depletion of aquifers and salt-water intrusion on arable lands, make exploiting groundwater impractical and unsustainable. Seawater desalination is another possible solution to MENA's shortage of freshwater. Desalination however is an energy-intensive process that is difficult to maintain since fossil fuels are the primary source of energy in the region. Therefore, MENA will need large quantities of clean and inexhaustible energy to build a sustainable water supply through desalination.

In this study, I will examine the energy development project Desertec as a form of ecological modernization (EM) in MENA. EM argues that capitalist economies can establish a new model of development that reconciles economic growth and ecological sustainability (Porritt, 2005). The program is relevant to developing countries facing environmental limits because it suggests the possibility of overcoming environmental crises without leaving the path of modernization. I will apply lessons from the case of Desertec to evaluate the opportunities and challenges associated with extending EM to developing countries as a means of promoting environmental sustainability.

2. DESERTEC BACKGROUND

Desertec is a major renewable energy project spanning Europe, the Middle East, and North Africa (EUMENA) that seeks to provide the three regions with sustainable power by tapping the energy potential of deserts. In 2003, the Trans-Mediterranean Renewable Energy Cooperation (TREC) under the auspices of the Club of Rome developed the Desertec project and conducted three studies with the German Aerospace Center (DLR) between 2004 and 2007 that created the foundation for the Desertec concept. The studies are MED-CSP (2005), focusing on availability of resources and demand for energy in the Mediterranean area; TRANS-CSP (2006), concentrating on the assessment of an interconnection between Europe and MENA for solar energy imports; and AQUA-CSP (2007), analyzing the demand for water in MENA and the possibility for seawater desalination and electricity generation through solar thermal power plants. The network of scientists, politicians, and economists involved in the studies formed the Desertec Foundation, an NGO working to promote Desertec in 2009. Later that year, twelve signatories representing leading firms in solar technology, investment banking, and electricity transmission and distribution from Europe and MENA announced their intention to create an industrial initiative to accelerate the implementation of Desertec. The joint venture based in Munich, Germany became the Desertec Industrial Initiative (Dii) and has expanded worldwide to include over 55 companies and institutions interested in implementing the project (Desertec Foundation, 2009).

Dii aims to build several concentrated solar-thermal power (CSP) plants throughout the deserts and along the Mediterranean coastline of MENA. The Desertec Foundation claims MENA will be the initial beneficiary of Desertec's electricity production in order to meet their urgent need for seawater desalination. Similarly, Dii contends that the primary aim of Desertec power generation is to provide MENA with the necessary electricity to address their issues of water and energy security (Desertec Foundation, 2009) while allowing the energy-producing countries in MENA to export electricity to Europe once they have met their local demands. However, there is no formal guarantee to ensure that Desertec will prioritize MENA's electricity needs over the EU's. By 2050, Desertec intends to supply around two-thirds of MENA's rising energy demand and approximately 15 percent of the EU's total electrical consumption (Desertec Foundation, 2012).

Dii will connect MENA's energy infrastructure to the European electrical grid to create a network that will link producers and consumers in all three regions. Dii plans to install undersea high-voltage direct current (HVDC) transmission lines across the Mediterranean to facilitate energy exports from suppliers in MENA to consumers in the EU. Dii's mission is to accelerate Desertec implementation by creating a favourable regulatory environment, enable concrete reference projects, and develop a rollout plan for the project up to 2050. Dii's first reference project began in January 2012, with the start of construction on a 500MW solar plant in Ouarzazate, Morocco (Desertec Foundation, 2012). The solar plant is the first of five projects by the Moroccan Agency for Solar Energy (MASEN), launched in November 2009, which aims to produce 2GW of solar electricity by 2020 (Clark, 2011). Algeria and Tunisia are also part of the reference project phase and are presently coordinating with Dii to begin development on CSP plants and HVDC connections with the EU.

3. LITERATURE REVIEW

The concept of EM developed in the 1980s through the work of German social scientists Joseph Huber (1985) and Martin Jänicke (1985). Their perspective offered a constructive approach for dealing with environmental problems by assigning a central role to science and technology (Mol and Spaargaren, 1993). Hajer (1995) describes EM as a supplement to the broader social theory of sustainable development, while Mol and Spaargaren note the similarity to Beck's (1992) Risk Society. However, unlike sustainable development or Beck's Risk Society, EM provides a clearer prescription for the capitalist political economy and its role in solving environmental problems (Dryzek, 1997). EM envisages the institutions of society undergoing a process of progressive modernization rather than destruction or dismantlement. EM posits that society can overcome environmental problems by complimenting the purely economic rationale of capitalism with environmental consciousness. Instead of overthrowing capitalism, EM simply seeks to green it (Porritt, 2005). Huber (1985) notes the need for industrial society to transition towards an ecologically rational organization of production based on the theory of a changed relationship between the economy and nature. The key tenet of EMT is that continued industrial development offers the best option for escaping from the ecological crises of the developed world (Fisher & Freudenburg, 2001).

EMT analyzes the way in which societies deal with environmental problems. EM views environmental problems as challenges for social, technical, and economic reform, rather than immutable consequences of industrialization. Reform emphasizes the transformation of the core social institutions of modernity: science and technology, production and consumption, politics and governance, and the market. Mol and Sonnenfeld (2000) describe the transformation as a process of delinking material from economic flows. In this sense, EM seeks to restructure social institutions on ecological terms. EMT relies on a theory of strategic capacity to integrate a cross section of authorities (environmental groups, labour organizations, and private businesses) in the administration of environmental protection and institutional reform (Jänicke, 2008). Fisher and Freudenburg (2001) note that increasing activism among economic actors and new roles for nongovernmental organizations logically accompany the changes in the performance of the environmental state.

EMT describes environmental improvements and environmental protection as economically and politically feasible. Fisher and Freudenburg (2001) note the importance of entrepreneurial agents and market dynamics in bringing about ecological change through EM. Growing business risks for polluters in the context of multi-level environmental governance make EM a more secure strategy for environmentally intensive companies – a company that depends on primary resources and delays implementing cleaner methods of production will be at a disadvantage in an environment where the resources they depend on are limited and exceedingly more expensive to extract. Furthermore, where only government held industry accountable in the past (Jänicke, 2008), now they work with NGOs, scientific organizations, and third party regulators, acting at all levels of the international system to ensure public accountability and corporate social responsibility. To compensate for costly production changes, EMT offers industry a comparative advantage and enhanced profitability

through waste reduction and increased efficiency. Ultimately, EM sees environmental protection not as a burden on the economy but as a precondition for future sustainable growth (Fisher & Freudenburg, 2001). EM argues that it can channel the logic for innovation and competition in capitalism toward ecological ends. Therefore, as governments reform markets to value nature, environmental protection becomes politically feasible.

Critics of EM argue that a theory of sustainable capitalism is not realistic. O'Connor (1994) claims EM is bound to fail because it is impractical – if not outright impossible – to assume that consumption at present rates can continue, and even increase, within a resource-limited system. Other critics extend O'Connor's analysis to question whether technological advances alone can achieve resource conservation and better environmental protection (York & Rosa, 2003) – they point to the need to stop capitalism and the process of industrialization altogether to address ecological crises (Young, 2000). Jackson (2009) focuses on the 'myth of decoupling' questioning EM's ability to produce an absolute decline in resource impacts. He points out the trouble with relative decoupling, which refers to a decline in the ecological intensity per unit of economic output but does not necessarily create a decline in absolute terms – impacts may still increase, but at a slower pace than growth in the GDP (Jackson, 2009).

If EM is to restructure the core institutions of modernity along ecological lines in MENA, it must overcome several limitations. EM's dependence on available and marketable technological solutions means it is not available to all states equally (Jänicke, 2004). This does not exclude countries with weaker economies from modernization; however, it does require committed political governance to meet the difficult restructuring challenges in MENA. Furthermore, a country's receptivity to a technological solution will vary based on the industry it serves. For instance, industries that are energy-intensive and dependent on fossil fuel are more difficult to modernize because environmental improvements in their sector typically require restrictive intervention in the established production, consumption, or transport structure of that industry. The diversity of energy profiles in MENA creates a challenge for environmental policymaking since the sensitivity to reforms will vary between the vast oil and gas sector of Algeria to the heavily import-reliant Morocco for example.

In a case study of Vietnam, Frijns, Phuong, and Mol (2000) assessed the value and applicability of EM to developing economies. Their analysis of environmental restructuring of economic development in Vietnam focused on three major issues: state-market relations, technology development, and environmental awareness. The authors found environmental awareness among the public was neither high nor widespread enough to trigger social movements that could put sufficient pressure on governmental and industrial organizations for radical ecological reform (Frijns, Phuong & Mol, 2000). Furthermore, the environmental policy system in Vietnam was incapable of detailed monitoring for a lack of financial and human resources and thus failed to develop and implement environmental technologies. Notwithstanding, EM could occur in Vietnam if it was modelled according to the region's identity. The study outlines the possibility of environmental reform in Vietnam and its conclusion – that EMT must be refined to fit the specific

local conditions and institutional developments of industrializing countries – illustrates the challenges Desertec faces to addressing the specific conditions of such a diverse group of countries in MENA.

Another study of EM looked at the contradictions of growth and efficiency in Southeast Asia's pulp and paper manufacturing industry. Sonnenfeld (2000) found that the Southeast Asian pulp and paper industry was able to improve efficiency, reduce waste, and progress towards cleaner production through the adoption of green technologies. However, the adoption of cleaner technologies was only partially 'ecologically-modern' in that increased pulp production in Southeast Asia was predicated on expanded destruction of natural forests and establishment of fast-growing exotic tree plantations in place of smallholder farms (Sonnenfeld, 2000). Mol (2008) notes that we cannot consider such incremental increases in environmental efficiency as sustained solutions since subsequent growth processes easily wipe them out – known as the rebound effect. The rebound effect is generally a problem with incremental efficiency improvements (cleaner technology), but in principle should not be a problem with radical shifts to different, ecologically sound methods (clean technology) such as Desertec. However, if clean energy becomes available in a way that spurs the development of economies in MENA, it is possible that other environmentally damaging activities could expand.

Developing countries may have an advantage over industrialized countries in their adoption of green technologies. Mol and Sonnenfeld (2000) note that developing countries can implement green technologies from the outset and avoid an environmentally damaging stage of industrialization associated with resource exploitation because of inefficient technology. Rather than modernizing existing infrastructure, developing countries have an opportunity to leapfrog the dirty stages of technological development. In the case of Desertec, early adoption is contingent on technology transfer from the EU to MENA. While technology transfer provides a way of circumventing domestic reforms to manage growth (CSP can avoid the limitations fossil fuels encounter since energy consumption and environmental impacts can be decoupled), it raises issues with ownership and project control in energy intensive industries such as power generation. The adoption of green technologies in MENA through Desertec has the advantage of cost sharing. A major barrier to adopting green technologies in developing countries is financing them – green technologies are typically costlier than existing polluting technologies. However, combining domestic electricity use in MENA with energy exports to Europe could make it possible for Desertec to generate solar electricity at a reasonable price (Kost et al., 2011).

Desertec is a unique case study of EM for several reasons. Desertec represents a radical shift in the production of, governance over, and market for renewable energy in MENA. While these developments will occur within the existing socioeconomic structures of MENA states, they represent a significant shift in the economic and environmental dimensions of production. The majority of past applications of EM have been restricted to developed countries, but projects such as Desertec show an effort to extend the program's relevance to other regions. Studies in developing regions such as Vietnam (Frijns, Phuong, & Mol 2000) and Southeast Asia (Sonnenfeld, 2000)

represent experiments that are minute and incremental applications of EM. The ambitious objectives of Desertec undoubtedly dwarf past applications of EM in developing regions. Furthermore, the platform for interaction – meaning the levels of governance and actors involved – is significantly larger in Desertec than in other studies of EM. With stakeholders across EUMENA representing a range of economic, environmental, and political interests, achieving consensus on the direction of development will prove a challenge for Desertec, and more broadly the application of EM in developing regions.

4. PURPOSE OF STUDY

The primary question of this study is what do the debates about the Desertec project reveal about the opportunities and challenges of extending EM to developing countries? To answer this question it is necessary to first look at the forces driving the project, key actors and their interests, and the controversies and obstacles facing Desertec. Once I have identified these features, I will comment more broadly on the role of EM in MENA as a mode of development. Before evaluating EM's prospects in developing countries as a whole, it is necessary to answer the following secondary questions concerning Desertec:

- i. What are the key economic, environmental, and political forces driving the Desertec project?
- ii. Who are the central actors and what are their core interests?
- iii. What are the main controversies and criticisms of the proposal?
- iv. What are the key obstacles to the success of Desertec in delivering sustainable development in MENA?
- v. Are there any evident tensions between economic, environmental, and social development objectives?

An analysis of Desertec will help assess the compatibility of EM as a political program and evaluate the role and context of EM in developing regions. In other words, identifying the conditions within and between countries in MENA will assist in drawing lessons on EM for regions beyond the scope of Desertec. If EM must conform to the specific local conditions of developing countries to succeed as Frijns, Phuong, and Mol (2000) found, it is necessary to examine the differences in the economic, political, and social structures of the countries in MENA. For this reason, it is important to comment on the obstacles to delivering sustainable development not only with respect to MENA as a region, but in a manner that recognizes the unique conditions of developing countries more broadly. Evaluating the obstacles to sustainable development can reveal overarching challenges for overcoming regional disparities and provide insight on the role of central actors in facilitating EM. Finally, assessing the compatibility between development objectives in Desertec can provide insight into the way developing countries can harness the competitive pressures of capitalism and orient them toward sustainability.

If Desertec can provide a foundation for environmentally benign development in MENA then the practical applications of EM could extend to other developing regions. However, before

prescribing EM to other developing regions it is crucial to cultivate an understanding of the opportunities and challenges in MENA under which Desertec functions. Through identifying the fundamental critiques of and obstacles to Desertec with an analysis of the responses from central actors in EUMENA there is potential to generalize the tenets of EM theory in a way that would be useful to other developing countries. A look at the role of regional cooperation in an EM project could provide a way forward for economic development and environmental sustainability. A study of Desertec can offer practical guidelines to refine EMT and add to the responses that industrialization can continue in harmony with resource conservation and environmental protection.

5. METHODS & LIMITATIONS

To begin answering my research questions I will have to determine the key economic, environmental, and political forces driving Desertec. This will require a review of the prospects and challenges to renewable energy development in MENA, and the reasoning behind the push for the Desertec project in Europe. To determine the driving forces behind Desertec's development I will analyze multiple sources that expand on the rationale for the project. This will include a look at Morocco, Algeria, and Tunisia's background with green technologies, present environmental challenges in the region, the political issues with North-South inequality, challenges to cooperation with Europe, and their economic orientation and policies on growth and sustainable development. I will contrast Morocco, Algeria, and Tunisia's position on Desertec with the EU's interests, and discuss the central factors leading the EU to pursue a partnership with MENA on renewable energy development.

In assessing EM in MENA, I will concentrate on the countries involved in Desertec's reference project – Morocco, Algeria, and Tunisia. While Desertec's long-term rollout plan for the period up to 2050 includes a larger representation of MENA countries, only an analysis of Morocco, Algeria, and Tunisia is possible during the early reference project phase. The 'scale-up' phase of the project will begin in 2020 and bring in Turkey, Egypt, Syria, Libya, and Saudi Arabia into the project once extra transmission cables are laid across the Mediterranean (Hickman, 2011). Evaluating the opportunities and challenges of extending EM to developing countries requires a detailed look at the position and prominence of various actors with a stake in Desertec. To do this, I will comment on the economic, environmental, and political forces driving the Desertec project and their influence on central actors. Next, I will identify the central actors that exert an influence on the development of the project and categorize them into three groupings: business, government, and civil society. Finally, using these three groupings, I will analyze their core interests, concerns, and objectives in the development of Desertec.

EM in MENA is contingent on the cooperation of governments, businesses, and civil society. The reasoning for using these three groupings is that they incorporate the majority of stakeholders who have an interest in the issue, whom the issue affects, or who have an influence on the decision-making and implementation process (Varvasovszky & Brugha, 2000). Each of these groupings has a role in the realization of Desertec and therefore, their interests will determine the development of EM in the region. An evaluation of the dominant actors in each grouping helps

determine the conflicts and controversies in the project as well as comment on the influence actors exert on one another. Identifying stakeholders requires a clear understanding of the issue under investigation so that one can establish the boundaries of the social and ecological phenomenon in question (Reed et al., 2009). As such, I will identify the key issues that provide a forum for debate by isolating central actors and analyzing the interactions within and between groupings. An analysis of the central actors in Desertec will serve to highlight the interests and concerns of business, government, and civil society that shape the decisive early phases of development in MENA.

To determine the position of central actors and their core interests I will analyze a variety of sources such as statements made at conferences, government hearings, and public events; documents such as policy statements, press releases, and op-eds; and news media websites. To develop a clear understanding of the prominent issues, controversies, and criticisms of the Desertec proposal I will supplement stakeholder research with a study of policy material and reports from central actors in business, government, and civil society, and past research related to the opportunities and challenges of the Desertec project. When evaluating sources to determine the position and prominence of central actors I will look for statements that reveal an actor's support or opposition of Desertec development. I will consider statements that develop an understanding of the behaviour, intentions, interrelations, interests, and the resources actors bring to bear on the decision-making and implementation process. I will approach identifying actors and determining their position as an iterative process (Reed et al., 2009), during which I will add and adjust actor positions as analysis continues. Because of the ongoing changes in actor needs, priorities, and interests, I will use the most recent sources available as the basis for analysis.

In policy research, categorizing stakeholders and identifying the issues of debate in a project is a way of generating information on relevant actors. Using the key forces driving Desertec in conjunction with the central actors involved in the project, I will identify the barriers to and conflicts with sustainable development in MENA. At this stage, I will investigate critiques of Desertec and address the potential limits to EM in developing countries. This includes looking at the tensions between economic and environmental rationalities and the concerns of underrepresented populations over land and water access in MENA. I will also examine the criticisms about decentralization, subsidies and tariffs, and the commercial viability of the project in the EU. I will focus on the technical, environmental, and financial critiques of Desertec and address their implication on issues of sustainable development, autonomy, and neocolonialism in MENA.

To establish the key obstacles to success of Desertec in delivering sustainable development in MENA and determine if there are evident tensions between economic, environmental, and social development objectives in the project I will draw on the position of central actors and utilize their critiques, concerns, and interests. This will include the concerns over equity between the EU and MENA, questions about CSP ownership, and the effects of solar development on the rural and poor communities in MENA. To simplify my analysis of the economic, environmental, and social development objectives I will pair the indicators to evaluate the relationship between each of them. Finally, I will connect my analysis of Desertec with literature and past studies of EMT to discuss the

opportunities and challenges of extending EM to developing countries. Through drawing on multiple sources of evidence, I aim to ensure consideration of a full range of perspectives and confirm that a variety of sources support any key conclusions.

In light of awareness of the forces, actors, controversies, and obstacles in Desertec, I will conclude with a discussion on the opportunities and challenges of extending EM to developing countries. First, I will discuss whether there is evidence of a dominant discourse – economic or environmental – of EM in Desertec and the implications associated with such a framework. Similarly, I will contrast the development imperatives in the EU and MENA to evaluate whether the development interests of one region impose on the other. Second, I will comment on gaps or areas of focus in EMT that could make the theory more accessible to developing nations. Third, I will look at the debates to see what they can tell us about the prospect of North-South cooperation in EM as well as the potential of such relationships to promote sufficiency-based growth in the South. Finally, I will close with a statement on the role of EM in the developing world and its potential as a development tool.

In this study, there are three significant limitations to evaluating the opportunities and challenges of extending EM in developing countries. First, because the project is in the early phases of development – with plans finalized in November 2011 to begin construction in Morocco – I am only able to comment on the reference projects in Morocco, Algeria, and Tunisia. Second, because of time and budget constraints I am unable to contact central actors and investigate their relationship with Desertec beyond the level I can ascertain from the information that is available publicly. Finally, since it is impossible to include all possible stakeholders this study will focus on the central actors who have a dominant interest or a strong influence over the decision-making and implementation process in Desertec. Additionally, I will focus my research on energy generation done through CSP rather than wind, geothermal, biomass, hydro, and photovoltaics (PV), since CSP is the principal feature of Desertec and there is little discussion available on other sources of renewable energy generation since such projects are not yet under development in Desertec.

6. DESERTEC'S DRIVING FORCES

The driving forces for Desertec development are numerous and commanding. These forces vary not only between the EU and MENA but also within the countries of each region. A range of policies and programs, regional and national objectives, and environmental and social concerns create the backdrop for Desertec. These factors influence the central actors and shape their motives and interests in the project. In the following sections, I will discuss the key economic, political, and environmental drivers acting on Desertec development. First, in the section on economic drivers, I will discuss the imperative for poverty reduction in MENA, the appeal of solar energy from the deserts, and the EU's desire to liberalize the renewables market. Second, in the section on political drivers, I will examine concerns over political stability in MENA and the EU's climate policy goals and their fears over energy security. Finally, in the section on environmental drivers, I will consider the challenges of climate change and water scarcity in MENA.

6.1 ECONOMIC DRIVERS

Economic growth is an imperative for developing countries seeking to overcome poverty and raise their standard of living. Large infrastructural projects such as the construction of several CSP plants are a significant economic driver for the host countries as they represent the opportunity for significant growth in renewable technologies and job creation in the energy sector. MENA's potential to profit is twofold: Desertec provides an opportunity for energy-producing countries to benefit by expanding their domestic energy industry through developing new markets for renewables and additionally through profiting from the sale of electricity to Europe. Investors find the project economically appealing since the deserts of MENA represent the largest and least tapped sources of solar energy in the world – with an economic potential to deliver over a hundred times the demand for renewable electricity in EUMENA (Desertec Foundation, 2009). Greenpeace's report on CSP technology (2009) comments that under a moderate scenario the countries with the most sun resources could together create €92.5 billion worth of investments, and nearly 1.2 million jobs by 2050. Economic development needs energy – the availability of an affordable, secure, and sustainable energy supply is not only essential to lifting people out of poverty but also an opportunity for lucrative investments.

The vast energy potential of MENA's deserts is fueling the economic dimension of the Desertec project. For example, the construction of one 250MW parabolic trough power plant requires 1,000 workers and engineers for a period of two to three years (Desertec Foundation, 2009). This type of intensive infrastructural investment is attractive to the long-stagnant economies in North Africa since it creates jobs and draws skilled labourers into the region. Dii claims that training local specialists and skilled staff is an important part of the Desertec concept because it promotes the transfer of technology and research between the EU and MENA. To add credence to this claim Dii set up the Desertec University Network (headquartered in Tunisia) in 2010 to train local specialists and stimulate research programs across MENA that assist to expand the regional capacity for desert technologies. Desertec estimates the total cost of seeing the project through to completion in 2050 is approximately €400 billion. Established solar industries such as those in Germany stand to gain from their advantage in renewable technologies since Desertec's exorbitant price tag promises booming investment in the field of HVDC transmission and solar plant equipment. In 2011, solar capacity around the world increased by 54 percent to about 28GW and spending on solar energy jumped 36 percent to US\$136.6 billion (Roca, 2012), however, CSP plants represent only 0.8GW of this capacity – Desertec alone would represent a 100-fold increase in worldwide solar-thermal power capacity (Prior, 2010). Germany's Wuppertal Institute claims that Desertec could create 240,000 German jobs and generate US\$2.8 trillion worth of power by 2050 (Steitz, 2009).

The EU seeks to liberalize access to North Africa's energy markets to ensure they will have eager recipients for their increasing investment in renewables. Access to MENA's solar market provides a cost-effective avenue for the EU to meet their renewable energy objectives. The EU's decision to count imports towards their self-imposed target of sourcing 20 percent of all energy

from renewables makes Desertec an appealing approach to meeting this objective. Likewise, the inclusion of Desertec projects in the Clean Development Mechanism (CDM) provides another flexible avenue for European emission reductions. Desertec's CSP imports allow EU member states to purchase their emissions reductions as solar imports from MENA present a relatively quick and cheap substitute for power from fossil fuels. The EU Neighbourhood Policy (ENP), a foreign relations instrument designed to integrate nearby countries (predominantly MENA) within the economy of the EU, aims to advance policies, such as those pursued by the WTO and World Bank, of privatization, specific restructuring of electricity, water, and health sectors, and a reduction/elimination of state aid (Hall, 2012). The liberalization of MENA's markets under ENP gives EU firms access to a lucrative and relatively unprotected energy sector, an issue that could create issues with social development objectives – something I will discuss in further detail in Section 10.

The drive to liberalize access to MENA's energy market is matter of economic – and not an environmental – interests. In a four-part study of Mediterranean electricity interconnections, the Mediterranean Energy Ring (MEDRING) found that most EU states would be capable of advancing their own transition towards a large share of renewable energy sources without resorting to any imports from Mediterranean partner countries. However, because of MENA's access to sun and wind the MEDRING study concludes,

MENA countries are today, tomorrow, and forever capable to offer renewable energy based electricity at competitive prices on Europe's markets – even when taking into account HVDC wheeling charges and transmission losses over 1000 – 2000 km (MEDRING, 2010).

MEDRING's conclusions reveal that commercial interests are at the center of developing renewable energy in MENA – the appeal of market liberalization is hard to resist especially when it opens up investment opportunities for private (and predominantly European) companies. They argue that the price of renewable energy generated in areas with practically unlimited access to renewable sources of energy like wind and sun will become increasingly competitive against other non-renewable forms of energy (Niekerk, 2010). Given the concerns over energy security and the arguments in favour of decentralization, orienting Desertec as a way for the EU to reach its renewable energy targets may not be the best way of achieving social and environmental objectives in the region but it certainly is a cost-effective one.

6.2 POLITICAL DRIVERS

The governments of MENA and the EU agree upon the political objective to address climate change – though little else. In MENA, there is a need to respond to the increasing demand for energy – for domestic consumption and seawater desalination – while the focus in the EU is more about energy security, namely reducing dependence on Russian gas and Middle Eastern oil. International institutions and political bodies such as the EU have made significant steps to move Desertec forward with the aim of create the right framework of laws and regulation to ensure there are strong incentives for Desertec development. Agreements such as the ENP aim to strengthen

relationships with neighbouring countries that are not members of the EU by offering financial incentives for progress made in economic and social development. Development of trade and investment is a major instrument in ENP related to Desertec – under the agreement Europe will continue increasing investments to MENA as development and trade in solar power grows. EU climate policy aims for a minimum 20 percent cut to greenhouse gas (GHG) emissions from all primary energy sources by 2020 (compared to 1990 levels) increasing to 50 percent by 2050 (EU Commission, 2007). Desertec compliments EU climate policy since imports of renewable energy into the EU count towards the European target of drawing 20 percent of their energy from renewable sources by 2020.

The EU's need to meet its climate change goals and their drive to expand trade relations with neighbouring countries is evident in several of their initiatives and programs. EU climate policy offers a broad political framework to promote renewable energy in MENA. An initiative of particular interest to Desertec is the Mediterranean Solar Plan (MSP) under the EU climate framework. The MSP aims to develop 20GW of renewable energy generation capacity and achieve considerable energy savings in the Mediterranean region by 2020. MSP highlights the importance of developing electricity interconnections between EU countries and its Mediterranean neighbours (Fritzsche et al., 2011). A lack of political coordination and no existing framework for feed-in renewables presents a challenge to EUMENA trade relations – an issue Desertec is attempting to address through MedGrid. Announced in May 2010, MedGrid – formerly known as Transgreen – is a private sector initiative driven by French energy companies that aims to promote and develop a Mediterranean electricity network. MedGrid helps the EU expand its energy trade with North Africa and as part of the MSP, MedGrid guarantees 5GW (of the total 20GW capacity) of electricity exports to Europe.

The MSP and the MedGrid project also function to ensure EU energy security. The EU meets 50 percent of its energy needs through import and, if they do not act this will increase to 70 percent between 2020 and 2030 (EU Commission, 2011). Russia and the Middle East are the EU's greatest benefactors accounting for 40 percent of natural gas and 45 percent of oil imports respectively. Desertec provides the EU with an opportunity to diversify its energy sources and shift imports away from unstable Russia, notorious for gas disputes and their control of pipelines going through the Ukraine. While critics argue the EU is merely switching dependence from one region to another, Dii contends that CSP imports could provide a more secure energy balance through expanding the number of suppliers. Moreover, CSP has an advantage in that it does not suffer from supply fluctuations and is less prone to system interruptions. The Algerian government points out that there has not been a single interruption in energy supply coming from their region to Europe in the last 30 years (Desertec Foundation, 2009). The Desertec Foundation notes that to promote solar imports through the ENP would lead to increased investments and business opportunities for the MENA countries, in turn providing new jobs and thereby increasing political stability. Whether CSP imports from MENA are a long-term solution to the EU's energy security problems is questionable; however, in the short-term, the argument that renewable energy provides more stability than gas and oil is well founded.

Political stability in MENA is of major concern to the EU given the large numbers of North Africans living in the EU, fears of larger numbers of immigrants arriving in the future, and concerns over civil unrest. An industry survey of key solar players in CSP found that the biggest uncertainty for solar development comes from the current unrest in MENA. Featuring over 400 solar industry players only 10 percent saw plentiful oil and gas as the problem, 24 percent thought developing a regulatory framework was of most concern, 26 percent were worried about financial support, and a 38 percent majority indicated political stability was the key issue for CSP development (Gallego, 2011). Likewise, when asked what the biggest challenge was facing the export of power to Europe, political cooperation came up as the number one concern. The Desertec Foundation points out that renewable energy and sustainable development will solve or help mitigate – through improving food and water security – many of the problems that caused the current mess in MENA. According to Kirsten Westphal, an energy expert at the German Institute for International and Security Affairs, the people behind these civil unrest movements pushing for democracy, may be the ones who will wind up approving solar projects (Kilian, 2011). Speaking at the Desertec 2011 conference in Berlin, Westphal said that the quest for democracy espoused by many of the young demonstrators in these countries might eventually give solar energy projects like Desertec the needed push to be undertaken. She added, “Many critics are saying that the Desertec project is dead because of the unrest in the region. But I would say the exact opposite is true” (Picow, 2011). While the majority of European stakeholders at the Desertec conference in Berlin titled ‘Desert Power for the People’ embrace the Arab Spring as a positive catalyst for democratization and stability, the stakeholders from MENA may understandably ask, “Which people?”

In contrast, MENA’s position on EU energy security issues is far less clear. While both the EU and MENA agree that political stability is essential due to the high costs and complexities of large solar projects, the strength of MENA’s young growing democracies to implement solar energy in such a rapidly changing region is uncertain (Kraemer, 2011). Moreover, there is a sense of skepticism – and rightfully so – amongst citizens in MENA that Desertec can provide a win-win situation for their countries and EU energy security. Since the solar projects will require cooperation with European countries, many of whom were formal colonial rulers of countries like Morocco, Libya, Tunisia, and Egypt, an element of trust between these countries and their former colonial rulers is vital (Picow, 2011). The EU’s response to the unrest in MENA has emphasized the need to bring the regions closer together rather than pull apart. Paul van Son, the CEO of Dii, said “You can improve stability by intensifying collaboration between Europe and these countries [MENA], and that stability will benefit companies” (Kinkartz, 2011). The Desertec Foundation argues that investment is most necessary now in the wake of the Arab Spring to foster stability, help establish an advanced economy based on technology, and create employment opportunities in MENA’s industrial sector (Desertec Foundation, 2012). In this sense, the Arab Spring may provide a boost for Desertec and energy security in the EU.

Energy security is an especially important issue for Morocco but for different reasons than the EU. Morocco is the only North African country without any oil and gas deposits and as a result must purchase all the energy it uses from other countries. Desertec provides Morocco with an

opportunity to produce energy from one resource it has in abundance – sunlight. As the focus of Desertec’s reference project, the Moroccan government has implemented various measures to accelerate the development of renewable energy technologies, manage long-term energy security, and contribute to the global reduction of climate change. The National Energy Strategy of Morocco (NESM) set targets to meet 10-12 percent of the country’s primary energy demand by 2020 and 15-20 percent by 2030 with renewable energy sources (Grant, 2011). The main objectives of the NESM adopted in 2009 are to provide sufficient and reliable energy to the economy and population of Morocco as well as minimize the harmful environmental effects stemming from the use of carboniferous fuels. The Moroccan Solar Plan as part of NESM aims to develop 2GW of solar power projects in Morocco by 2020 – with the investment cost of approximately US\$9 billion covered by public as well as private national and foreign contributions (Fritzsche et al., 2011). An associated Morocco renewable energy law will regulate the commercialization and export of renewable energy and outline a procedure for the authorization of renewable energy installations (Grant, 2011). The regulations in Morocco are an essential factor for attracting foreign investors to provide the capital necessary to implement the technology to fulfill Morocco’s solar plan and move forward with Desertec development (Fritzsche et al., 2011).

6.3 ENVIRONMENTAL DRIVERS

Underlying Desertec’s political and economic drivers is the need to respond to global environmental issues. MENA, and more broadly the Earth face severe environmental consequences from continued carboniferous growth leading to climate change. MENA’s most pressing environmental issues all circulate around issues of water. The International Water Management Institute (IWMI) expects that by 2025 all MENA countries will have physical water scarcity – meaning they will not be able to produce enough food for their population because of water shortages (Bucknall, 2007). Large-scale desalination projects present a possible solution to MENA’s water crisis; however, the high-energy costs of desalination – approximately 4kWh per m³ of water output on large-scale systems with energy recovery mechanisms (Mohamed et al., 2006) – pose a problem to the region if it continues to depend on fossil fuels as its primary source of energy. To build a sustainable water supply by desalination, clean and inexhaustible forms of energy are required in large quantities; present seawater desalination via fossil fuels in MENA is an inefficient and transitory solution (Desertec Foundation, 2009).

MENA’s average 797m³ of annual freshwater withdrawals per capita come principally from groundwater extraction (Shah et al., 2000). Unsustainable levels of groundwater extraction are quickly leading to depletion of aquifers causing additional problems. When the groundwater table sinks below the seawater table, there is an intrusion of salt water into near shoreline aquifers. Intrusion of saline water destroys the aquifers – as is already happening in Gaza – leading to well closures and deepening water scarcity. As a result, some arable land such as that on the Batinah coastal plain of Oman has been lost. In Bahrain, the saline interface between sea and groundwater is advancing at an annual rate of 75-130 meters (Desertec Foundation, 2009). The IWMI estimates that by 2020 the annual freshwater deficit may go up to 80 billion m³/year – corresponding to a volume

greater than the Nile River (Desertec Foundation, 2009). Construction of CSP plants provides a potential solution for MENA's water issues by making use of waste heat from turbines for seawater desalination. The spent steam from CSP turbines can raise the temperature of seawater causing it to evaporate and then condense as fresh water in a succession of stages (known as multi-effect distillation) to improve overall efficiency (Desertec Foundation, 2009). MENA's water issues are a strong environmental driver for Desertec since the project provides the possibility of creating a sustainable water supply in conjunction with the renewable energy necessary for growth.

7. ACTORS & INTERESTS

Desertec's sheer scale and ambitious vision has drawn interests from the international business community, national governments throughout EUMENA, and a variety of actors in civil society. The actor's interests are as varied as their backgrounds. In the following sections, I will study the ongoing dialogue within and between the three major actor groupings in Desertec – business, government, and civil society. First, in the section on business actors, I will examine the structure of Dii, consider any conflicts shareholders may have with renewable energy, and highlight the key financiers and their motivations in Desertec. Second, in the section on government actors, I will contrast the interests of European governmental actors with those of Morocco, Algeria, and Tunisia. Finally, in the section on civil society actors, I will look at the dialogue put forth by Eurosolar, Greenpeace, Germanwatch, the Desertec Foundation, and the World Bank to discuss their support or opposition to Desertec.

7.1 BUSINESS ACTORS

Based on three studies examining the viability of the Desertec concept by the German Aerospace Center (DLR), TREC help assemble an assortment of business interests to construct a legally recognized limited liability company known as Dii backed by a dozen shareholders in 2009. Of the dozen shareholders that initially formed Dii, 11 were European, with Cevital – an Algerian agro-foods company – as the only non-European firm. Since the creation of Dii, the number of shareholders has nearly doubled to 21, of which ACWA Power, a Saudi Arabian developer of water and power projects, and Nareva, a Moroccan energy utility, joined Cevital as the only other non-European company's part of Dii. Along with the shareholders, Dii receives funding (€75,000 per year for membership) from 35 associated partners that represent “leading international companies and institutions, enthusiastic about the Desertec vision” (Dii, 2012). The associated partners have an identifiable link to Dii in terms of business in EUMENA but do not have ownership or control over development like Dii shareholders – shareholders have the power to vote in Dii while associated partners do not. However, associated partners are closely involved in all relevant changes in the project, they have access to Dii studies, and they may participate in working groups to contribute expertise to the project.

To finance Desertec, the shareholders signed a MOU, with the explicit goal of accelerating the implementation of the project. Many of Europe's largest blue chip firms including insurance giant Munich Re, Siemens, E.ON, RWE, and Deutsche Bank have committed to developing a

detailed investment plan (due in 2012) exploring financing options for the project (Dii, 2010). Germany's deputy foreign minister Guenter Gloser announced initial funding for the project would include one billion euros from the EU, with shareholders seeking an additional four billion (Steitz, 2009). The World Bank announced that it would finance 13 solar thermal power plants through their Clean Technology Fund (CTF) in selected countries in MENA (Egypt, Algeria, Tunisia, Morocco, and Jordan), corresponding to an investment volume of US\$5.5 billion. US\$72 million will go to Desertec's reference CSP plant project in Ouarzazate, Morocco; US\$51 million to Hassi R'Mel II, a hybrid gas-solar project part of Desertec, in Algeria; and US\$40 million for a Tunisia-Italy HVDC transmission line (Wuppertal Institute, 2010). Similarly, the African Development Bank pledged €373 million to fund Morocco's renewable energy plan (Karam, 2011).

Desertec shareholders represent a wide range of international expertise in wind and sun power generation, transmission technologies, project development, energy trading and long-term contractual arrangements, renewable energy feed-in systems, financing and risk management, insurance, and knowledge transfer and training. As a consortium of business interests Dii describes their role in Desertec as one that will "develop the business case" and "prepare an economic and regulatory framework to bring desert power to the market" (Dii, 2010). Dii's activities aim at developing viable investment plans for establishing the project and implementing Desertec thereafter. Dii outlines their founding principles for the implementation and development of Desertec in their MOU that all shareholders subscribe to when joining the consortium. The MOU reiterates Dii's goal to create "the necessary political, socio-political, and economic foundations" for Desertec (Dii, 2010).

While Dii's MOU explicitly states their aim to include interested companies "from a variety of different countries" (Dii, 2010) the makeup of shareholders is predominantly European. Even more troubling however, is the homogeneity in European interests – which all point to making a return on their investment. The Financial Times Deutschland aptly describes the interests of European firms in Dii writing:

Of course it isn't ecological concerns that have led several large companies to join the desert power project. A hoped-for image boost is likewise not the decisive factor, even if companies like the coal-power plant concerned RWE and the nuclear reactor manufacturer Siemens could use the green hue. Rather, the project is sending a strong signal that investments in renewable energies don't just make ecological sense — they make economic sense as well. The potential partners are convinced that they can, in the foreseeable future, use giant solar thermal power plants in sunny regions to generate power at competitive prices (Hawley, 2009).

ABB, a Swedish-Swiss corporation specializing in robotics and automation technologies, and one of Dii's shareholders said, "we would not support the project [Desertec] if we were not convinced that it could be economical in the medium- and long-term" about their investment (Moglestue, 2009). In a 2011 presentation on Desertec investment, Deutsche Bank outlined key success and risk factors for the project in the areas of political support, financing, and technology. Similar to ABB's

sentiment, Deutsche Bank intentions are to develop an appropriate political framework to guarantee investment security, create adequate incentives on risk/return profiles, and push for the most cost-competitive technology for power generation (Rüschchen, 2011).

E.ON and RWE, amongst other shareholders, have overtly conflicting interests with solar energy – adding to evidence that Dii’s concerns are a matter of self-serving economic interests rather than environmental rationality. Desertec’s outline for energy, water, and climate security in the fourth edition of their Whitebook takes a strong position against nuclear power – emphasizing the unnecessary risks and competing interests with solar power. The Desertec Foundation argues that while the prices of uranium have multiplied several times since the year 2000 nuclear energy still receive substantial subsidies, which hinder the further expansion of renewables. Moreover, it is difficult to combine energy generation from nuclear fission and CSP plants because nuclear plants cannot vary their output in an economic manner to meet fluctuating demands (Desertec Foundation, 2009). The issue stemming from base load plants with constant output – such as nuclear – is that in a green energy future, non-renewable power facilities must exclusively serve balancing duties, using valuable stored energy sources exclusively for what they are best suited for and not wasting them for quotidian use. Nuclear plants do not fit well into such a system because they are not capable of providing quickly changing output to fill the gap between the partially fluctuating supply from renewables and otherwise fluctuating demand. Horizon Nuclear Power – a joint venture between E.ON and RWE – plans to invest over US\$22 million to develop 6GW of nuclear capacity in the UK by 2025 (Horizon Nuclear Power, 2012). In comparison, the combined capacity of Dii’s reference projects in Morocco and Tunisia would equal 6.7GW by 2030. Such competing nuclear interests – especially considering CSP from MENA needs a feed-in framework and subsidization to remain competitive – could seriously impair the viability of solar energy.

The perspectives of key business actors involved in Desertec have a Eurocentric leaning and an emphasis on the economic viability over the social, environmental, and political dimensions of the project. The statements Desertec shareholders put forth highlights the importance of balancing risks with financial returns, liberalizing MENA’s market for solar energy, and creating a framework within which they can pursue those goals. The MOU makes Dii’s role as an intermediary that sets the political, social, and economic foundation for a viable implementation plan clear. However, the loose definition makes no mention of shareholder obligations to environmental concerns or sustainable development in MENA. While Dii takes a firm position on the adoption of solar energy in MENA, the response from business actors is to develop an ‘energy mix’ – which may explain why a number of Desertec shareholders (Red Eléctrica, RWE, E.ON, Terna, UniCredit, Enel, and Deutsche Bank) also invest heavily in nuclear energy and other non-renewable technologies. Freshfields Bruchaus Deringer, a global law firm headquartered in London, in their briefing after joining Dii as an associated partner wrote, “A broad range of energy supply opportunities and sources of supply of raw materials will provide a sound economic basis for the upcoming decades” (Freshfields Bruckhaus Deringer, 2009). Enel, an Italian energy provider made a similar statement,

The most suitable solution is a balanced generation mix that includes fossil fuels, renewables, and nuclear power. Indeed, nuclear ensures the stability of electricity generation while allowing the reduction of carbon dioxide emissions (Enel, 2012).

7.2 GOVERNMENT ACTORS

At present, the EU, Moroccan, Algerian, and Tunisian governments are the central partners negotiating the implementation and development of the Desertec project. To date the EU has emphasized the need for a favourable commercial environment through closer integration with MENA –evident in the programs and policies of the ENP. The governments of MENA have a divergent views on Desertec that reflect both concerns and interests based on their socioeconomic conditions, the state of their energy structure, and past relationships with the EU. In the following sub-sections, I will look at the interests of European governmental actors (predominantly the EU Commission and Germany) and their counterparts Morocco, Algeria, and Tunisia. I will discuss the interests of the MENA countries in the order that they signed on to Dii.

7.2.1 EUROPEAN GOVERNMENTAL ACTORS

The EU Commission has channelled their private interests in Desertec through the Union for the Mediterranean (UfM) – a partnership launched in 2008 that includes all 27 EU members and 16 states around the Mediterranean. The UfM falls under the ENP, which promotes general policies of privatization, trade liberalization, the reduction and elimination of state aid to public services, and specific restructuring and privatization in sectors such as electricity, water, and health (Niekerk, 2010). The European Investment Bank (EIB) is a strong supporter of the ENP and encourages,

Economic liberalization and the development of the private sector by ‘focusing on sectors that offer the greatest leverage in order to encourage structural reform and promote private initiatives, whether local or foreign’ (Niekerk, 2010).

As noted previously, Desertec provides an avenue for the EU to meet its climate goals of which many stem from the UfM and associated MSP. The EU’s interest in Desertec is reflected in their aims to develop 20GW of renewable energy projects by 2020 and integrate the electrical grid between the EU and its Mediterranean partners – which include Morocco, Algeria, and Tunisia. Through liberalizing access to MENA’s emerging renewable energy industry, the EU stands to reap the benefits of private ownership and control over solar infrastructure in MENA while fulfilling their so-called ‘20-20-20’ goals targeted to: i) reduce GHG emissions by 20 percent compared to 1990 levels; ii) derive 20 percent of its energy mix from renewable sources; iii) reduce its energy consumption by 20 percent; all by 2020.

The EU Commission has welcomed Desertec with enthusiasm as part of its Energy Roadmap 2050 to reduce GHG emissions to 80-95 percent below 1990 levels by 2050 and its Renewable Energy Directive mentioned above as part of their 20-20-20 goals. In the EU Commission’s Conference on the Renewable Energy Strategy in February 2012, the commission announced they would begin preparing a document to look at the policy framework for renewable

energy in a post-2020 perspective. The EU Commissioner for Energy, Günther Oettinger said in an address to the Dii,

Large-scale investments in the renewable energy sector will only be possible if the right framework conditions are put in place. Several of our partners in the South have started ambitious energy sector reforms and regional market integration is starting to gain momentum. The EU is accompanying these initiatives through its bilateral and regional programmes. Our interventions will continue to focus on setting the right framework conditions for investments in renewable sources (Oettinger, 2010).

Oettinger assured Dii that European financing bodies, including the EIB and national institutions, would continue to be a major source of financing for Mediterranean energy infrastructure – a relationship that an EU agreement on an energy policy framework with MENA would strengthen.

Despite its German roots, the opinions on Desertec its home country are mixed. German Chancellor Angela Merkel has endorsed the project, noting that Desertec has the “potential to be a connecting project between the European and African continent” (Merkel, 2010). However, some German critics point out that because of Germany’s domestic plans to expand renewable energies Desertec could prove to be an impractical and unnecessary investment for the country – I will expand further on these criticisms in Section 8. The left-leaning newspaper die Tageszeitung wrote,

There is reason to be wary [of Desertec] on at least one point: The desert plans cannot be allowed to impinge in the slightest on the further development of solar power in Germany. Should politicians use the Sahara facilities as an excuse to one day slow down domestic solar power projects, it would be a disaster (Hawley, 2009).

Germany has set the bar high for renewables in their country, with Desertec critics arguing that decentralized power in the country will likely always be cheaper – a point of great contention – than the cost of importing energy from MENA. On the other hand, German supporters of Desertec argue that the country’s large investments and subsidization for domestic solar are financially inefficient and wasteful. The right-leaning die Welt wrote,

Desert power from solar thermal power plants would be cheaper and there would be a constant supply. But Germany's solar lobby apparently wants to teach environmentally aware consumers that solar power is good when it is generated domestically with billions in subsidies. And it's bad when it comes from projects that benefit the poor in Africa (Hawley, 2009).

7.2.2 MOROCCO

Thus far, the Moroccan government has made the most progress with Desertec in MENA. The partnership between Desertec and Morocco has flourished for two reasons. First, Morocco provides an ideal site for Desertec’s reference project since it has the only existing under-sea transmission cable between North Africa and Europe – connecting the Spanish and Moroccan

energy grids – and could begin supply electricity to the Spanish grid as early as 2014. Second, the Moroccan government maintains that Desertec is a way out of their energy dependency problems – Morocco is the only North African country without any gas or oil deposits (Rhein, 2010). Once completed, the Ouarzazate solar project would represent 18 percent of Morocco’s annual electricity generation (Clark, 2011).

According to the World Bank (2009), Morocco imported 95 percent of its energy in 2009, with total costs related to energy imports reaching US\$8 billion that year (AEDI, 2010). Compared to Tunisia who imported only 18 percent the same year and Algeria who exported over three times the energy it used in 2008, Morocco is eager to begin producing more of its own electricity. Said Mouline of Morocco’s renewable energy agency (CDER) commented regarding Desertec, “Morocco doesn’t have even 1 percent of Europe’s energy consumption, so let’s be realistic. We would be generating enough power [via Desertec] for us and for export for the next 100 years” (Pfeiffer, 2009). MASEN, established in 2010 after Morocco announced its partnership with Desertec whose role is implementing the Moroccan Solar Plan under NESM, showed similar support for the project. The country’s solar plan has some of the most ambitious targets in the world – Morocco aims to draw 42 percent of its energy from renewables by 2020 (Kraemer, 2011).

7.2.3 ALGERIA

Whereas the Moroccan government’s position on Desertec has been one of keen support, the Algerian government has met the project with more suspicion. In 2009, Algeria’s Minister of Energy and Mines Chakib Khelil said, “We don’t want foreign companies exploiting solar energy from our land” (Pfeiffer, 2009). Given that CSP installations would be the property of foreign countries and the long timescale of Desertec, the Algerian government expressed concerns about Desertec interfering with their sovereignty. Algeria’s Interior Ministry carefully monitors foreign companies and keeps a 51 percent stake in all foreign projects (AnsaMED, 2010). Prior to their denouncement of Desertec, the Algerian government had tightened terms on inward investment and announced it would only participate in Desertec if it allowed partnerships between Algerian and foreign firms and guaranteed their ownership with associated technology transfers (Pfeiffer, 2009). When Dii was unable to satisfy them on these points the Algerian government backed away from Desertec (Niekerk, 2010).

However, in May 2010, Algerian president Abdelaziz Bouteflika removed Khelil from his role as Minister of Energy and Mines[†] in response to criticisms from Algeria’s hydrocarbons industry and corruption investigations at the state-owned oil and gas utility Sonatrach. Algerian critics argued that Khelil failed to open Algeria’s hydrocarbons industry to foreign investment, pointing to his attempt to persuade fellow gas exporters in MENA to reduce their production levels in order to boost

[†] Khelil's removal was part of a political realignment in Algeria that also saw the promotion of influential Interior Minister Nourredine Zerhouni to the newly created post of Deputy Prime Minister. Zerhouni played an important role in Algeria's campaign against Islamist militants affiliated to al Qaeda – a move that may have improved EU faith in Algeria’s political stability.

prices[‡] (Hoyos, 2010). Bouteflika replaced Khelil with Youcef Yousfi, the former Ambassador for Algeria to the United Nations. Following Yousfi's ascension to office, Algeria announced a US\$20 billion solar plan – perhaps in response to neighbouring Morocco's goals – that would see 40 percent of nation's electricity come from renewables by 2030. Following a 2011 EU-Algeria meeting on renewable energies, Dii was able to strike a deal with Algeria's electricity distribution utility Sonelgaz. "We will work on renewable energy sources through Desertec which we will develop by mutual consent," Bouteflika said of the partnership with Dii (AnsaMED, 2010). The agreement between Sonelgaz and Dii aims to install 22GW of renewable energy (mostly solar) capacity by 2030 with the Algerian government planning to keep 12GW for domestic use, with the other 10GW going to Europe as energy exports (Dii, 2012).

7.2.4 TUNISIA

Tunisia was the latest country to join Desertec when STEG Énergies Renouvelables, a subsidiary of the Tunisian state gas and oil utility, announced a partnership with Nur Energie to construct TuNur a 2GW CSP plant as part of the project. TuNur is set to be six times the size of the largest CSP project ever built and four times bigger than the largest power plant of any type in Tunisia (Kraemer, 2012). The deal with Nur Energie is particularly appealing for the country since the independent solar project developer has promised it will manufacture heliostats (the panel that reflects sunlight to the solar tower of a CSP plant) locally, building 825,000 flat plate mirror-and-steel devices in Tunisia itself (Kraemer, 2012). TuNur facility will create as many as 20,000 jobs and spur investments in local education – in partnership with the Desertec University Network – to aid the long-term management of the plant. The first phase of construction for the TuNur CSP plant is set to begin in 2014 and the first electricity exports are set to reach Europe by 2016 (Dii, 2012).

While Tunisia's dependence on energy imports is not nearly as strong as Morocco's, the country still relies on foreign countries for nearly a fifth of its energy. As a result, Tunisia has been eager to realize its solar potential and may have joined Desertec to keep pace with Morocco and Algeria's ambitious solar plans as the three countries have been seemingly competing to outdo one another. In 2009, the Tunisian government launched their own renewable energy plan with an investment of €2 billion between 2010 and 2016 with the aim of funding 40 projects (Hmida et al., 2011) – specifically solar and wind – and a mandate to install 4.7GW of renewable energy capacity by 2030 (Dii, 2012). Dii opened an office in Tunis from which to coordinate all its activities in North Africa in April 2011 and appointed René Buchler – who had previously worked as the head of Siemens Tunisia – as North African coordinator and head of operations in the region (Dii, 2011). Buchler helped bring MedGrid to Tunisia to begin work on a HVDC transmission line between Tunisia and Italy (dubbed ELMED) capable of exporting up to 5GW of power to Europe when completed in 2020 (Kraemer, 2012).

[‡] Low prices were a result of a European market oversupplied with oil and gas because of a drop in demand following the recession.

7.3 CIVIL SOCIETY

Among the civil society groups examining Desertec, most are concerned over the feasibility and human development dimensions of the project. The European Association for Renewable Energy (Eurosolar), a non-profit organization that develops political and economic action plans for the introduction of renewable energy independent of political parties, institutions, commercial enterprises, and interest groups is a key critic of the project. They contend that Desertec advocates underestimate both the costs and timescales for realizing the project. Eurosolar argues that before Desertec can achieve its desired effects, electricity generation from renewable sources in Germany will develop at a lower cost and have lower prices than solar imports from North Africa (Eurosolar, 2009). Eurosolar points to evidence that within three years solar power generation in Germany will reach ‘grid parity’ – meaning that its cost will match the current price of fossil fuels. Moreover, the costs of operating power stations in the desert (such as protecting solar mirrors from sandstorms and drifts) and developing transmissions grids across several countries are grossly underestimated argue Eurosolar. The group concludes that the only reason to develop a project like Desertec is if Europe found it did not have sufficient potential to generate enough renewable energy domestically to meet its own needs – a statement MEDRING disproved in their 2010 study.

The ENGO Greenpeace, while commenting only briefly about Desertec in a news release in 2009, expresses strong support for CSP technology. In their 2009 publication ‘Concentrating Solar Power Global Outlook 09: Why Renewable Energy is Hot’ Greenpeace makes a technocratic statement on the growing CSP market. They argue that CSP is a large-scale, commercially viable way to make electricity, and that with advanced industry development and high levels of energy efficiency, CSP could meet up to 7 percent of the world’s projected power needs in 2030 (Greenpeace, 2009). The principal focus of the report is on the relationship between climate change and CSP as a mainstream energy generation solution, the economic benefits of investment in CSP technologies, and the policies needed to support CSP industry growth. Greenpeace comments on CSP in Algeria, Morocco, and Egypt but their instrumental approach only examines the market situation in each country and ignores any socio-economic or human development implications. Shortly after the creation of Dii in 2009, the German wing of Greenpeace wrote, “Companies must understand Desertec as an alternative to environmentally damaging coal and nuclear power, rather than a competitor with decentralized wind power and PVs in Germany” (Totz, 2009).

Germanwatch, a NGO seeking to influence public policy over trade, the environment, and relations between countries in the Global North and South, expresses concern over concepts of equity and the changes to livelihood for citizens in MENA under Desertec. Germanwatch points out that Desertec primarily represents and discusses its vision to promote sustainable development in view of global challenges in terms of technical and regulatory parameters and the narrow application of economic cost-benefit-analysis (Germanwatch, 2011). In a 2011 report titled ‘Desertec and Human Development at the Local Level in MENA’ Germanwatch wrote:

It is crucial that Desertec integrate its vision in a concept of transformative change that supports not only climate goals and energy security in Europe but also the development

perspectives and democratic stabilization of a rapidly changing MENA region as well as human rights and livelihoods in the relevant regions (Germanwatch, 2011).

The report outlines three strategic elements essential for the Desertec concept to foster sustainable human development outcomes – social inclusion, empowerment, and human security. I will elaborate further on these key elements in Sections 9 and 10. Germanwatch concludes that addressing sustainable human development and equity in Desertec will require cooperation between stakeholders and a commitment to human rights from both state and non-state actors.

The Desertec Foundation also acts as a civil society initiative aimed at shaping a sustainable future through renewable energy. Established in 2009, the foundation is a non-profit organization that grew out of a network of scientists, politicians, economists, and committed private individuals from around the Mediterranean who together established the Desertec concept through TREC and the German Association of the Club of Rome (Desertec Foundation, 2012). The Desertec Foundation helped establish and is currently a shareholder of Dii. The foundation describes their work as: i) informing the civil society sector and politicians about the benefits of Desertec; ii) promoting the establishment of the framework conditions necessary for a global transition to renewables; iii) supporting knowledge transfer and scientific cooperation; iv) fostering exchange and cooperation with the private sector (Desertec Foundation, 2012). The foundation was instrumental in developing the Solar Plan for the UfM, creating a partnership between MedGrid and Dii, and establishing the Desertec University Network. Their global mission is to realize renewable energy generation in desert regions throughout the world. The Desertec Foundation has already started establishing contacts throughout Greater East Asia in order to promote “the implementation of the necessary political framework conditions” for desert energy there.

Perhaps owing to its duality as an international financial institution and a development organization, there is tension between the World Bank’s concern for social and economic development in MENA. On one hand, the institution firmly supports the neoliberal approach to economic development through privatization and minimal involvement from the state – this type of development comes at the cost of social spending and public welfare programs. For instance, the Program on Private Participation in Mediterranean Infrastructure (PPMI), a joint venture between the World Bank, EU Commission, and EIB aimed at fostering private participation and competition in infrastructural development in MENA is evidence of the institutions Eurocentric leaning on economic interests (Hall, 2012). Conversely, the World Bank also operates the CTF – a program that promotes scaled-up financing for demonstration, deployment, and transfer of low carbon technologies with a significant potential for long-term GHG emissions savings that is committed to investing US\$5.5 billion in MENA. A key aspect of the CTF is to foster development through co-funding programs embedded in national plans and strategies. This funding strategy encourages MENA to develop government bodies – such as MASEN – to realize environmental programs. The support for economic liberalization seemingly contradicts the World Bank’s efforts to involve governments in managing their energy resources, begging the question, what role will institutions such as MASEN play if private firms own and manage the majority of Desertec’s infrastructure?

8. CRITICISMS OF DESERTEC

The ambitious vision and vast scale of Desertec has come under considerable scrutiny as opponents have labelled the project everywhere from problematic to completely unrealistic. Amongst critics, the late Hermann Scheer, former President of Eurosolar and General Chairman of the World Council for Renewable Energy, was particularly vocal about Desertec, calling into question the logistics and reasoning behind the project. The Worldwatch Institute has also pointed out issues with the water needed to produce electricity through CSP and dangers associated with centralized energy projects. Critics on the economic end of the spectrum note that Desertec is financially questionable and risky. In this section, I will focus only on the technical, environmental, and financial critiques of the project. I will address issues of sustainable development, autonomy, and neocolonialism in Section 9.

German politician and campaigner for the promotion of renewable energies Hermann Scheer argued that the Desertec concept – powering Europe from the Sahara desert – had no prospect of success. In an op-ed following the creation of Dii, Scheer wrote about Desertec:

If the aim were to enable the Sahara countries to make the transition to energy generation completely from renewable sources, I would fully agree to the Desertec plan. The EU would make both an essential contribution towards stable economic and social prospects for the southern Mediterranean countries and to fighting climate change (Scheer, 2009).

Scheer claims that energy imports to Europe from MENA are impractical – even if Desertec’s plan to supply 15 percent of the EU’s electricity demand with €400 billion was feasible – because generating power from within the EU itself is less costly. Using Germany as an example, Scheer points out that within nine years (between 2000 and 2009) the percentage of electricity generation from renewable sources increased by 15 percent in the country with an investment cost of about €80 billion – and the cost per kilowatt-hour is constantly falling. A counter to the Desertec concept, the German Renewable Energy Act, has been in operation since 2000, during which it has encouraged investment and decentralization through feed-in tariffs. Scheer criticizes Desertec for ignoring the potential for decentralized renewable energy generation within Europe, highlighting that over 90 German towns and council districts have put forward specific concepts on how they will satisfy all their energy demands from local and regional sources by 2030 at the latest.

There is an important distinction between producing energy in a centralized or decentralized manner. Financially, decentralized production, such as local energy projects using feed-in tariffs spread the profits and value added from production across a large number of producers; however, centralized production, as in the case of Desertec with large power stations, concentrates wealth in the hands of a few – typically the corporate interests that dominate the project. In terms of security, centralized energy projects pose a risk since a disruption in power generation will affect a larger group of individuals. Specifically in MENA, critics note that political uprisings could disrupt power generation, or worse, power plants and supply lines could become a target for terrorist attacks (Rzhevskiy, 2009). Dii claims that as the power network in EUMENA expands, the risks to the

system from a single line failure will decrease (Dii, 2012). Desertec needs close coordination between governments to succeed, yet Maghreb states (the region of Northwest Africa including Morocco, Algeria, and Tunisia) have tried and failed for two decades to integrate their economies and deepen political ties (Pfeiffer, 2009). Border disputes between Morocco and Algeria over control of the Western Sahara and the recent Arab Spring revolutions are a reason for concern over centralized energy security. Regarding energy imports from North Africa, Eberhard Rhein from the European Policy Centre said, “Europe will never want to import more than 25 percent[§] of its electricity from North Africa before these states assure the rule of law” (Humphrey, 2009).

Critics have expressed concern over CSP, the principal technology for solar development in Desertec, for its high water requirements. Water is an essential component for cooling in nuclear, coal, geothermal, and natural gas plants, while wind power and solar PV energy are the only technologies that require little or no water (Eilbert, 2010). CSP plants need a small amount of water (approximate 2% of the plants total water needs) to clean dust from solar panels and mirrors while the majority of water use goes towards wet cooling (US Department of Energy, 2010) – a process that uses water to condense the generator’s steam exhaust for reuse. However, because of the high operating temperatures (between 550°C to 1000°C) and lower steam cycle efficiency, CSP plants using wet cooling require approximately three times more water than coal plants (Carter & Campbell, 2009). The alternative, dry cooling – a process that circulates ambient air through a closed-loop system to condense the steam – costs approximately 5 to 10 percent more but reduces total water usage by 80 to 90 percent (Greenpeace, 2009; US Department of Energy, 2010). The 2GW TuNur CSP plant in Tunisia is the only Desertec project confirmed to use dry cooling technology. Excessive water use in wet cooling CSP plants could exacerbate the water scarcity problems in MENA, especially if Dii tapped already stressed aquifers for the construction and operation of CSP plants. Desertec argues that CSP plants in MENA can offset their water consumption through using the waste heat for seawater desalination; however, there is no documentation or assurance from Dii that CSP plants will sustain themselves through seawater desalination rather than withdrawals from aquifers or other bodies of freshwater.

The financial aspects of Desertec face substantial criticism. CSP plants require large upfront capital investment – 80 percent of costs over the entire lifecycle of a CSP plant are from construction and associated debt (Greenpeace, 2009). HVDC transmission lines will drastically increase the cost of Desertec. All three nations that are part of Desertec’s reference phase are developing HVDC projects with Algeria launching two HVDC lines, one connecting to Spain and another to Sardinia, while Tunisia is developing their 5GW ELMED line that will connect to Italy. The HVDC grid infrastructure required for the 100GW EUMENA connections that Desertec plans include over twenty lines with a cost of up to €45 billion (Desertec Foundation, 2012). The Desertec Foundation claims the 100GW capacity is necessary to bridge the price gap between CSP electricity (currently 0.14-0.18€/kWh) and electricity from conventional sources such as coal and oil (currently

[§] The Desertec Foundation acknowledges this point and claims that in the scenarios put forward by the DLR, 65 percent of Europe’s energy will come from domestic sources of renewable energy by the year 2050, and 17 percent will be imported solar energy.

0.06€/kWh) in Europe (Desertec Foundation, 2009). Perhaps even more compelling than bringing CSP to grid parity is responding to the EU's concern over energy security – Dii's vast HVDC grid aims to minimize the vulnerabilities of centralized energy production significantly. While increasing the number of HVDC connections between the EU and MENA is a logical way of lowering the risks of supply disruption, running that many cables across long distances beneath the Mediterranean is a costly endeavour. The Desertec Foundation predicts the costs of power loss** and capital and operating expenses for the HVDC lines, will account for around 0.01-0.02€/kWh, depending on the length of the lines, in addition to the cost of production.

Based on DLR's TRANS-CSP (2006) study, Dii predicts that solar power from MENA will break-even in the European market between 2020 and 2030 because of cost reductions for technological improvements and large-scale manufacturing, and rising costs of fuel and environmental considerations. However, since decentralized renewable energy projects – such as those Eurosolar points to in Germany – are already near grid parity, Desertec must rely on a combination of feed-in tariffs, tighter regulations on carbon emissions, drastic cuts to fossil fuel subsidies, and other incentives for renewable energy if it is to prove competitive in the EU. Furthermore, critics argue that HVDC development creates an imperative for electricity imports to the EU and overlooks MENA's own energy needs. There is a stark contrast between the EU's HVDC network, which Dii argues, “should be pragmatic”, and MENA's HVDC projects, deemed a different matter since they are “essential to ensure energy security” (Dii, 2012). Desertec's HVDC network in the EU has received little attention – and rightfully so, there is little to speak of – since there are only plans to setup two or three lines to connect Spain and Italy to Northern Europe. Conversely, MENA already has five underwater HVDC lines under construction as part of MedGrid linking Morocco, Tunisia, and Algeria to the EU (Germanwatch, 2011). While construction of the first CSP plant in Ouarzazate just started in January 2012, the scramble for HVDC development shows a clear impetus to start exporting electricity to the EU as soon as possible.

9. OBSTACLES TO SUSTAINABLE DEVELOPMENT IN MENA

Coordinating over 40 countries across three socially, politically, and economically distinct regions to develop the largest renewable energy project in the world has no shortage of challenges. In particular, Desertec has several obstacles to overcome in developing an extensive network of renewable energy in a way that promotes sustainable development in MENA. If we understand sustainable development as a pattern of growth in which resource use meets human needs while preserving the environment for generations to come it is important to make a distinction between those needs in MENA and the EU. The EU's obstacles to sustainable development are predominantly a matter of finding ways of decoupling growth from environmental impacts with considerations to future generations; MENA's are a matter of meeting the needs of present generations. Another important difference is that of growth, the EU is in a position to question whether continued growth is beneficial or even necessary; conversely, growth in MENA is essential until the region can provide a basic standard of living to all its residents.

** HVDC cables typically suffer energy losses of about 4-5 percent per 1000km of line (Desertec Foundation, 2012).

Against the background of growing energy needs due to population and economic growth, shrinking fossil fuel reserves, and already existing electricity and fuel shortages, MENA has made a strong commitment – although with varying motives – to support renewable energy sources within their national policies (Erdle, 2010). The combined impact of MENA's carboniferous energy dependence with a growing demand for electricity has increasingly hampered human development and left the region highly vulnerable to exogenous price shocks (Germanwatch, 2011). Therefore, it is important to ask what instruments Desertec can provide MENA with to respond to such issues. While it is clear that Desertec will generate vast quantities of electricity from MENA's sunshine, it is not clear what benefits this will provide to rural populations in MENA without access to electricity. Desertec's emphasis on a favourable commercial environment and the technocratic perspective on the physical and financial dimensions of the project have made up the dominant discourse to date. If this trend continues, Europe stands to repeat its colonial past, pillaging MENA's resources without creating any local benefits. Germanwatch said,

Without addressing the concept's human development dimensions, it [Desertec] is likely to offer – next to climate benefits – only a few trickle-down effects and instead bears a high risk to generate numerous adverse impacts particularly on the most vulnerable groups of society (Germanwatch, 2011).

Due to its nature, Desertec could influence a variety of social and environmental assets simultaneously – for example, it is difficult to determine the benefits of CSP energy generation without also considering the effects it has on regional water availability and the influence on local livelihoods. In their report on Desertec and Human Development, Germanwatch emphasizes the need for a holistic approach that makes considerations beyond the realm of economic incentives and energy security:

It is urgent that Desertec not only act as an energy project, but as a valuable alternative to the shrinking endowments of natural assets in order to promote sustainable development and political stability through capacity building, new infrastructure, and foreign investments (Germanwatch, 2011).

One of the immediate obstacles for sustainable development in MENA is addressing water scarcity. CSP plants using wet cooling technology require a significant amount of fresh water to function. If CSP plants deplete water resources, the increasing competition over water and direct implications on food security may outweigh the positive effects of electricity generation (Germanwatch, 2011). However, this obstacle also presents an opportunity if Desertec can combine desalination facilities with CSP plants. To address environmental challenges Desertec must respond to the specific local conditions of each region as Frijns, Phuong, and Mol (2000) concluded in their case study of Vietnam.

Along with water, land is a key resource, especially in rural areas, where the livelihood of people depends on who owns land and how it is used. Land and water are inseparable issues, particularly in arid regions where access and distribution of land and water is rooted in traditions,

Islamic law, and the social status of different groups (Germanwatch, 2011). Although the land area of MENA is vast, the amount of arable, productive land is limited and shrinking because of saltwater intrusion, desertification, and unsustainable agricultural practices. CSP plants require large areas of land for their solar collectors and mirrors and thus may interfere with other land requirements or traditional local laws concerning access to land. For example, several proposed project sites, such as the one in Ouarzazate, Morocco, are close to densely populated human settlements because of their proximity to water supplies for cooling or connections to the electrical grid (Germanwatch, 2011).

The required land for CSP plants and additional infrastructure such as roads, water pipes, and power lines conflicts with other land usage such as housing, farming, or industrial development. Resettlement of local populations is a possible solution; however, such actions frequently have negative impacts on the affected population and in some cases are even causes for violent conflict. For example, the Moroccan government forced resettlements of local population in Ouarzazate during the 1970s in the course of the construction of the Mansour Eddahbi dam. The project displaced approximately 8,000 people and cost Ouarzazate 1,000 hectares of arable land. The government's resettlement policy did not reflect the needs of the relocated local population and consequently those affected did not receive the policy well – compensation measures were inequitable and caused social unrest (Germanwatch, 2011). With bitter memories of resettlement in Ouarzazate, Desertec must carefully consider the consequences of its reference project on local populations and their water and land rights.

Another key obstacle for sustainable development in Desertec is generating a balanced response to the differentiated needs of the EU and MENA. Embracing the perspectives and needs of disadvantaged MENA citizens – who are at present, largely unrepresented in the project – is necessary to move past Desertec's dominant Eurocentric vision for sustainable development. A large part of meeting these needs is ensuring that Africa, for once, will be the beneficiary of its own natural resources (Laylin, 2011). This means addressing the concerns of individuals such as Algeria's Chakib Khelil who questioned matters of ownership and Desertec's coordination with foreign firms. A member of the EU Commission, Andris Pielbags, commented on matters of Desertec ownership in a 2009 debate on EU energy security noting,

We need to work with partners because it is very clear that we cannot just say we will take your territory, we will put solar panels in and transport electricity to the European Union...It is clear that for Desertec to be successful we need common ownership of these projects, otherwise there will be no successful outcome (European Parliament, 2009).

Balancing the needs of the EU and MENA extends beyond problems of sustainable development and reveals the conflicts amongst economic, environmental, and social development objectives – something I will discuss in further detail in the following section.

10. TENSIONS BETWEEN DEVELOPMENT OBJECTIVES

The majority of tensions between development objectives stem from regional differences in understanding amongst the EU and MENA. Just as sustainable development has different connotations in the EU than it does in MENA, the interpretation of economic, environmental, and social objectives varies. In contrasting the economic, environmental, and social dimensions of development objectives in Desertec, it is possible to make three comparisons. This involves evaluating the relationship between economic and environmental objectives, social and economic objectives, and environmental and social objectives. Seeing that reconciling the economic and environmental aspects of development is at the core of EM, I will save this discussion for the conclusion as to include a wider analysis of the implications, opportunities, and challenges of extending the program to developing countries. In this section, I will focus on the relationship between the social and economic and the environmental and social objectives.

10.1 SOCIAL & ECONOMIC OBJECTIVES

Reconciling social and economic development in Desertec is a difficult circle to square. Private European interests dominate Desertec's economic dimension, evident in Dii's shareholder portfolio – of which 18 of the 21 firms are European. Likewise, in their literature, the Desertec Foundation and Dii have been far clearer about the economic benefits and risks of the project in the EU than in MENA. The Desertec Foundation speaks of employment benefits largely in terms of German jobs and emphasizes the goal of supplying the EU with 15 percent of their electricity needs by 2050; however, statistics related to MENA's energy needs are generally ambiguous. The clearest estimate pegs Desertec to account for two-thirds of MENA's rising electricity budget by 2050 (Desertec Foundation, 2012), other sources merely state the project will provide “a substantial part of MENA's energy needs” (Dii, 2012). Dii argues that the ambiguity regarding energy supply to MENA is because each country will have the ability to decide for themselves how much of their energy to keep for domestic use and how much to sell. Likewise, the Desertec Foundation writes,

It is left to the sovereignty of the producing countries as to whether they use the clean energy to meet their own demands first and finance this energy supply through the profits that they earn from selling or dispensing with the fuels that are thus saved, or sell the energy profitably to Europe and wait until the relevant technology becomes cheaper. In the light of the enormous potential that solar energy entails, these countries could take advantage of both possibilities at the same time (Desertec Foundation, 2012).

The Desertec Foundation's point that producing countries will have the freedom to choose between using electricity to satisfy local demands or export to the EU conflicts with the Project Agenda set out in their Red Paper, which implies some obligation on MENA to export a certain amount of their energy to Europe. The Desertec Foundation emphasizes the need for “long-term binding purchasing agreements” that will stipulate “appropriate conditions and minimum quantities” with regard to the import of clean power from MENA (Desertec Foundation, 2012).

Even more troubling is the EU's pursuit of liberalization, which has done anything but reassure the governments of MENA that they will retain control of energy development in their countries. Economic liberalization policies in the ENP are a threat to MENA's social development – the history of neoliberal economics and its effects on the poor in developing countries is not a promising one. There is not so much a tension between economic and social development objectives as there is an outright dominance of the economic over the social dimension in Desertec. The risk of having such dominant and Eurocentric economic interests is that addressing MENA's social and economic needs may turn into little more than a symbolic gesture to keep the bulk of power flowing freely to the EU. Beyond their self-serving interest to maintain political stability in MENA, the EU has made little effort to address social development objectives in the region. There has been an inconsistency between the European dialogue and their actions in the Desertec project. For instance, the EU Commissioner for Energy, Günther Oettinger recognized the importance of a partnership that acknowledged MENA's development needs in his 2010 speech at the first annual Dii conference in Barcelona,

The socio-economic development of our partners and the interest and support to them so that they develop means to face their own energy challenges in the South is a shared objective. It will require increased amounts of energy over the coming decades. Therefore, an initiative like Desertec will succeed if it convincingly meets two conditions. First, it benefits our Southern Partners in order to meet their own security of supply – this means that part of the electricity needs to be dedicated to the local markets at an affordable price; second, the right choices in terms of industrial investment, technology transfer and employment (Oettinger, 2010).

Yet Dii and the Desertec Foundation have delayed taking any significant actions to acknowledge the imperative Oettinger brought up at the conference. The annual Dii conferences invite hundreds of participants from across EUMENA to exchange ideas with international partners from the business, political, and academic arena. While the audience and presenters comprise numerous high-profile stakeholders such as the governments of Morocco, Tunisia, Libya, and Egypt; business leaders from the energy manufacturing, transmission, marketing, construction, and investment industries; and organizations such as the European Parliament, World Bank, EIB, UfM, MedGrid, and the Arab league, there is one notable exception. Representatives from labour and civil society have been absent from the conferences – it is not clear whether their exclusion is intentional. However, it is evident that Desertec's economic emphasis has marginalized the social development discourse.

The Desertec University Network is the only evident attempt to address social development in MENA. The initiative aims to bridge the skills gap and provide means for participation, employment, and prospects to young people in MENA. However, the initiative suffers from its narrow scope and inaccessibility to the impoverished and rural communities that could use it the most. The Desertec University Network is of no use to people that cannot access (for financial, geographic, or social reasons) the 20 participating public and private institutions involved – all of

which are in major metropolitan hubs. Moreover, the network does little to benefit the rural and poor communities. Desertec construction and development is most likely to affect. Thus far, Desertec has failed to show that low-income electricity distribution will be a priority, that there will be real capacity building and skill development in the areas host to CSP projects, and that the rural and poor communities will genuinely benefit from the project. Moreover, it is unclear how much influence the MENA countries will have over CSP projects and where the profits of such projects will go.

10.2 ENVIRONMENTAL & SOCIAL OBJECTIVES

Tensions between environmental and social objectives are less apparent. CSP construction and development could exacerbate issues of water scarcity, but because of dry cooling technology and the potential for facilities with joint saltwater desalination plants, it is feasible to preserve water resources and even reduce water stress. However, because of uncertainties over local ownership and control over plants, there is a chance that private firms could offset the costs of desalination onto consumers. This could put a premium on water if desalination plants overtake local wells and interfere with groundwater extraction. This would breed dependence on desalination facilities and cause a spike in water prices – akin to Bolivia’s water wars. Between January 1999 and April 2000, a series of protests broke out in Cochabamba, Bolivia in response to multinational participation in the infrastructure and water management of the city’s municipal water supply. After pressure from the World Bank, the Bolivian government put SEMAPA – the state agency in control of Cochabamba’s water works – up for auction for privatization and was purchased by Aguas del Tunari^{††} a business consortium led by firms from the UK, Italy and United States. Upon taking control, the consortium raised water rates an average of 35 percent to about US\$20/month. While this seemed minuscule in the developed nations that the Aguas del Tunari staff had come from, many of their new clients only earned about US\$100 a month and US\$20 was more than they spent on food.

Similarly, construction and development of CSP plants could interfere with land access and property rights. The state owns most of the land needed for renewable energy projects in MENA. Government land ownership poses a regulatory challenge in MENA since Land Use Agreements (LUAs) are either imprecise or nonexistent. As a result, local authorities use LUAs for tendering renewable energy projects, typically handing land over for free and exempting the contractor from customs duties on project-related imports (Erdle, 2010). The beneficiary (likely private contractors in Desertec’s case) then retains the exclusive and unrestricted right to use and exploit the land (Aboulnaga, 2009). Egypt, with support from the EU through MEDRING, recently finalized a draft model for LUAs to pave the way for private sector wind energy projects (Aboulnaga, 2009). However, new LUAs may conflict with existing land distribution mechanisms with cultural and religious roots. If MENA’s governments and Desertec developers negotiate land transfers without including local and indigenous peoples, their decisions could cause massive disruptions in local communities.

^{††} Incidentally, Spain’s engineering and construction firm Abengoa (a Desertec shareholder) was involved in the privatization of Bolivia’s state water agency SEMAPA, leading to the Cochabamba Water Protests in 2000.

11. CONCLUSIONS

Our world can only be developed by creating lasting values, but neither by cultivating luxury nor by saving costs.

-Dr. Franz Trieb of the DLR

For the moment, it seems Desertec can deliver on the promises of EM. The economic rationality, while dominant, does not conflict, and in fact supports the ecological aims of EUMENA. The issue of water depletion linked to wet cooling CSP plants in Desertec creates a potential challenge but not a fundamental conflict with EM. Dii could conceivably use dry cooling on all their CSP plants; however, since there are concerns over already high project costs the Desertec Foundation notes that their approach to water conservation will vary across sites. They point out that based on the region, evaporative cooling towers and seawater cooling could provide other more efficient alternatives to dry cooling. Moreover, since CSP desalination plants can produce up to several 100,000 m³ of freshwater daily (AQUA-CSP, 2007), Dii could opt to centralize production across a few sites and then redistribute water – while this provides an attractive means for combining the economic and ecological rationality of EM, it could cause social issues as mentioned in Section 10.2. The DLR argues that desalination powered by CSP is the only viable approach to MENA's water scarcity challenges, they write:

Measures to increase efficiency of water use and distribution are vital for the region, but insufficient to cover the growing demand in a sustainable way. The situation in MENA after 2020 will become unbearable, if adequate counter measures are not initiated in good time. The use of new, unconventional sources of freshwater will be imperative, and seawater desalination powered by concentrated solar energy is the only already visible option that can seriously cope with the magnitude of that challenge (AQUA-CSP, 2007).

Mending MENA's water woes and cutting carbon emissions, all the while doing so profitably, is within Desertec's grasp. There are immense opportunities for green growth in MENA, of which solar energy is the backbone. Private firms acting in their own self-interest can create ecological benefits when working within a framework where it makes economic sense to do so – future developments in EUMENA's renewable energy policy will serve as important indicators of Desertec's progress on creating a socially and economically equitable framework for all three regions. With Dii helping to pool together business interests in conjunction with strong European climate goals and flexible mechanisms to reach them, MENA's energy potential is irresistibly appealing. The way in which central actors influence the progress of Desertec will determine whether renewable energy development in MENA furthers or impedes economic, environmental, and social development objectives. While there are challenges to overcome with land use and water scarcity, these are largely matters of governance and policy implementation rather than logistic or technical challenges to the project. The necessary technology to address MENA's environmental challenges is available; however, whether Desertec will implement these measures hinges on a confluence of economic, political, and social factors that are markedly less clear.

Despite Desertec's strengths and potential, its success as a model for EM in developing countries is not absolute. Desertec still faces challenges three major challenges: coordinating public-private relations, establishing a regulatory framework for renewable energy in EUMENA, and finding equitable ways to meet social development objectives. Establishing transparent public-private relations and addressing social development objectives share a close relationship – both require answers about who will have project ownership, where the profits will go, and how benefits will translate to the most-affected communities? Whether the Desertec Foundation and Dii have been intentionally ambiguous in answering – or ignoring – these questions or if it is simply too early to answer them is a matter of further study. Establishing a regulatory framework for renewable energy in EUMENA is a matter of creating subsidies and feed-in tariffs to allow solar energy to compete in the European market and to incentivize and support production in MENA respectively. The dialogue between Desertec critics and supporters reveals conflicting opinions on the viability of solar imports to the EU. It is unquestionable that an eager market for renewable energy exists. In the present, it seems that this market will emphasize exports to the EU over local consumption in MENA. This may change with time as decentralized energy makes headway in the EU and MENA's economy expands and their energy demands increase relative to the EU's.

Extending EM to developing countries is a feasible way of bridging economic and environmental objectives. However, to say EM is a precursor to sustainable development as a way of meeting the needs of marginalized people is uncertain. Facilitating regional cooperation presents a key obstacle to extending EM to developing countries. If Desertec is any indicator of EM's prospects in the developing world, the project makes evident that cooperation amongst donors and recipients of technology is only a part of the necessary formula for success. Perhaps more important is coordination across all levels of governance – Desertec may be a victim of its own narrow focus on regional over local development implications. For instance, while MENA as a whole may benefit from the energy exports and the associated benefits of renewable energy from CSP plants, the rural and poor communities may suffer if developers ignore them in favour of larger markets. Opting to contract skilled workers, technicians, and planners from abroad, siphon electricity to large cities while leaving small communities off the grid, and interfering with local water and land use rights without compensation could all cause major disruptions in MENA. Accounting for the social dimensions of development and human rights is essential to the evolution of EM. If EM can show us how to get rich while saving the world, we must not forget that wealth alone, without compassion, equity, and justice will never lead to true prosperity.

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