# MIRACLE OR MIRAGE? CRITICAL CONTRIBUTIONS TO THE THEORY OF ECOLOGICAL MODERNIZATION IN LIGHT OF THE DESERTEC PROJECT[1]

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## Introduction

The notion of ecological modernization (EM) solidified as a paradigm of environmental sociology by analyzing processes through which modern societies are transformed according to the assumptions of environmental rationality, which is understood in light of interconnected procedures to minimize negative human impacts on ecosystems such as waste accumulation, improper management of toxic substances, and unsustainable use of natural resources. After noting that problems related to ecological degradation provoked during the mid-1970s a series of institutional restructurings in industrialized nations which promoted environmental policies, a network of scientists dedicated to mapping and describing these mechanisms to restructure productive processes based on ecological criteria was gradually established (MOL, 1995).

The point of convergence among the main proponents of EM (Joseph Huber, Martin Jänicke, Arthur Mol, and Gert Spaargaren) was an affirmation of gradual emancipation of the ecological sphere with regard to other areas of social life. Beyond this, they sought to identify how environmental rationality could reconnect the state, the market, and technological innovations — which had been indicated by ecological movements and the generation of environmental sociologists during the 1960s and 1970s as vectors of natural degradation (HANNIGAN, 1995) — in such a way that could rebalance the impact of industrial societies on ecosystems without abandoning modernity (SPAARGAREN & MOL, 1992).

1. The authors wish to thank Franz Trieb and Olaf Goebel for granting interviews, as well as the São Paulo State Research Foundation (FAPESP) and the Brazilian National Council for Scientific and Technological Development (CNPq).

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These authors believed that the validity of EM was to be analyzed from two different points of view. Initially, it is a theoretical and conceptual framework for describing and analyzing how societies respond to the current environmental crisis. At the same time, EM features a normative dimension which can be translated into environmental reforms and discards any utopian alternatives for crisis management that are not supported by the products of modernity themselves, particularly industrial and technoscientific knowhow (SPAARGAREN, 2000). These two dimensions of EM merged to formulate a research agenda which resulted in an abundant volume of case studies. Its proponents claim that this research attests to the effectiveness of modernizing interventions, and also theoretically expresses the emancipation of environmental rationality (MOL & SONNENFELD, 2013; PRESAS & MOL, 2004).

Against this backdrop, this article establishes a critical dialog with EM based on a study of the Desertec project for the Mediterranean region. Briefly, Desertec was a proposal for energy cooperation between the countries of Europe, the Middle East, and North Africa (EUMENA) to mitigate climate change through investments in large-scale construction of solar thermal power plants in the Sahara Desert and other arid regions of the southern Mediterranean countries (DESERTEC FOUNDATION, 2009). Implementation of the plan would allow the MENA countries to diversify their energy sources and respond sustainably to the growing demand for electricity that resulted from economic and population growth in the region.

From an environmental point of view, the project would connect the fight against global warming with a response to 'water stress' in nearly all the Maghreb and Mashriq countries, since it could power seawater desalination plants without fossil fuels (SOUZA & FERREIRA, 2016). From an economic point of view, the initiative offered commercial advantages, since part of the electricity could be exported to Europe through high voltage direct current (HVDC) cables, which transmit power over long distances with an acceptable loss rate of approximately 3% for every thousand kilometers (HESS, 2013).

Europe's interest in the Desertec project was related to the strategic role of solar thermal energy in balancing the electric sector, if the European Union (EU) maintains its commitment to reduce its $CO_2$ emissions 80 to 95% by 2050 (EUROPEAN COMMISSION, 2012). Unlike wind and photovoltaic power, concentrating solar power (CSP) systems store heat in order to generate electricity even at night or on cloudy days. This means that solar thermal plants can produce dispatchable energy, which would compensate for oscillations in renewable sources known to be intermittent and still lacking mechanisms for viable electricity storage (TRIEB *et al.*, 2016).

To work efficiently, CSP technologies require direct solar radiation rates exceeding 1800 Kwh/m$^2$/year, and few European countries have the climate for this type of electricity generation because of their latitude. This explains why European production of solar thermal energy is insignificant aside from in Spain, which has approximately 2.5 GW of installed capacity (CSP WORLD, 2017). However, geographical proximity to the MENA countries would allow Europe to add solar thermal power as an important component in ensuring its energy security; according to modeling studies by the German Aerospace

Center, just 0.2% of the suitable land in the Sahara would be sufficient to meet 15% of European demand in 2050 (DLR, 2005).

The Desertec Foundation, comprised of scientists and members of the Club of Rome, joined a consortium of energy companies (which have the technology needed to generate and store solar thermal energy), financial institutions and insurers to drive this project, which was known as the Desertec Industrial Initiative (DII).[5] Investments of approximately 666.5 billion euros would be required to ensure the construction of the power plants and transmission lines necessary for annual sales of 703 TWh (2010 values). In return, the $CO_2$ emissions resulting from solar thermal power plants would be reduced to 16 g/kWh (compared to 900 g/kWh for coal-fired thermoelectric plants and 450 g/kWh for those powered by natural gas), along with the other advantages mentioned above in terms of balancing the grid (TRIEB *et al.*, 2012).

The idea of strengthening energy cooperation based on the use of renewable energy sources gained momentum when the Union for the Mediterranean (UfM), an organization established to enforce the Barcelona Process, launched the Mediterranean Solar Plan (MSP). The MSP was one of six major initiatives for cooperation between the EU and the Maghreb and Mashriq countries; the objectives were to increase installed capacity of renewable energy sources by 20 GW, and promote significant gains in energy conservation and efficiency. The general guidelines of the program included large-scale construction of solar thermal plants and investments to improve electrical connections between countries to the north and south of the Mediterranean (ENPI, 2010).

This article critically examines some central assumptions of EM based on the results of the MSP which have been implemented so far, as well as prospects for the achievement of its goals. Unlike typical EM case studies, the MSP analysis consists of what we can call 'failure case', in other words, environmentally rational projects that did not attain its goals because of certain obstacles and constellations of interests, and consequently did not yield the expected ecological benefits. Despite initial enthusiasm stemming from discussions of the project in the international press, the broad consensus is that the concrete results fall considerably short of the announced goals. The Desertec Consortium itself abandoned the strategy to supply Europe with electricity generated in the MENA countries, which was a major setback for energy cooperation based on CSP technologies (CALDERBANK, 2013).

However, describing the MSP as a failure case does not mean that this process yielded nothing positive. On the contrary, over the past few years a modest increase has been registered in the installed capacity of solar thermal plants in some MENA countries. These advances are duly considered in our analysis, and even appear as an important step toward understanding the epistemological limits of EM. The following section consequently focuses on construction of the solar thermal power plant complex in Ouarzazate, Morocco, and its analytical structure resembles the Model employed in classical studies on ecological modernization (MOL, 1995).

5. This group includes Deutsche Bank, Munich RE, ABB, HSH Nordbank, Schott Solar, Abengoa Solar, UniCredit, Terna Energy, Acwa Power, and M+W Group.

In the third section, however, we demonstrate that the precepts of EM cannot withstand more detailed analysis in terms of theoretical validity. As soon we expand our view from the restricted context of Ouarzazate to a larger-scale examination of policies to stimulate solar thermal energy in the Mediterranean region, the economic rationality of the market (which EM considers to drive environmental rationality) actually becomes an obstacle. This allows us to gather elements, in our final considerations, to better understand the paradox contained in the contradiction between multiplication of ecological modernization processes and progressive deterioration of ecological indicators in recent decades (YORK *et al*., 2010). Finally, we support the argument that EM does not have the scope required to assert itself as a theory, and that the responses presented by supporters of this school of thought reveal the essentially teleological nature of this perspective.

We utilized the following empirical data as sources: a) scientific articles discussing aspects of investments in CSP technologies in the MENA countries and trans-Mediterranean energy cooperation; b) institutional literature introducing the MSP and discussing its implementation (EU, UM, BM, MASEN, etc.); c) articles in the international press about the Desertec Project and the MSP; d) semi-structured interviews with Franz Trieb (a scientist at the German Aerospace Center and coordinator of the MED-CSP, ACQUA-CSP, and TRANS-CSP modeling projects, which have become touchstones in the debate on trans-Mediterranean cooperation in solar thermal energy) and Olaf Goebel, professor at the Hochschule Hamm-Lippstadt and deployment coordinator for the Shams1 CSP plant in the Persian Gulf.

## The Ouarzazate solar thermal complex and paradoxical internalization of environmental criteria into Morocco's energy policy

The initial formulations of EM date back to a time when discussions about '*the limits of growth*' and theories of counterproductivity (André Gorz, Ivan Illich, Barry Commoner, etc.) predominated in the environmental sociology and ecologist movements. It was generally held that after a certain stage of development, the environmental costs of modernization would surpass the material advantages resulting from economic growth. This observation was followed by critiques of the industrial paradigm and its technical and scientific vectors, as well as discourse encouraging the restructuring of social life based on eco-communities and small-scale societies (LENZI, 2005).

According to the precursors of EM, these theories of counter productivity represented 'romantic and "holistic' visions expressed in proposals that were utopian and consequently incapable of providing effective alternatives to face the environmental crisis. Proponents believed that this approach should be abandoned in favor of reforms, in which the advances of environmental rationality would depend on a process of 'hyperindustrialization' in which technological innovations would act as tools for adapting modern societies according to ecological parameters (SPAARGAREN, 2000).

At the same time, EM distanced itself from criticism by neo-Marxist sociologists, such as Allan Schnaiberg and James O'Connor, claiming that the capitalist mode of production would be able to internalize the environmental variable and even catalyze

the processes of ecological modernization, provided that the market was provided the stimuli necessary to make environmental preservation economically advantageous. In the famous words of Huber (1982), this meant 'ecologizing the economy' as well as 'economizing ecology.'

Initially, the precepts of EM regarding synergy between environmental rationality and the imperatives of the market are important to our study, to the extent that trans--Mediterranean cooperation for solar thermal energy emerged not only as an intervention to reduce greenhouse gas emissions, but also to stimulate economic growth in the MENA countries. This is because the MSP not only would generate revenues from exporting electricity to European centers, it would also contribute to regional development of the renewable technology industry. According to estimates by Ragwitz (2011), southern Mediterranean countries could reach a 60% share of the CSP value chain if 5 GW of solar thermal capacity were installed in the Sahara Desert, generating between 64,000 and 79,000 permanent jobs in the region.

Furthermore, various studies have investigated strategies to reduce the cost of generating solar thermal power to make this modality competitive with other sources, since initial expenses involved in constructing solar farms require major investment and interpose obstacles to expanding CSP technologies in the MENA countries as well as in other regions with suitable climate (SOUZA & CAVALCANTE, 2017).

The progressive elimination of fossil fuel subsidies appears as the common denominator in these studies, since these stimuli created distortions favoring conventional energies and primarily benefited local elites. But in more specific terms, Trieb (2011) argues that challenges to the commercial viability of solar thermal energy would diminish considerably if initial production targeted supplying the grid at peak times. This is because heat storage devices allow CSP plants to operate at base, intermediate, or peak load capacity; since rates vary according to each of these modalities, the initial investment would cause a smaller budget impact if generation was primarily directed toward peak times with more expensive rates.

It is already well established in the scientific literature that increased investment in renewable technologies causes a gradual reduction in generation costs. Because of incentive policies in different countries over the past two decades, producers of photovoltaic and wind power components have benefited from economies of scale, and the kWh price for environmentally sustainable energy has dropped considerably. Even though this process is still in its initial stages for CSP technologies, forecasts indicate that prices will also drop in this field, allowing solar thermal plants to expand and gain a larger share of the electricity market. To accelerate this process, studies inevitably suggest public policies in which governments and energy agencies establish feed-in tariffs (FIT) or power purchase agreements (PPA) to facilitate investments (IRENA, 2017).

Morocco is the southern Mediterranean country which has demonstrated the most consistency in implementing CSP technologies. In November 2009, its government announced an ambitious plan to reach 2,000 MW of solar energy by 2020; the next step was the approval of a law creating the Moroccan Agency for Solar Energy (MASEN) to promote construction of CSP plants and invest in widespread use of photovoltaic panels

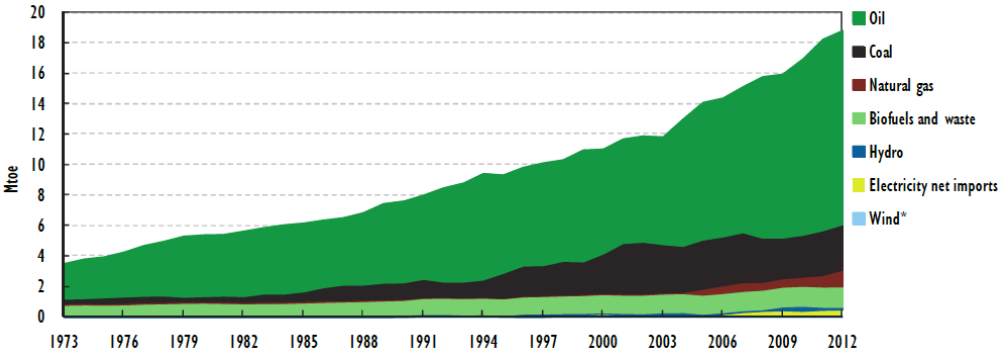
(FRITZSCHE *et al.*, 2011). MASEN followed this undertaking with plans for the world's largest solar thermal complex in the city of Ouarzazate, with final installed capacity of 510 MW.

The Ouarzazate complex was built in three stages; the first was concluded in 2016 with the inauguration of NOOR I, with 160 MW of parabolic troughs and a three-hour storage capacity. The NOOR II plant came online in late 2017, adding 200 MW of parabolic troughs and storage for seven hours, and the project concluded in 2018 with the NOOR III plant, based on a solar tower with 150 MW capacity and eight-hour storage (SCHINKE & KLAWITTER, 2016).[6]

A consortium formed by the Saudi company ACWA Power and Acciona, a Spanish company, won the auction for NOOR I with a bid of US$ 795 million. The total costs of the project were divided between MASEN and private initiative, and financed by international institutions such as the World Bank, the African Development Bank (AfDB) and Kreditanstalt für Wiederaufbau (KfW). From an environmental point of view, the plant will avoid emissions of 1,000 tons of NOx, 4,000 tons of SOx, and 240,000 tons of CO2e (CARAFA, 2015; WORLD BANK, 2015).

Viewed through the lens of EM, the Ouarzazate solar thermal complex could be interpreted as an indicator affirming environmental rationality, expressed in this case by incorporating sustainability criteria into electricity generation. However, when we zoom out to view Ouarzazate amid the overall backdrop of changes in the Moroccan energy sector in Morocco, this incorporation of sustainability becomes paradoxical. Since 1995, the Moroccan government has carried out an expansion program that brought electricity to rural areas and boosted access rates to 98% of the population. However, no less than 91% of the electricity used in the country comes from fossil fuels, and $CO_2$ emissions increased 56.4% between 2002 and 2014 to reach a total of 51.8 Mt (IEA, 2014).

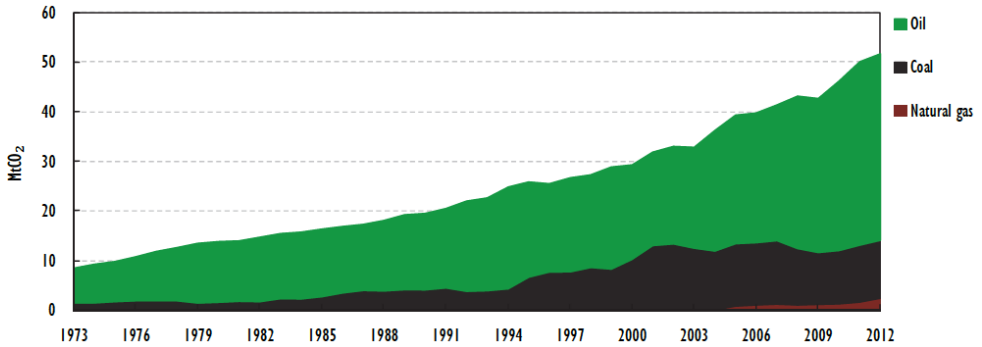
**Figure 1 - Total Primary Energy Supply (TPES), 1973–2012.**




Source: IEA, 2013.

6. For an explanation of the different CSP technologies, see IEA/IRENA (2013).

**Figure 2 - $CO_2$ Emissions by Fuel Type, 1973–2012.**




Source: IEA, 2013.

In other words, the Moroccan government was building solar power plants and wind parks while simultaneously promoting increased consumption of fossil fuels. Moreover, this strategy of presenting investments in clean technologies and a larger relative share of renewable energy as a sign that the environmental variable was being incorporated into energy planning (even when the impact on ecosystems increased in absolute terms) is not limited to Morocco (VIEIRA, 2017). As Luiz Marques has noted, 'despite advances, renewable energies are not replacing fossil fuels. They are only contributing to satisfy the insatiable energy greed of global capitalism' (2016: 18).

It therefore becomes evident that EM cannot clarify the environmental dynamic beyond a very partial and reduced scale. Initially, it lacks a broader framework which recognizes ecosystems as dynamic totalities. This means that within a reality where the economy must grow incessantly to avoid crisis, there is no way to minimize the problem of ecological resilience or formulate an action program to tackle environmental degradation based on relative proportions and calculations about the amount of waste or resource use per unit of GDP without taking into account the cumulative impacts of this growth.

Secondly, it is not reasonable for proponents of EM to make a series of theoretical inferences which restrict their studies to those cases that successfully achieved ecological improvements. For example, considering the scope of this article, this would be equivalent to confusing single cases with the whole process and discussing the prospects of CSP technology in the MENA countries using only Ouarzazate as a reference. In the next section, we will try to understand why the results of the MSP have been negligible so far, and why the 'Desertec concept' is no longer prominent in the public debate on energy and environmental cooperation in the Mediterranean region.

## Obstacles to the Desertec project resulting from corporate interests: a case study of unsuccessful ecological modernization

As explained earlier, EM is defined by its theoretical framework as well as by the affirmation it is a concrete program for environmental reforms within a regulatory

framework. In this sense, the strategic importance we attach to the study of failure cases within research dedicated to ecological modernization must be understood as a scientific imperative, given that any theoretical system must be comprehensive and also respond to experiences that can call into question not only the universality of its assertions but also the general pattern of development inferred from the empirical evidence. The skewed character of research design in 'classical studies' on EM immediately comes to mind, since its proponents focused unilaterally on experiments in which ecological modernization was successful (YORK, 2010).

At the same time, analyzing 'failure cases' does not oppose environmental reform; quite to the contrary, this approach actually contributes to implementation, to the extent that it uncovers constellations of interests that act as obstacles to environmental policies based on devices and technologies that are already mature. We consequently deemed it relevant to investigate why the MENA countries have so far reached only about 20% of the initial target of 20 GW (even counting CSP plants in the planning/development phases) and uncover the reasons why trans-Mediterranean electricity sales such as those described in the Desertec project never left the drawing board (see Table 1).

**Table 1 - CSP plants operating or in the planning/developing phases in the MENA countries.**

| Country | Planned (MW) | Under development or construction (MW) | In operation (MW) |
|---|---|---|---|
| Saudi Arabia | n/a | 93 | n/a |
| Algeria | n/a | 7 | 25 |
| Egypt | 250 | 100 | 20 |
| United Arab Emirates | 700 | n/a | 100.1 |
| Iran | n/a | n/a | 17.25 |
| Jordan | 225 | n/a | n/a |
| Kuwait | n/a | 110 | n/a |
| Lebanon | 52.8 | n/a | n/a |
| Morocco | n/a | 355 | 180 |
| Oman | n/a | n/a | 200 |
| Tunisia | 55 | 2.000 | n/a |
| **Total** | **1282.8** | **2665** | **542.35** |

Source: The authors, based on worldwide CSP mapping data from www.cspworld.org and NREL (www.nrel.gov/csp/solarpaces/by_contry.cfm), 2017.

According to Martin Jänicke, 'an environmental problem proves politically less difficult to resolve if a marketable solution exists. In contrast, if a solution (…) requires an intervention in the established patterns of production, consumption, or transport, it is likely to meet resistance' (2008: 557). This reasoning is consistent with the argument

presented in the previous section, in which 1) CSP investments in the MENA countries represented a window of opportunity for component manufacturers and job generation; 2) the high costs at that time could be offset and would tend to decrease if electricity from solar thermal plants was initially used to supply the grid at peak times.

Among the twelve member companies funding the DII consortium, five traded shares on the Frankfurt stock exchange at volumes exceeding two billion euros. This means that the start-up capital for the MSP was already largely available, and could also be complemented with other means of financing (BARTSCH, 2010). Contrary to this logic, however, the German firms Siemens and Bosch announced in 2012 that they would be leaving the DII consortium in light of the risks involved in the project and as part of a strategic reorientation to boost their profitability. In the case of Siemens, this reorientation led the company to cease its activities in the solar energy sector, since in the opinion of the company's directors, the decline in solar panel prices made investments in CSP unattractive, while competing Chinese solar panel manufacturers simultaneously had a negative impact on the profitability of panel manufacture (GOEBEL, 2017).

This scenario worsened when the Spanish government stated that the economic crisis made it impossible to direct the funds it had pledged toward construction of transmission lines in the Strait of Gibraltar. From that time onward, the relationship between the Desertec Foundation and the DII consortium deteriorated to culminate in a rupture between the parties, with industry representatives decrying the 'utopian and unrealistic' character of the project. At the same time, the epistemic community publicly protested the corporate thinking of the consortium, which in their view took advantage of the positive image of the 'Desertec brand' but did not demonstrate the necessary commitment to environmental causes (HEGMANN, 2013).

In more specific terms, the Desertec Foundation decried statements by Paul Van Son (executive director of the DII consortium) that the implementation targets for solar thermal plants should be lowered drastically and that trans-Mediterranean sale of CSP electricity should be abandoned in favor of generating power exclusively for consumption by the MENA countries. The Desertec Foundation also criticized the dubious positions of those companies that adopted environmentalist rhetoric while they were members of the DII but maintained diversified investment portfolios which included projects that still contributed to worsening climate change. One example was the E.on company, which was working to build a mega-scale coal-fired thermoelectric power plant in Chile at the same time that the Desertec Foundation was attempting to convince the Chilean government to implement CSP technology in the Atacama Desert. For these reasons, the Foundation's representatives accused the consortium of misrepresenting the initiative and forcing them to behave 'as if we were Coca-Cola' (Thiemo Gropp *apud* SCHULTZ, 2013).

A methodological problem which is relevant to investigating failure cases is the difficulty in tracing actions undertaken by business lobbies to impede projects that are disadvantageous to their businesses. This is because in most cases, corporate intervention in the decision-making process is not expressed publicly, and even in the exceptional circumstances in which businesses communicate their guidelines to civil society, their arguments follow an instrumental and non-transparent logic. But because of the initial

positive repercussions of the 'Desertec concept' in the press and in scientific circles, conventional energy interests adopted a confrontational stance, publicly positioning themselves against the volume of investments and policy challenges involved in this project. In this way, they ran a systematic campaign to label the trans-Mediterranean sale of CSP electricity as unfeasibe (MORRISON, 2009).

Particularly significant for a critical discussion of the prognosis for 'greening the economy' according to the concept of EM, however, is the fact that efforts to hinder investments in CSP technologies are not limited to coal traders and nuclear power plants. Lobbyists for the renewable energy industry also attempted to systematically discount importing electricity from the MENA countries, using nationalist arguments about the advantages of value-added production within Europe and decentralized electricity generation using photovoltaic panels and wind turbines (WERENFEL & WESTPHAL, 2010).

In reality, this opposition expresses fierce competition for public subsidies, since according to environmental rationality, solar thermal energy does not compete with but instead complements other renewable sources. The transmittable electricity supplied by CSP plants balances the grid, offsetting oscillations in sources without storage capacity, especially considering that Europe's potential for hydroelectric and biomass production is limited and consequently insufficient to transition to an energy mix with little or no fossil or nuclear sources. 'But it is clear that photovoltaic and wind energy companies were absolutely opposed because they feared for their businesses' (TRIEB, 2016).

Finally, friction between market logic and 'environmental rationality' can also be seen in how financial institutions classify risks associated with CSP plant investments in the MENA countries. Private investors base their decisions on the relationship between risks and dividends; as investors see higher risk, higher interest rates are charged on loans. Schinko and Kommendantova (2016) not only demonstrated that financial agencies consider investments in fossil fuels less risky than construction of CSP power plants, but also determined that if the projects in North Africa had been able to obtain financing to build solar thermal parks at terms equivalent to loans granted to European countries, the price of electricity generated by these plants would then drop from US$ 0.236/kWh to US$ 0.145/kWh (a considerable reduction of 39%).

Based on qualitative studies of the actors involved in developing renewable energy projects in the southern Mediterranean, Schinko (2015) identified that the risks perceived by interviewees were for the most part related to 1) the threat of terrorist attacks on energy infrastructure, 2) political instability in the region, 3) inadequacies in the legal regulation of the energy sector, and 4) insufficient knowledge among these actors about the advantages associated with the use of renewable energy sources. The authors consequently argue that these elements affect guidelines from international funding agencies, raising the required rates of return for investments in trans-Mediterranean sale of solar thermal electricity.

However, as Souza *et al.* have demonstrated (2018), risk assessments created by funding agencies reflect distorted perceptions about energy governance in the MENA countries. Concerns about instability in the region ignore the fact that local conflicts have

not negatively impacted the hydrocarbon trade with Europe (LACHER & KUMETAT, 2011), and that at least in Northern Africa, there are only isolated records of terrorist attacks on energy infrastructure (LILLIESTAM, 2014).

In summary, a detailed study on the obstacles to Mediterranean cooperation in solar thermal power did not corroborate EM's assumptions about a progressive convergence between market logic and environmental rationality. Furthermore, the notion that financial institutions tend to develop mechanisms to help mitigate the causes of climate change is also not supported by evidence that risk calculations are based on unilateral and distorted perceptions which do not consider socioenvironmental risks in financing energy policies.

## Final considerations

Over the past three decades, the concept of EM has been at the center of some of the main controversies in environmental sociology, and has influenced a large number of researchers around the world. During this time, this train of thought has encountered criticism from a wide range of sources, which have led its proponents to reformulations that helped broaden the scope of their theoretical and methodological research. They recognized that a Eurocentric slant was present, since work by the 'first generation' of EM focused mostly on modernization processes in Central European countries. To address this criticism, they mapped and described similar processes in developing countries (particularly in the former Soviet Union region, China, and Southeast Asia), even though they concede that regions such as Latin America and sub-Saharan Africa still have not received due attention (MOL *et al.*, 2014).

At the same time, EM attempted to take on a more cosmopolitan tone with case studies addressing transnational flows of materials and energy. 'Hyperglobalization' and the emergence of global networks were then perceived as phenomena that render the conventional notion of spatially-limited environmental reform unusable. This is because both natural degradation processes as well as instruments and mechanisms which intervene in these processes have been progressively deterritorialized and integrated into a global circuit of material and informational flows that made it impossible to consider artificially limited views according to political fragmentation of space (SPAARGAREN *et al.*, 2006).

Particularly through the work of Gert Spaargaren (2011), EM sought to correct its 'productivist' orientation and include human agents within their relations with institutional developments in research. Spaargaren argues that clarifying the role of 'citizen--consumers' would integrate analysis of the cycles of production and circulation in such a way that would stop individual behavior from being focused instrumentally, as mere units at the end of the production chain that convert products into waste.[7]

Despite these changes, EM does not provide satisfactory explanations for why the proliferation of ecological modernization projects around the world has not prevented

7. This position was criticized by neo-Marxist environmental sociologists, who reaffirmed the primacy of production in creating consumer tastes and practices. They also relativized the scope of individual actions in the face of the restrictions imposed by infrastructure apparatuses and devices.

significant deterioration in environmental indicators during this same period. This is primarily the fault of the teleological way in which this train of thought interprets the relationship between the development of environmental rationality and the rationality characteristic of the economic sphere. Although environmental and economic rationalities are recognized as referring to distinct domains (which are relatively independent and have their own goals), EM allows 'extrapolations into the future' (MOL, 1995: 49) in which it is arbitrarily assumed that environmental rationality will eventually catch up to the dominating economic rationality.

This 'profession of faith' reveals the limits of EM and explains the unilateral nature of research conducted by its proponents, which has focused exclusively on describing those restricted processes in which ecological modernization coincides with the imperatives of the economic sphere. In contrast, our article shows in detail how corporate interests and financial institutions were decisive in derailing the trans-Mediterranean sale of environmentally sustainable electricity. In this sense, we argue that a research agenda focused on the investigation of 'failure cases' theoretically shows that 'ecologizing economy' and 'economizing ecology' are distinct and relatively independent processes which are not equally effective.

In other words, studying failed cases helps debunk the illusory notion that there is a rule of historical development which states that an intrinsically expansive system must move towards the criteria for environmental rationality. On the contrary, the change in focus suggested here could catalyze an environmental reform program by explicitly indicating conflicts of interests which stand in its way. It would return to an emphasis on the political dimension of those ecological modernization projects which (even without ruling out the need for structural changes in the design of modernity) play an important role in mitigating the current environmental crisis.

A research agenda that includes 'failure cases' therefore shares affinities with work guided by the concept of 'environmental justice', considering that both perspectives cast doubt on the teleological assumption of 'ecologyzing economy' (PORTO *et al.*, 2013; ACSELRAD, 2010). However, the debate would need to be expanded to incorporate in a critical perspective some elements of the environmental reform programs advocated by the theoretical proponents of EM, since some ecological modernization projects actually do contribute to ecological balance without necessarily harming disadvantaged social layers. For this reason, case studies are important to ensure that the various social and environmental elements involved in each ecological modernization project are specifically discussed to avoid undeserved generalization which inevitably characterizes sophisticated technologies as false technocratic solutions.

Furthermore, abandoning the expectation that market agents are the proponents of environmental rationality *par excellence* highlights the contradiction expressed in the fact that the logic of accumulation (which in certain cases, fosters ecological modernization) is the same logic which as in other settings accelerates natural processes of degradation. Seizing the dialectic which sees the same system as both "clean" and "dirty" would consequently broaden the scope of EM, purging it of its teleological assumptions and bringing the limits of planetary resilience back to the center of the debate.

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Submitted on: 12/03/2018
Accepted on: 07/10/2019
http://dx.doi.org/10.1590/1809-4422asoc20180043r1vu2020L1AO
2020;23:e00431
Original Article

# MIRACLE OR MIRAGE? CRITICAL CONTRIBUTIONS TO THE THEORY OF ECOLOGICAL MODERNIZATION IN LIGHT OF THE DESERTEC PROJECT

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## MIRACLE OR MIRAGE? CRITICAL CONTRIBUTIONS TO THE THEORY OF ECOLOGICAL MODERNIZATION IN LIGHT OF THE DESERTEC PROJECT

***Abstract*:** This investigation analyzes the Desertec project, which envisioned a transition to "clean energy" through constructing solar thermal power plants in the Sahara Desert and linking Europe, North Africa, and the Middle East via high voltage cables. Despite great enthusiasm in the international media and some sectors of civil society, the project faced so many obstacles that even the consortium which initially fostered the initiative decided to withdraw. This article uses this case to critically assess the theoretical and epistemological assumptions of the theory of ecological modernization, pointing out an alternate research agenda which focuses on unsuccessful projects in this area (failure cases), emphasizing the limited scope of this theory and the teleological postulate which assumes convergence between economic and environmental rationalities.

***Keywords*:** Ecological Modernization Theory; Concentrating Solar Power; Desertec; Ouarzazate; Climate change.

## MILAGRE OU MIRAGEM? CONTRIBUIÇÕES CRÍTICAS À "TEORIA DA MODERNIZAÇÃO ECOLÓGICA" À LUZ DO PROJETO DESERTEC

***Resumo*:** A investigação tem como objeto a análise do projeto "Desertec", um empreendimento que visa estimular a transição para as "energias limpas" por meio da construção de usinas termossolares no deserto do Saara e interconexão via cabos HVDC entre Europa, Norte da África e Oriente Médio. Apesar do entusiasmo com que foi divulgado pela imprensa internacional e setores da sociedade civil, "Desertec" enfrentou uma série de obstáculos e impasses, sendo abandonado inclusive pelo consórcio de empresas que o havia impulsionado inicialmente. À luz desse estudo de caso, o artigo propõe um debate crítico com os pressupostos teóricos e epistemológicos da "Teoria da Modernização Ecológica" (TME). Trata-se de apontar para uma agenda de pesquisa que enfoque os projetos de modernização

ecológica mal-sucedidos (*failure cases*), sublinhando os limites de abrangência da TME e o postulado teleológico de que a racionalidade econômica tende a coincidir com os critérios de racionalidade ambiental.

***Palavras-chave*:** Teoria da Modernização Ecológica; Concentrating Solar Power (CSP); Desertec; Ouarzazate; Mudanças Climáticas.

## ¿MILAGRO O ESPEJISMO? CONTRIBUCIONES CRÍTICAS A LA TEORÍA DE LA MODERNIZACIÓN ECOLÓGICA A LA LUZ DEL PROYECTO DESERTEC

***Resumen*:** La investigación tiene como objetivo el análisis del proyecto "Desertec", una iniciativa que pretende estimular la transición hacia "energías limpias" por medio de centrales termosolares en el desierto del Sahara y de la interconexión vía cables HVDC entre Europa, Norte de África y Oriente Medio. A pesar del entusiasmo con el que fue divulgado por la prensa internacional y por sectores de la sociedad civil, "Desertec" enfrentó obstáculos e impases, siendo abandonado por el consorcio que lo había impulsado inicialmente. A partir de este caso, el artículo efectúa un debate crítico con los presupuestos teóricos y epistemológicos de la "Teoría de la Modernización Ecológica" (TME). Se trata de proponer una agenda de investigación que enfoque los proyectos de modernización ecológica que hayan fracasado (*failure cases*), resaltando el alcance de la TME y el postulado teleológico de que la racionalidad económica tiende a coincidir con los criterios de racionalidad ambiental.

***Palabras-clave*:** Teoría de la Modernización Ecológica; Concentrating Solar Power (CSP); Desertec; Ouarzazate; Cambio Climático.