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New 'renewable' frontiers: contested palm oil plantations and wind energy projects in Brazil and Mexico

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ABSTRACT

This paper argues that new land conflict frontiers are emerging in the context of renewable energy production. The novel aspect of these frontiers is a 'green' framing of the use of land considered 'degraded', expressing it as a climate protection strategy, and consequently causing similar dynamics of conflict in different regions. With reference to political ecology debates on the notion of frontiers, we analyze the social conflicts over palm oil production for biodiesel and wind energy development in Brazil and Mexico, respectively. We show that green narratives, understood as forms of knowledge production concerning the protection of the climate and sustainable development, not only represent legitimization strategies for new land grabs, but also come with their own dynamics of social conflict and their own constellations of actors.

1. Introduction

To mitigate climate change, a societal shift from a dependence on fossil fuel to renewable energies based on sun, wind, and biomass needs to occur. However, many studies show that the production of renewable energy can exacerbate existing social and ecological problems and rekindle historical conflicts surrounding land use (see, e.g. Bratman, 2014; Pasqualetti, 2011). The promotion of biofuels in particular has been heavily criticized for acting as a catalyst for the expansion of monocultures for soy, sugar cane, or palm oil, all of which have resulted in the dispossession of peasants and indigenous peoples, as well as food scarcity, deforestation, biodiversity loss, and the emission of gases that harm the climate (e.g. Borras, McMichael, & Scoones, 2010).

Given the predominantly negative socio-ecological impacts of biofuels,¹ energy experts are currently discussing biomass cultivation on what are referred to as 'marginal' or 'degraded' lands (Deininger et al., 2011), and promoting wind and sun as sustainable alternative energy sources. However, this increases the need for more land. In contrast to fossil fuels, renewable energy requires more space above ground and thus has a different impact on the dynamics of land use (Jepson & Caldas, 2017). Furthermore, from a critical political ecology perspective there can be no universally valid definition of so-called degraded or marginal land. Areas that seem to be degraded from the macro perspective of decision-makers can, in fact, be the basis for the livelihoods of peasants or traditional local communities (Blaikie & Brookfield, 1987). This analysis thus focuses on the power relations and dynamics of conflict surrounding the definition of lands or regions as degraded: Who defines an area as being degraded? What areas are identified as degraded? What land-use practices are characterized as degrading? Who are the winners and losers?

In the present paper, we consider how this policy shift initiates new renewable energy projects in rural regions, especially in the Global South. This engenders and reproduces land conflicts because it fails to take into account the social dimension of energy production. Following Larry Lohmann and Nicholas Hildyard, to achieve a thorough understanding of energy, its inherent social relations must be actively borne in mind (Lohmann & Hildyard, 2014). This includes an analysis of land-use relations in the context of renewable energy production. Drawing on perspectives of political ecology on the frontier (Peluso & Lund, 2011; Schmink & Wood, 1987) and on the concept of 'land control' (Peluso & Lund, 2011), our hypothesis is that new frontiers of land conflicts surrounding the expanding production of renewable energies are currently emerging in different regions of the world. The novelty of these frontiers is their 'green' framing as climate protection strategies for what have been purported to be degraded areas or marginal lands, causing similar dynamics of conflict in different regions. We show that green narratives, understood as forms of knowledge production around the subject of environmental and climate protection, not only represent legitimization strategies for new land grabs (Borras, Hall, Scoones, White, & Wolford, 2011), they also come with their own dynamics of social conflict and their own actor constellations (Fairhead, Leach, & Scoones, 2012). One pivotal effect is the silencing of the critique of social movements or other social actors regarding the expansion of renewable energy production in their region. The overarching aim of the current paper is to provide an in-depth understanding of the winners and losers of the expansion of renewable energies.

Hence, this paper argues that research on land-use changes and renewable energies must consider the social context of renewable energy projects and include an analysis of green narratives.

The present article compares different types of green framing of renewable energy production, drawing on two case studies. The first of these pertains to the social conflict surrounding wind farms in Mexico (Lehmann, 2018) and the second to the social conflict over palm oil plantations in what are alleged to be degraded areas in Brazil (Backhouse, 2016). The chapter on wind energy generation in Mexico is based on data obtained during two field studies conducted in February/March 2014 and February/March 2015 for a research project on the conflict surrounding wind energy in the Oaxacan Isthmus (see Lehmann, 2018, 2019). 25 qualitative interviews were conducted with state representatives, staff of private companies, and civil society actors in Mexico City, Oaxaca de Juárez, and several locations in the Isthmus of Tehuantepec. Further, the author of the present study attended workshops and meetings held by local assemblies that are critical of wind energy development. She also participated in discussion rounds that were part of the consultation process in Juchitán in March 2015 during which different actors expressed their opinions regarding the wind power projects. Press articles, grey literature (including audio and video documentation), as well as secondary literature all complemented the analysis. The period analyzed encompasses the development of wind energy from the late 1980s onwards, with a focus on the years between 2010 and 2015. In the research as well as in this comparative study, the analysis does not focus on a specific local entity, e.g. a community or a town, or a single wind energy project. This approach was taken because the development of wind energy has a regional dimension and, since social networks transcend village borders, stakeholders' behavior and the opinions they articulate are also influenced by events in other communities. The chapter on palm oil production in Brazil presented in this article builds on research carried out in Brazil. In field studies conducted over several months in 2010, 2011, and 2013, more than 80 qualitative interviews were carried out with representatives of the private sector, the state, and civil society in Brasília, Belém, and five of the 44 municipalities designated for oil palm production (Moju, Acará, Tomé-Açu, Concórdia, and Bujaru) in Pará. These were supplemented by observations at public meetings with peasants organized by companies in Moju and Tomé-Açu, grey literature, and secondary data (for a comprehensive analysis, see Backhouse, 2015, 2016). Since this research was concluded, the political and economic context of Brazilian palm oil production in particular has changed (for an update, see Brandão, de Castro, &

Futemma, 2018; Brandão & Schoneveld, 2015; Levitt & Araujo, 2017). The objective of both research projects was to study the actors and policy processes surrounding the implementation of renewable energies, with a particular focus on the role of historical land conflicts, unequal power relations among the key actors in the struggles surrounding land-use change engendered by the corresponding projects, and the articulations of groups of actors. For the purpose of this article, we reanalyzed the data obtained during our research projects according to specific categories of changes in land control, new constellations of actors, and green narratives. These categories are derived from our analytical framework for studying new frontiers which we will outline in the following section. In sections three and four, we describe our case studies, with an emphasis on the narratives surrounding renewable energy projects. In section five, we compare these cases and in the last chapter, we discuss the intended contribution of the paper to studies on renewable energies and land use.

2. Frontier and land control as a flexible analytical framework

Drawing on a political-economic perspective within the broader research field of political ecology, the appropriation of nature is heavily influenced by capitalist social relations (Görg, 2004; Robbins, 2010). Energy is, therefore, not only a physical entity, it also encompasses labor and land-use relations, as well as unequal distribution and consumption patterns that are transnational in scope (Lohmann & Hildyard, 2014). According to Fairhead et al. (2012), the technocratic strategy of substituting fossil fuel with renewable energy comprises a twofold approach aimed at coping with the socio-ecological crisis of capitalism.² The strategy tries to mitigate climate change by reducing greenhouse gases and simultaneously opening new fields of accumulation within the emerging green economy. Thus, new frontiers for capital framed as green expand or (re-)emerge and 'represent, most basically, the discovery or invention of new resources' (Rasmussen & Lund, 2018, p. 388).

According to Nancy Peluso and Christian Lund, frontiers are not 'sites where "development" and "progress" meet "wilderness" or "traditional lands and peoples"' but regions where 'authorities, sovereignties, and hegemonies of the recent past have been or are currently being challenged by new enclosures, territorialization, and property regimes.' (Peluso & Lund, 2011, p. 668) Against this background, we understand frontiers as *contested* valorization strategies set in motion by state policies. The analytical focus on actors, actor alliances, and conflicts over new valorization strategies is pivotal for the study of frontier dynamics, since struggles by marginalized groups against the valorization of their land can alter the frontier in their favor (Schmink & Wood, 1992).³

Conflicts triggered by the expansion of renewable energy production are about land control. As Peluso and Lund describe, land control means 'practices that fix or consolidate forms of access, claiming, and exclusion, for some time' (Peluso & Lund, 2011, p. 668). These processes comprise and can also transform legal frameworks and territories (e.g. Kelly & Peluso, 2015). Often, the allocation of concessions for resource extraction, mapping, or land titling are important prerequisites for or the outcome of changes in the control over land and its use (e.g. Rasmussen & Lund, 2018, pp. 394–395). In many cases, such processes are accompanied by knowledge hierarchies, i.e. information about tender processes is unequally distributed, leading to uncertainty among those affected (Bebbington, Cuba & Rogan, 2014). The study of new frontiers, therefore, needs to include a comprehensive analysis of the different practices that structure land access and use.

The concept of 'land control implies a historical dimension as "new" frontiers challenge, transform, or extinguish previous ones' (Peluso & Lund, 2011, p. 669).⁴ Thus, according to this understanding, an analysis of the historical, social, and political contexts of the new frontiers is crucial.

Finally, the concept of new frontiers also includes an analysis of the narratives that constitute a green framing of renewable energy production as a climate protection strategy. The literature highlights a growing number of cases where green credentials are used to justify appropriation of land for capital accumulation in the emerging green economy (Fairhead et al., 2012, p. 238),

including the case of biomass production on so-called degraded lands (e.g. Backhouse, 2016), or for the valorization of ecosystem services (e.g. McAfee, 1999). As previously mentioned, green narratives are not only legitimization strategies for new land grabs, but come with their own societal dynamics and socio-ecological implications (Backhouse, 2016, p. 131; Fairhead et al., 2012). At the same time, they are intrinsically intertwined with the economic (new phases of valorization of lands) and political (state policies and incentives) dimensions of contested frontiers. Stuart Hall's (1980) concept of articulation, which he developed in the context of his theory of ideology and media studies, is helpful in the analysis of green narratives. According to Hall, the term articulation denotes a form of conjunction which can (but need not necessarily) establish a temporary, contingent unity between distinct (discursive, ideological, practical) elements (Grossberg, 1996, p. 141). With this in mind, we consider the concept of articulation to be a useful analytical tool for studying narratives as 'articulation of different elements into a distinctive set or chain of meanings' (Hall, 1995, p. 18). In the context of research on new frontiers, this requires an accurate analysis of the articulation of distinct elements of meaning vis-à-vis influential narratives: How is the expansion of renewable energy legitimized as necessary and without alternative? What powerful narratives of green development are deployed, for example, in the articulation of land privatization? What is constructed as 'true' and 'false', respectively, along the chains of reasoning of the dominant narratives? Who (for instance, social institutions or think tanks) produces or reproduces these beliefs? What are the prevailing forms of contradiction or resistance? In which groups does resistance originate?

Based on these considerations, we can determine the following three categories: Changes in land control, new actor constellations, and green narratives. These categories provide the structure for our analysis of the empirical material with the aim of substantiating the emergence of new frontiers in the context of the implementation of renewable energies in Mexico and Brazil. First, we show that land control is changed by government-led incentives promoting the economic valuation of the marginal hinterland. We do this by summarizing the respective renewable energy projects as well as the specific historical context of land access and use. We pay particular attention to how land control is changed and whether this is a contested process. Second, we focus on the key actors and analyze whether actor constellations have changed and if so, then how. Finally, we study the green narratives surrounding the renewable energy projects outlined, guided by the questions listed above. We particularly focus on the articulation of the technical arguments in favor of renewable energies (e.g. climate) using the narrative of sustainable development in poor regions of the Global South combined with the narrative of climate protection through expanding the production of renewable energies in so-called degraded or marginal regions. As will become clear over the following chapters, it is possible to separate the three categories analytically, but they are still intertwined and influence one other.

3. Wind energy in southeastern Mexico, land conflicts, and the framing of climate friendly development

Wind energy frontiers, regulation, and contested land control

In 2017, the installed capacity for electricity production in Mexico amounted to 75.69 GW (the corresponding figure for 2016 was 73.51 GW). A total of 70.5 percent of this was produced by fossil-fuel power stations, 29.5 percent was generated by 'clean energy' plants (AHK Mexiko, 2018). According to Mexican law, clean energy comprises renewable energy from wind, water, sun, and biomass, but also nuclear power. The majority of this clean energy is produced in hydropower stations (16.7 percent) and wind energy (5.6 percent in 2017 and 4.7 percent in 2016; *ibid.*). Up until 2016, wind energy was the fastest growing renewable energy source (SENER, 2016, pp. 48–49).⁵ In 2018, the total installed capacity of wind power was up to 4.935 MW, with around 2.756 MW of this being installed in the Isthmus of Tehuantepec region in the southern state of Oaxaca.⁶ Here, from

October onwards, cold air currents head south from North America over the Mexican Sierras ending up in the flatlands of the Isthmus, providing one of the best quality wind in the world. The region has the highest density of on-shore wind turbines worldwide, and has been the center of wind energy development in Mexico (Borja Díaz, Jaramillo Salgado, & Mimiaga Sosa, 2005, pp. 41–48; Cancino-Solórzano, Gutiérrez-Trashorras, & Xiberta-Bernat, 2011; National Renewable Energy Laboratory [NREL], 2004). The more than 1,000 wind turbines are situated between urban settlements and dispersed villages (see figures 1 and 2). In the Isthmus, which officially covers close to 20,000 km² and has 561,000 residents, collective land tenure of primarily indigenous communities predominates and subsistence agriculture and fishery exists in parallel with cash crop production.⁷ The other main sources of income for the region's residents are (precarious) jobs in the construction and service sector, government programs, remittances, and informal labor. A minority work in the huge oil refinery in Salina Cruz, one of the Isthmus' major towns (Nahmad, Nahón, & Langlé, 2014). In recent years, organized crime and drug trafficking has been on the increase, making the Isthmus one of the most violent regions in the state of Oaxaca.⁸

Wind electricity producers and turbine manufacturers are largely transnational companies, such as Accióna/Nordex, Iberdrola, Gas Natural Fenosa, Gamesa/Siemens, EDF, or Vestas, notably with European or North American origins. They often operate through a Mexican subsidiary company. Investment has frequently come from International Financial Institutions (IFIs) and the energy produced goes to industrial end consumers like Moctezuma (CCM-Heineken) or Industrias Peñoles (mining) according to the self-supplier model⁹, or sold to the Federal Commission of Electricity (CFE) (Kreiner, 2012; SENER & GTZ, 2009; Uharte Pozas, 2012). The wind companies have benefited from close relationships with government (Gerber, 2013; Howe & Boyer, 2015) and entered the state-dominated energy sector after reforms implemented in 1992 (Maihold, 2010).

Wind energy policy has been negotiated between federal state agencies and wind companies, while the local administration has been sidelined in the process. Since the 1990s, the residents affected have not been kept informed by federal or Oaxacan state agencies about what has been dubbed the 'wind corridor' or about companies' interests in leasing land (Nahmad et al., 2014, p. 147; Oceransky, 2009). The absence of discussions with residents on the Environmental Impact Assessments (EIAs), something which is actually required by law (Huesca-Pérez, Sheinbaum-Pardo, & Köppel, 2016), has fostered community distrust and uncertainty.

The 'discovery' of the wind corridor led to changes in historically contested land control. The majority of land lease contracts for wind farms lacked transparency: Contracts were concluded in the absence of land holders (e.g. by their children, although this was reversed by the courts as a result of protest by the individuals affected, and the construction of turbines on the corresponding land plots was thus prevented), with illiterate persons, under pressure and subject to threats from company middlemen. In many cases, people with collective land titles¹⁰ were not included in a joint decision-making process on land-use change (Gerber, 2013; Oceransky, 2009; PODER, 2011). This has fuelled conflict, for example in the settlements around the lagoon situated between the Pacific Ocean and the flatlands of the Isthmus of Tehuantepec (Cruz Rueda, 2011) and in the towns of Juchitán and Unión Hidalgo, where multiple land claims have existed for decades, and the allocation of land plots was politically motivated (CodigoDH, 2014; Warman, 1993). There is controversy around the ILO declaration 169, the Indigenous and Tribal People Convention,¹¹ which Mexico signed in 1990 and which stipulates the right of indigenous peoples to decide on economic or infrastructure projects on their territories (free, prior and informed consultation). This is something which had not occurred in Isthmus up to 2015 (Baker, 2013; Diego Quintana, 2018).

Local organizations and assemblies with varying levels of support within communities have questioned the economic benefits and criticized the socio-ecological impacts of wind energy projects. With endorsement from (trans)national NGOs, they have denounced the top-down approach and corresponding decision-making processes of state agencies as well as the repression of critics by private security and police forces, not infrequently connected to organized crime, and have highlighted the lack of participation from peasants and indigenous communities (Avila, 2017;

CodigoDH, 2014; Dunlap, 2017; Friede, 2016; Grunstein Dickter, 2016; Jiménez Maya, 2011; Zarate Toledo & Fraga, 2016). Protests resulted in the cancellation of one wind energy project in 2013: A judicial decision supported the claim that no consultation according to ILO 169 had been conducted. Subsequently, the transnational consortia implementing the project relocated it to another, no less contested area near the town of Juchitán for which state agencies organized a free, prior, and informed consultation in 2014/2015, ostensibly in accordance with ILO 169. At the time the research project which forms the basis of this article was concluded in 2018, the legitimacy of the consultation still remained disputed (Diego Quintana, 2018; Friede & Lehmann, 2016; Gerber, 2015; Zaremborg, Torres Wong, & Guarneros-Meza, 2018). Since then, the company has finished the construction of Latin America's largest wind farm, while intimidation of those who oppose new wind farms due to their lack of contribution to the socioeconomic prospects of local residents and who question the corresponding consultation processes prevails.

Actor constellations, the narrative of climate-friendly development on windy lands, and the marginalization of critical voices

Wind energy is framed as a climate-friendly development for local communities in the Isthmus, since the land is not suitable for farming and peasant agriculture is not regarded as a viable prospect for the future.

The wind energy sector, characterized by an increasing concentration of capital (Uharte Pozas, 2012), is reliant on public funds such as the Clean Technology Fund, a multi-donor Trust Fund channelled through the World Bank Group or the Inter-American Development Bank (IDB). Further, companies receive credits from multilateral funding agencies like the European Investment Bank or the IDB. Alongside the majority of state institutions, these actors link wind energy development to climate protection, often referring to sustainability and claiming that the wind energy projects 'simultaneously advance human development and low-carbon economic growth' (IDB, 2009), for 'present and future generations' (SENER, 2009, p. 01–22). This framing reflects the meta-narrative of ecological modernization (Fisher & Freudenburg, 2001), in which wind energy technology plays an important role (Avila, 2018) and sustainable development is the connection line between companies, state institutions, IFIs, and industrial end consumers. These powerful actors reproduce and promote their arguments as 'true' in the face of the climate crisis and lack of economic prospects in the Isthmus, framing critics as being in opposition to development. These narratives have silenced other ideas on development and social practices that may be critical of, or in contrast to, the hegemonic modernization theory and trickle-down economics (Kolland, 2007), and have given wind power generation technology a neutral character by presenting it as something modern and clean.

Moreover, local-level proponents in particular have linked wind energy production to job creation and income generation through, for example renting out land. This narrative is nourished by pie-in-the-sky promises made by companies to landholders (e.g. 'airplanes and an airport', interview Grupo Solidario La Venta). The local-development narrative is directly linked to the allegedly poor condition of agricultural land in the Isthmus due to the heavy winds and abandoned countryside. As a director of the Commission for Indigenous Development (CDI) put it: 'There is nothing in the Isthmus' (interview CDI). Wind farms are portrayed as relief for local communities, since wind has always been a great burden, filling 'our mouth with sand' but 'thanks to God', the companies 'knocked on the door', an inhabitant of Juchitán explained during the ILO consultation (contribution *consulta* 1). This resonates with the recurring historical images of the Isthmus as too inhospitable and windy for agricultural production (e.g. Henestrosa, 1993).

The dominant narrative of economic development and the history of failed government promises have resulted in wind energy development being framed as a way out of poverty and leaving subsistence agriculture behind. Previously, agricultural production was mainly for subsistence purposes or for the local market, but in the 1960s, cash crop farming took off. In the

1990s, agricultural production decreased, partly due to the end of subsidies in the context of the liberalization of the agricultural sector and the opening of the Mexican economy to the world market. Furthermore, the quality of agricultural land has deteriorated due to Green Revolution agriculture and the nearby oil refinery impacting already marginalized indigenous communities (Nahmad et al., 2014, pp. 91, 105–106; Zarate Toledo, 2010, pp. 273–275; Friede, 2016; de Ita, 2019). This has contributed to the narrative that the land is degraded and that agriculture is not a viable option for the future. A common claim during the consultation in Juchitán was that the ‘sons of the peasants’ are engineers who want to work on the wind farms to secure economic prospects for themselves. Or, as one speaker asks: ‘Are we indigenous peoples condemned to poverty? What do we leave to the next generation?’ (contribution *consulta* 2). This framing of wind energy projects as the only solution for the region’s development is reinforced by documents such as the Wind Atlas, funded by the US-American and Mexican state agencies and wind companies (NREL, 2004), which highlights the importance of the Isthmus for energy infrastructure. Plans, practices, and narratives around land for wind energy production resonate with development plans for the economy and infrastructure of this trade region (CodigoDH, 2014, p. 18; Castillo Jara, 2011; Tutino, 1993).

Consequently, as we have already indicated, critics from the local communities or (trans)national human rights networks are framed as outsiders or (Isthmenian) individuals who are ‘against development’ and are pursuing their own political agendas, as they try to ‘drag wind power plants into the dirt’ – in contrast to the wind energy companies who are eager to advance clean and green development in the region (interview EDF). Critics have argued that current development narratives are exclusive, imposed, and not self-determined, or as a contributor during the consultation process pointedly states: ‘We are not against development, but we want the kind of development in which we can all participate’ (contribution *consulta* 3). They claim that jobs in the construction sector are only short term. Land lease payments contribute to the wellbeing of those who have a few hectares at their disposal, whereas those with no land do not benefit. Land is leased out for decades, therefore preventing agricultural use in the future. This stands in contrast to articulations concerning the compatibility of agricultural use with wind energy production on the same land plot. Overall, wind energy development has not lived up to its promise of progress for all (Huesca-Pérez et al., 2016; Lehmann, 2018; Nahmad et al., 2014). Nonetheless, due to the hegemonic narrative of wind energy production on non-arable land as a win-win solution to both the lack of economic prospects and climate change, criticism has been marginalized and/or stigmatized as being anti-development. As critics are harassed and intimidated, the lack of legitimization of their cause not only constitutes discursive marginalization, but also means they have a more limited audience when they try to politicize these threats. Further, the search for socio-economic alternatives to large-scale wind energy development (e.g. community wind parks and agricultural or industrial production with local ownership), although increasingly supported in the rhetoric of state officials, had not managed to identify a supporting institutional framework by the time the present research had come to an end (see Lehmann, 2019).

4. Palm oil plantations on so-called degraded lands in the Northeast of the Brazilian Amazon region

Biodiesel, palm oil, and contested land control

The Brazilian energy mix comprises a 43 percent share of renewable energies, earning the country the title of ‘low carbon economy’ (IEA Bioenergy, 2018, p. 2). In comparison, the global average is about 13.7 percent (Empresa de Pesquisa Energética, 2018). A particularly important source of electricity generation in the case of Brazil is hydropower, which accounted for 64.4 percent of Brazil’s total electricity production in 2017. Similarly, bioenergy also represents a major source of energy in Brazil: some 8.8 percent of electricity production is based on biomass, which, in turn, is

made up of 77 percent sugarcane and 21.45 percent wood (see UNICA, 2018). In the transport sector, Brazil has introduced blending quotas: biodiesel (80 percent of which is soy based) has a blending quota of ten percent, while for (sugarcane-based) ethanol, the corresponding figure is 27 percent (USDA, 2018).

Today, Brazil is the second largest global producer and consumer of ethanol (based on sugar cane) and biodiesel (from oil seeds) after the US (USDA, 2017). The production of ethanol started in the context of the oil crisis in the 1970s (Nitsch, Borges, Freitag, & Hurtienne, 1984). The Brazilian National Biodiesel Production Program (*Programa Nacional de Producao e Uso do Biodiesel*, PNPB) was created in 2004 to promote domestic production, reduce import dependency on oil, generate jobs, and tackle poverty in the countryside by including peasants in production. As much as around 70 percent of Brazil's biodiesel is produced from soybean oil, followed by animal tallow (16 percent), while the rest comes from cottonseed oil and other oil seeds (USDA, 2017). However, the production of biofuels has not been an inclusive process for peasants, since soy and cattle require large-scale land holdings (Bernardes & Aracri, 2011). In 2010, the state program for sustainable palm oil production (*Programa de Produção Sustentável da Palma de Óleo*) was implemented with the aim of diversifying the oil seeds for biodiesel and initiating sustainable development in the poor countryside of the northeast Amazon.

This program resumes a large-scale development project developed in the 1970s (Homma & Furlan, 2001). The novelty here is the reframing of agro-industrial palm oil production as a climate protection measure (Backhouse, 2016). A binding agro-ecological zoning plan seeks to ensure that the program only involves areas deforested before 2008 (EMBRAPA & MAPA, 2010). The focus is supposed to be on the so-called degraded grazing pastures in the northeast region of Pará and the aim is to capture carbon dioxide through growing oil palms (see figure 3). For this purpose, the program has selected around six million hectares in 44 municipalities. Between 2010 and 2013, the area of oil palm plantations tripled to 180,000 hectares. After 2013, the expansion stopped because companies faced difficulties with purchasing land, growing expenditures, low market prices, and the general political and economic crisis in Brazil (Brandão & Schoneveld, 2015). Since 2017, the sector has been recovering (Levitt & Araujo, 2017).

The region designated for oil palm plantations is more than degraded grazing pastures. Since colonial times, this has been one of the most populated and oldest settlement regions in the Amazonian basin (de Assis Costa, 1989) with a long history of unclear land tenure relations and land conflicts (Treccani, 2001). Farmers, activists, and *quilombolas* (traditional communities of Afro-Brazilian descendants) report deforesting initiatives in their neighborhoods for the conversion of these areas to homogeneous oil palm plantations. According to these citizens, the use of pesticides contaminates rivers, the soil, and drinking water. Interfering with natural stream courses, for example, to construct roads or irrigate plantations, also impedes peasant farmers' access to water and irrigation.

The palm oil corporation project has fueled aggressive land speculation. Frequent land sales and purchases through front men have resulted in price increases (Flexa, 2011). Agricultural experts we interviewed referred to a decoupling of prices on the informal land market. In 2011, the trade union representative from Acará described the situation in the village of Bucaia, where the majority of the peasants had sold their land and moved to the poor quarters of the town of Acará within a period of just two years (interview, trade union I). This has increased the pressure on the peasants and *quilombos* who have not yet obtained a legal land title to sell the land they own (Backhouse, 2015, p. 174).

The introduction of contract farming for peasant farms triggered a restructuring process that has resulted in peasants losing control over the use of their land and their labor, despite the fact that they formally retain ownership. Peasant land use in palm oil plantation areas has been reorganized both spatially and temporally and production is now dominated by agro-industrial suppliers for the agro-industrial palm oil complex with peasant land having been converted into monoculture 'mini-plantations'. At the same time, debt is a constant risk and peasant farmers are subjected to fluctuations in the world market (ibid.; Glass, 2013).

State officials have acknowledged the negative socio-ecological effects of the palm oil program. Nevertheless, they still consider the palm oil program to be a necessary development project for the region. They point out the jobs created by the oil palm plantations. An agrarian secretary in Concórdia, explains: 'Of course oil palm plantations have negative environmental effects. But, this way we are creating jobs for young people who have no education and no prospects' (interview, agrarian secretary). At the same time, state officials promote the contract farming system as a necessary strategy for modernizing the Amazonian peasantry.

New actor alliances, the narrative of degraded land, and the silencing of resistance

The interviews with peasants and actors from civil society, private firms, and the state in the region show that the processes of restructuring land access and land use cause controversy. Whereas some see the palm oil program as a unique opportunity for economic development in the region, others regard it as a renewed attempt by agribusiness to appropriate Amazonia. Opposing positions can also be found among the peasants: Some of them are in favor of unconditional participation as contract farmers in this project, while others are more hesitant or even become involved in peasant associations and neighborhood groups which are opposed to contract farming production.

However, the critical voices of peasants or *quilombolas* have been marginalized in public debates on the palm oil program. The reasons for this are complex. The members of these groups are already socially marginalized. They have low incomes and only precarious access to education, health, and agricultural credits. Additionally, new alliances of actors have emerged in support of the project. These comprise palm oil companies, national and local government representatives (including from all parties) as well as certain unions. This has meant that the *quilombolas* have lost some of their political allies, who are now in favor of the palm oil project. The mandatory public hearings and environmental impact assessments for large-scale projects were not carried out before the implementation process. Instead, (state) agro-experts, as well as palm oil corporations have expanded the narrative of degraded grazing pastures by building on the old and powerful narrative of degrading traditional cultivation, particularly the shifting cultivation of manioc. A manager of a palm oil plant in Concórdia elaborates:

"The cultivation of manioc is a very old practice with no sign of any development. People do not want to change their lives. If you take a satellite view of the area, you will see that the traditional Amazonian peasantry, together with the landowners of extensive pastures, have destroyed this region. [...] They mainly want to produce manioc, since it is also a cash crop. They degrade the soil because they have shortened the cycles of shifting cultivation." (interview, manager of Biopalma/Vale)

In the context of the Brazilian Amazon, the narrative of degraded areas is by no means new but is nevertheless powerful (Backhouse, 2016, pp. 17–19). According to this narrative, tropical forests have been degraded by deforestation caused by cattle farmers and the traditional land-use practice of shifting cultivation. Nowadays, it is acknowledged by the scientific community that the land-use practices of the traditional Amazonian peoples are much more diverse, and the tropical ecosystems more complex, and in part more resilient, than classical trophic ecology had assumed (Heckenberger & Neves, 2009; Hurtienne, 2005). Nevertheless, this naturalizing narrative about the Amazonian ecosystem and traditional land-use systems continues to be influential, and has proven useful for the green reframing of the palm oil program as a climate protection strategy. According to the national agricultural research institute, EMBRAPA, the palm oil plantations will restore the areas that had been degraded by extensive pastures and shifting cultivation (EMBRAPA & MAPA, 2010). EMBRAPA sees palm oil plantations as ideal in so-called degraded areas as they can grow in nutrient poor soil and they also sequester CO₂ (Furlan Junior, Kaltner, Azevedo, & Campos, 2006). Thus, agro-industrial palm oil production is considered a climate-friendly alternative to the

traditional cultivation of manioc – an important crop for peasant farming cultures and the main staple in the region. Some peasants and quilombolas are outraged by this:

“They say that our manioc degrades the land and contaminates the water. But this is not true. Our manioc can be used in different ways and it also feeds us. But palm oil does not; instead it needs a lot of water, fertilizer, and pesticides.” (interview, *Quilombola*)

International environmental politics has eliminated spaces of articulation for Amazonian peasants and what are referred to as ‘traditional’ communities, despite the fact that the important impact of these groups on forest conservation is emphasized in other contexts. Not only are local actors being physically surrounded and marginalized by the rapidly growing plantations, their ‘traditional’ practices of land use are also being called into question and used against them. The widely endorsed climate protection strategy of conserving valuable primary forests and the climate via intensified monocropping on what are purported to be degraded areas may further undermine the land control of already marginalized groups. Through the technocratic simplification of climate change policies into carbon capture and storage estimates, monocropping cultivation is reframed as green in a region that, at the same time, has been constructed to be degraded. A unionist emphasizes her helplessness: ‘Why would I mess with the palm oil industry? [...] I know that this project is of global interest. No way! I prefer to be cautious given that I do not have the power to negotiate with them’ (interview, trade union II).

Palm oil is still being framed as a sustainable green source of biodiesel, even though it has not yet been used for biodiesel production in Brazil. It has, however, had serious implications for local land control, reproducing pre-existing unequal land-use relations.

5. Discussion

It has become clear that new ‘renewable’ frontiers are emerging in Mexico and Brazil, as government-incentivized projects with a focus on renewable energy in the marginalized hinterland are changing land control. A comparison of two case studies on palm oil production in Brazil and wind energy in Mexico using a flexible analytical framework reveals similar dynamics:

In Brazil and Mexico, incentives and support from governmental institutions and IFIs, as well as policies framed as climate change mitigation were decisive for the take-off of renewables in both the Isthmus and the state of Pará. One difference between the two countries is that in Brazil, the support of a government program was crucial for the introduction of palm oil production, whilst in Mexico, it was legal changes that enabled private companies to produce wind energy. In both cases, there was no democratic involvement of the affected communities in the decision-making and implementation procedures. On the contrary, state representatives only selectively distributed information to the affected communities. In both countries, the expansion of renewable energies occurred in regions where, historically, there has been conflict over land control and, in both cases, state agencies have refrained from working to solve them.

Although Brazil and Mexico have different histories of land access and use, renewable energy projects, in both countries, there has been a similar restructuring of land control in favor of those with financial means and access to technology. Additionally, private land use is *de facto* supported, although the status of private and collective land use and the corresponding land titles remain contested. The two cases differ in terms of violence and force, however. Whereas in the Mexican Isthmus, there was social mobilization against the wind farms, resulting in violent confrontations and the persecution of critics. This was not the case in Pará where the voices of critics were not heard because they were unable to mobilize beyond the local level.

In both examples of contested renewable energy projects, the actor constellations changed and are highly unequal. Those who advocated for the implementation of the renewable energy projects had access to technology, financial capital, and networks. Moreover, they were supported by state agencies and international organizations. In the case of Mexico, critics were able to rely, albeit to

a limited extent, on transnational activist networks, international human rights frameworks and the corresponding state laws, although these were, admittedly, highly selective. In Brazil, since the narrative of the expansion of palm oil plantations on degraded lands won over international agencies concerned about primary tropical forest in South America and Southeast Asia, there was less space for critical voices to be heard. In both examples, we showed that this marginalizing and silencing of criticism was a result of the technical needs for the production of renewable energies being articulated via the meta-narrative of climate protection through intensified use of so-called degraded or marginal lands but also via the narrative of sustainable development in the poor hinterland of the Global South. Expressed by powerful pro-renewables actors, these narratives affect the dynamics of conflict: First, they enable new alliances between government officials, private companies, unions, NGOs, and international organizations to be formed. Second, these powerful alliances of actors force the introduction of new technologies or of agricultural products to generate energy (electricity or fuel). This, in turn, impacts the land access of small-scale peasants and traditional collective forms of land use as well as labor relations. Third, critics are left with little scope to draw attention to the problematic aspects of renewable energy projects.

The comparison of these two different case studies presented in this paper reinforces our hypothesis that the same win-win narrative of green development of degraded or marginal lands through renewable energy projects has caused similar dynamics of conflict in different regions. Although contexts differ, this green framing further strengthens powerful new coalitions of actors advocating for the production of renewable energies. As a result, criticism and resistance are side-lined and portrayed as 'anti-sustainable' and against the development of poor regions. Hence, our comparative analysis underlines the theory of authors such as Fairhead et al. (2012) that sustainable development projects can result in new frontiers of land-use changes and related conflicts when the local and transnational power relations surrounding land relations are ignored.

6. Conclusion and outlook

In this comparative analysis we described wind power generation projects in Mexico and palm oil production projects in Brazil and concluded that, in both countries, the win-win narratives on renewable energy production on degraded land and its contribution to development were similar. The comparison also revealed analogous dynamics in these different contexts. New constellations of actors emerge and are strengthened by these green narratives, whereas criticism is sidelined. However, we should not overestimate the scope of our comparative study: despite the similar dynamics in the two different regions shown by the study, the results cannot be generalized on a global scale. It would therefore be interesting to broaden the study by analyzing the green narratives of renewable energy projects in different regions of the Global South and also in the Global North.

Further, with this empirical analysis of new or renewable frontiers we seek to contribute to increased exchange between political ecologists and scholars in the field of land-use science and a heightened interest in examining the question of land use and land control in renewable energy projects beyond mere questions of technical implementation. We urge scholars and practitioners to focus more on land control and the role of narratives as part of the social reality surrounding the appropriation of nature, without decoupling them from their political and economic dimensions. A critical understanding of the social embeddedness of technology – and this includes renewable – is key for the global transition to a fair energy regime. If we do not acquire this understanding, the problematic socio-ecological impacts of renewable energy projects may well end up being justified as green solutions with no alternative. Thus, the challenge for future political action and research on land-use change engendered by renewable energy projects is to identify the starting points for this process of transformation in order to avoid the expansion of new frontiers and the corresponding conflicts. In order to fulfil this task, spatial studies could include methods of participatory mapping or illustrations providing an insight into different and multiple land-use rights and

practices of diverging, unequal actors, similar to thematically distinct studies in political ecology or critical geography, for instance (see, e.g. Zaragocin, 2018). Furthermore, decision-makers should take participatory approaches in the context of large-scale projects more seriously. First, this means that round tables, consultations, or public hearings must take place before the implementation process starts. Second, all those affected must be part of an open-ended democratic decision process – and if that decision is ‘no’ then the project cannot be implemented.

Notes

1. Most studies find that incentives for biofuels exacerbate the negative impacts of agroindustrial monocropping. As a result, the European Union has frozen the blending quota for biofuels and set sustainability criteria in order to prevent indirect land-use changes by biofuels, see <https://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/sustainability-criteria>.
2. Drawing on the ideas of eco-Marxist Elmar Altvater, the necessity of capitalism for growth causes overuse of human and natural resources and, ultimately, threatens its own existence. Consequently, the ecological crisis is not only caused by human beings but is, at the same time, part of a deep socio-ecological crisis of capitalism (Altvater, 1987).
3. We, do not, therefore, use the term frontier in the sense of a ‘land use frontier’ (Müller & Munroe, 2014, p. 135) that attributes land-use change to the influx of human populations (Parker et al., 2008, p. 5). We do not provide an overview of the different frontier theories and definitions in this paper as the focus is on our understanding of the new frontiers of renewable energies.
4. Niels Fold and Philip Hirsch discuss similar dynamics when analyzing the concept of the ‘post-frontier’ (Fold & Hirsch, 2009; also Beckert, 2016; Sato, 2000).
5. Also <https://www.forbes.com/sites/mergermarket/2017/07/14/wind-investors-blow-into-latin-america/#91770a6dd62f>, and <http://www.mittelstand-nachrichten.de/verschiedenes/weltweit-schlagen-herzen-fuer-windenergie-20160916.html>.
6. See <https://www.amdee.org/mapas-eolicos>.
7. See the maps on http://132.248.14.102/layers/CapaBase:ii_4_3_terri_indigena and http://132.248.14.102/layers/CapaBase:ii_2_zonas_agri.
8. See <https://oaxaca.quadratin.com.mx/Reporta-Fiscalia-de-Oaxaca-182-homicidios-dolosos-de-enero-a-marzo/>.
9. Here, ‘self-supply’ means that contracts are concluded between two or more parties who agree that the energy produced by the producer goes solely to the end consumer who uses this energy for their own purposes. This model applies to industrial end consumers and not, for example, to communities.
10. On the ejido and the agrarian community and collective land titles in Mexico, see Appendini, 2001; (Assies, 2008).
11. See https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C169.

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References

- AHK (Deutsch-Mexikanische Industrie- und Handelskammer) (2018). MEXIKO. Solarthermie und Photovoltaik Zielmarktanalyse 2018 mit Profilen der Marktakteure. Retrieved from https://www.german-energy-solutions.de/GES/Redaktion/DE/Publikationen/Marktanalysen/2018/zma_mexiko_2018.pdf?__blob=publicationFile&v=3
- Altwater, E. (1987). *Sachzwang Weltmarkt: Verschuldungskrise, blockierte Industrialisierung und ökologische Gefährdung, der Fall Brasilien*. Hamburg: VSA-Verlag.
- Appendini, K. (2001). Land regularization and conflict resolution: The case of Mexico. *Document prepared for FAO, rural development division, land tenure service*. Mexico D.F: El Colegio de México.
- Assies, W. (2008). Land tenure and tenure regimes in Mexico: An overview. *Journal of Agrarian Change*, 8(1), 33–63.
- Avila, S. (2017). Contesting energy transitions: Wind power and conflicts in the Isthmus of Tehuantepec. *Journal of Political Ecology*, 24, 992–1012.
- Avila, S. (2018). Environmental justice and the expanding geography of wind power conflicts. *Sustainability Science*, 13 (3), 599–616.
- Backhouse, M. (2015). Green grabbing: The case of palm oil expansion in so-called degraded areas in the eastern Brazilian Amazon. In K. Dietz, B. Engels, O. Pye, & A. Brunnengräber (Eds.), *The political ecology of Agrofuels* (pp. 167–185). New York, NY: Routledge.
- Backhouse, M. (2016). The discursive dimension of green grabbing: Palm oil plantations as climate protection strategy in Brazil. *Pléyade. Revista de Humanidades y Ciencias Sociales*, 18, 131–157.
- Baker, S. (2013). Why the IFC's free, prior, and informed consent policy doesn't matter (Yet) to indigenous communities affected by development projects. *Wisconsin International Law Journal*, 30(3), 668–705.
- Bebbington, A., Cuba, N. & Rogan, J. (2014). The overlapping geographies of resource extraction. *ReVista Harvard Review of Latin America*. Retrieved from: <https://revista.drclas.harvard.edu/book/overlapping-geographies-resource-extraction>.
- Beckert, B. (2016). A post-frontier in transformation: Land relations between access, exclusion and resistance in Jambi province, Indonesia (Dissertation). Georg-August-Universität Göttingen, Göttingen. Retrieved from <https://d-nb.info/1126724785/34>
- Bernardes, J.A., & Aracri, L.A. (Eds.). (2011). *Novas Fronteiras do Biodiesel na Amazônia: Limites e desafios da incorporação da pequena produção agrícola*. Rio de Janeiro: Arquimedes Edições.
- Blaikie, P.M., & Brookfield, H.C. (1987). *Land degradation and society*. London: Metbuen.
- Borja Díaz, M.A.R., Jaramillo Salgado, O.A., & Mimiaga Sosa, F. (2005). *Primer Documento del Proyecto Eoloelectrico del Corredor Eólico del Istmo de Tehuantepec*. México: Instituto de Investigaciones Eléctricas.
- Borras, S.M., McMichael, P., & Scoones, I. (2010). The politics of biofuels, land and agrarian change: Editors' introduction. *The Journal of Peasant Studies*, 37(4), 575–592.
- Brandão, F., de Castro, F., & Futemma, C. (2018). Between structural change and local agency in the palm oil sector: Interactions, heterogeneities and landscape transformations in the Brazilian Amazon. *Journal of Rural Studies*. doi:10.1016/j.jrurstud.2018.09.007
- Bratman, E.Z. (2014). Contradictions of green development: Human rights and environmental norms in light of Belo Monte Dam Activism. *Journal of Latin American Studies*, 46, 261–289.
- Cancino-Solórzano, Y., Gutiérrez-Trashorras, A.J., & Xiberta-Bernat, J. (2011). Current state of wind energy in Mexico, achievements and perspectives. *Renewable and Sustainable Energy Reviews*, 15, 3552–3557.
- Castillo Jara, E. (Ed.). (2011). *Inequidad en torno al uso de la energía eólica en México*. México: Grupo de estudios internacionales contemporáneos. Energía y Ambiente.
- Brandão, F. & Schoneveld, G. (2015). The state of oil palm development in the Brazilian Amazon: Trends, value chain dynamics, and business models. (Working Paper No. 198). Bogor: CIFOR
- Comité de Defensa Integral de Derechos Humanos Gobixha (CodigoDH). (2014). *Rostros de la Impunidad en Oaxaca. Perspectivas desde la Defensa Integral de los Derechos Humanos*. Oaxaca: CodigoDH.
- Cruz Rueda, E. (2011). Eólicos e inversión privada: El caso de San Mateo del Mar, en el Istmo de Tehuantepec Oaxaca. *The Journal of Latin American and Caribbean Anthropology*, 16(2), 257–277.
- de Assis Costa, F. (1989). *Amazonien – Bauern, Märkte und Kapitalakkumulation*. Berlin: Spektrum.
- de Ita, A. (2019, January 31). Garantiepreise und offener Markt. Retrieved from <https://www.npla.de/allgemein/garantiepreise-und-offener-markt/>
- Deininger, K., Byerlee, D., Lindsay, J., Norton, A., Selod, H., & Stickler, M. (2011). *Rising global interest in Farmland. Can it yield sustainable and equitable benefits?* Washington, DC: World Bank.
- Diego Quintana, R. (2018). Política gubernamental vs. política pública: Avatares de los parques eólicos en el Istmo de Tehuantepec. *Revista Problemas del Desarrollo*, 194(49), 91–117.
- Dunlap, A. (2017). Counterinsurgency for wind energy: The Bii Hioxo wind park in Juchitán, Mexico. *Journal of Peasant Studies*, 45(3), 630–652.
- EMBRAPA & MAPA (2010). Zoneamento Agroecológico do Dendezeiro nas Áreas Desmatadas da Amazônia Legal Nível de Manejo B. Brasília. http://www.cnps.embrapa.br/zoneamento_dende/.
- Empresa de Pesquisa Energética. (2018). *Balanco Energético Nacional: Relatório Síntese, ano base 2017*. Rio de Janeiro.

- Fairhead, J., Leach, M., & Scoones, I. (2012). Green grabbing: A new appropriation of nature? *The Journal of Peasant Studies*, 39(2), 237–261.
- Fisher, D.R., & Freudenburg, W.R. (2001). Ecological modernization and its critics: Assessing the past and looking toward the future. *Society and Natural Resources*, 14, 701–709.
- Flexa, E. (2011, April 3). Programa planta êxodo e colhe miséria. Em Tomé-Açu empresas compram terras do pequeno agricultor para cultivar palma de óleo. *O Liberal*, 10.
- Fold, N., & Hirsch, P. (2009). Re-thinking frontiers in Southeast Asia. *The Geographical Journal*, 175(2), 95–97.
- Friede, S. (2016). *Enticed by wind: A case study in the social and historical context of wind energy development in Southern Mexico*. Washington: Wilson Center. Retrieved from <https://www.wilsoncenter.org/publication/enticed-the-wind-case-study-the-social-and-historical-context-wind-energy-development>
- Friede, S., & Lehmann, R. (2016). Consultas, corporations, and governance in Tehuantepec, Mexico. *Peace Review*, 28(1), 84–92.
- Furlan Junior, J., Kaltner, F.J., Azevedo, G.F.P., & Campos, I.A. (2006). *Biodiesel: Porque tem que ser Dendê*. Belém: EMBRAPA.
- Gerber, P. (2013). *Europäische Unternehmen erzwingen das grüne Geschäft mit dem Wind in kolonialem Stil. Conquista 3.0.: Die Windkraftindustrie in Oaxaca, Mexiko*. Berlin: Rosa-Luxemburg-Stiftung.
- Gerber, P. (2015). ¡Vientos! Proyectos eólicos y la consulta indígena en el Istmo. *El Topil. Boletín Bimestral de Analisis y Reflexión*, 4–8.
- Glass, V. (2013). *Expansão do dendê na Amazônia brasileira: Elementos para uma análise dos impactos sobre a agricultura familiar no nordeste do Pará*. São Paulo: Repórter Brasil.
- Görg, C. (2004). The construction of societal relationships with nature. *Poiesis Praxis*, 3, 22–36.
- Grossberg, L. (1996). On postmodernism and articulation: An interview with Stuart Hall. In D. Morley & K.-H. Chen (Eds.), *Stuart Hall. Critical Dialogues in Cultural Studies* (pp. 131–150). London: Routledge.
- Grunstein Dickter, M. (2016). Contra el viento: Regulación, crisis social y cambio institucional en el Corredor Eólico del Istmo. *Economía, Sociedad y Territorio*, 16(51), 485–517.
- Hall, S. (1980). Race, articulation and societies structured in dominance. In: UNESCO: *Sociological theories: Race and colonialism* (pp. 304–345). Paris: UNESCO.
- Hall, S. (1995). The whites of their eyes. Racist ideologies and the media. In G. Dines & J.M. Humez (Eds.), *Gender, race and class in media. A text reader* (pp. 18–22). London: Sage Publications.
- Heckenberger, M., & Neves, E.G. (2009). Amazonian archaeology. *Annual Review of Anthropology*, 38, 251–266.
- Henestrosa, A. (1993). The foundation of Juchitán. In H. Campbell, L. Binford, M. Bartolomé, & A. Barabas (Eds.), *Zapotec struggles. Histories, politics, and representations from Juchitán, Oaxaca* (pp. 39–40). Washington, London: Smithsonian Institution Press.
- Homma, A., & Furlan, J., Junior (2001). Desenvolvimento da deindeicultura na Amazônia: Cronologia. In A.A. Muller & J. Furlan Jr. (Eds.), *Agronegócio do dendê: Uma alternativa social, econômica e ambiental para o desenvolvimento sustentável da Amazônia* (pp. 193–207). Belém: EMBRAPA.
- Howe, C., & Boyer, D. (2015). Aeolian politics. *Scandinavian Journal of Social Theory*, 16, 31–48.
- Huesca-Pérez, M.E., Sheinbaum-Pardo, C., & Köppel, J. (2016). Social implications of siting wind energy in a disadvantaged region: The case of the Isthmus of Tehuantepec, Mexico. *Renewable and Sustainable Energy Reviews*, 58, 952–965.
- Hurtienne, T. (2005). Agricultura familiar e desenvolvimento rural sustentável na Amazônia. *Novos Cadernos NAEA*, 8(1), 19–71.
- IEA Bioenergy. (2018). *Brazil: Bioenergy policies and status of implementation*. Paris: IEA.
- Inter-American Development Bank (2009, December 15). Inter-American Development Bank: IDB to finance historic expansion of wind power in Mexico. Retrieved from <http://www.iadb.org/en/news/newsreleases/2009-12-15/wind-power>
- Jepson, W., & Caldas, M. (2017). Changing energy systems and land-use change. *Journal of Land Use Science*, 12(6), 405–406.
- Jiménez Maya, I. (2011). El megaproyecto eólico en el Istmo de Tehuantepec, Oaxaca: Energías limpias, empresas sucias y la resistencia social. In J.M. Sandoval Palacios, R. de Flores Álvarez, & S.Y. Fernández Moreno (Eds.), *Planes Geoestrategicos, Desplazamientos y Migraciones Forzadas en el Área del Proyecto de Desarrollo e Intetración de Mesoamérica* (pp. 212–235). Mérida, Venezuela: CEFI.
- Kelly, A.B., & Peluso, N.L. (2015). Frontiers of commodification: State lands and their formalization. *Society and Natural Resources*, 28(5), 473–495.
- Kolland, F. (2007). Zwischen Fortschrittsoptimismus und kritischer Gesellschaftsanalyse: Die klassischen Entwicklungstheorien. In K. Fischer, G. Hödl, I. Maral-Hanak, & C. Parnreiter (Eds.), *Entwicklung und Untentwicklung: Eine Einführung in Probleme, Theorien und Strategien* (pp. 79–104). Wien: Mandelbaum Verlag.
- Kreiner, I. (2012). Studie zu erneuerbaren Energien in Mexiko (Forschungspotential in Mexiko und Perspektiven der deutsch-mexikanischen Zusammenarbeit im Bereich Wissenschaft und Forschung. Erneuerbare Energien. Retrieved from http://www.kooperation-international.de/uploads/media/Studie_Erneuerbare_Energien_Mexiko.pdf

- Lehmann, R. (2018). The conflict surrounding wind energy projects in the Mexican Isthmus of Tehuantepec. Renewable energies and politics of scale. *Bioeconomy & Inequalities Working Paper No. 3* Jena. Retrieved from https://www.bioinequalities.uni-jena.de/sozbemedia/Neu/2018_11_05+Working+Paper+3-p-315.pdf
- Lehmann, R. (2019). *Der Konflikt um Windenergie in Mexiko. Partizipation, Diskurse und die ungleiche Gestaltung der Naturverhältnisse im Isthmus von Tehuantepec*. Wiesbaden: Springer VS. Energiepolitik und Klimaschutz. Energy Policy and Climate Protection.
- Levitt, T., & Araujo, H. (2017, June 29). The Amazon's new danger: Brazil sets sights on palmoil. The Guardian. Retrieved from: <https://www.theguardian.com/sustainable-business/2017/jun/29/brazil-palm-oil-amazon-rainforest-deforestation-temer-farming-para-cerrado>.
- Lohmann, L., & Hildyard, N. (2014). *Energy, work and finance*. Sturminster Newton: The Corner House.
- Maihold, G. (2010). Mexiko zwischen Autonomie und Einbindung: Energiepolitik im Hinterhof der USA. In G. Maihold & J. Husar (Eds.), *Energie und Integration in Nord- und Südamerika* (pp. 131–146). Opladen: Verlag Barbara Budrich.
- McAfee, K. (1999). Selling nature to save it? Biodiversity and green developmentalism. *Environment and planning. Society and Space*, 17, 133–154.
- Müller, D., & Munroe, D.K. (2014). Current and future challenges in land-use science. *Journal of Land Use Science*, 9(2), 133–142.
- Nahmad, S., Nahón, A., & Langlé, R. (2014). *La visión de los actores sociales frente a los proyectos eólicos del Istmo de Tehuantepec*. Oaxaca: CIESAS.
- National Renewable Energy Laboratory (NREL)/Laboratorio Nacional de Energías Renovables (2004). Atlas de Recursos Eólicos del Estado de Oaxaca. Retrieved from: <https://www.nrel.gov/docs/fy04osti/35575.pdf>.
- Nitsch, M., Borges, U., Freitag, H., & Hurtienne, T. (1984). *PROÁLCOOL. Analyse und Evaluierung des brasilianischen Biotreibstoffprogramms*. Breitenbach: Saarbrücken.
- Oceransky, S. (2009). Wind conflicts in the Isthmus of Tehuantepec: The role of ownership and decision-making models in indigenous resistance to wind projects in Southern Mexico. In *The Commoner* 13, 203–222.
- Parker, D.C., Entwisl, B., Rindfuss, R.R., Vanwey, L.K., Manson, S.M., Moran, E., & Malanson, G. (2008). Case studies, cross-site comparisons, and the challenge of generalization: Comparing agent-based models of land-use change in frontier regions. *Journal of Land Use Science*, 3, 41–72.
- Pasqualetti, M.J. (2011). Opposing wind energy landscapes: A search for a common cause. *Annals of American Geographers*, 101(4), 907–917.
- Peluso, N.L., & Lund, C. (2011). New frontiers of land control (Special issue). *Journal of Peasant Studies*, 38(4), 667–681.
- PODER. (2011). *El lado sucio de la energía eólica*. Mexico DF. Retrieved from <https://www.projectpoder.org/es/2013/09/el-lado-sucio-de-la-industria-eolica/>
- Rasmussen, M.B., & Lund, C. (2018). Reconfiguring Frontier spaces: The territorialisation of resource control. *World Development*, 101, 388–399.
- Robbins, P. (2010). *Political ecology: A critical introduction* (2nd ed.). Chichester: Wiley-Blackwell.
- Sato, J. (2000). People in between: Conversion and conservation of forest lands in Thailand. *Development and Change*, 31, 155–177.
- Schmink, M., & Wood, C.H. (1987). The 'Political ecology' of Amazonia. In P.E. Little, M.M. Horowitz, & E. Nyerges (Eds.), *Lands at risk in the third world: Local level perspectives* (pp. 38–57). Boulder: Westview Press.
- Schmink, M., & Wood, C.H. (1992). *Contested frontiers in Amazonia*. New York: Columbia University Press.
- SENER (2009, January 23). Con la energía eólica se refuerza la seguridad energética ya que diversificamos las fuentes primarias y disminuimos la incertidumbre originada por la volatilidad de los precios de los combustibles: Georgina Kessel. Retrieved from <http://calderon.presidencia.gob.mx/2009/01/con-energias-renovables-reforzaremos-nuestra-seguridad-energetica-g-kessel/>
- SENER (2016). Prospectiva de Energías Renovables 2016-2013. Retrieved from https://www.gob.mx/cms/uploads/attachment/file/177622/Prospectiva_de_Energ_as_Renovables_2016-2030.pdf
- SENER & GTZ. (2009). *Wind energy country analyses Mexico*. Eschborn: GTZ.
- Treccani, G.D. (2001). *Violência e grilagem: Instrumentos de aquisição da propriedade da terra no Pará*. Belém: UFPA.
- Tutino, J. (1993). Ethnic resistance: Juchitán in Mexican history. In H. Campbell, L. Binford, M. Bartolomé, & A. Barabas (Eds.), *Zapotec struggles: Histories, politics, and representations from Juchitán, Oaxaca* (pp. 41–61). London: Smithsonian Institution Press.
- Uharte Pozas, L.M. (2012). *Las multinacionales en el siglo XXI: Impactos Múltiples: El caso de Iberdrola en México y en Brasil*. Madrid: Plataforma 2015 y Más.
- UNICA (2018): Boletim Unica. A bioeletricidade em numeros. Julho/2018. Brasília.
- USDA (2017). *Grain Report. Brazil. Biofuels Annual 2017* (Report No. BR17006). São Paulo: GRAIN.
- USDA. (2018). *Brazil Biofuels Annual: 2018*. São Paulo.
- Warman, A. (1993). The future of the Isthmus and the Juárez Dam. In H. Campbell, B. Leigh, M. Bartolomé, & A. Barabas (Eds.), *Zapotec struggles: Histories, politics, and representations from Juchitán, Oaxaca* (pp. 101–106). London: Smithsonian Institution Press.
- Zaragocin, S. (2018). Gendered geographies of elimination: Decolonial feminist geographies in Latin American settler contexts. *Antipode*. Retrieved from <https://onlinelibrary.wiley.com/doi/epdf/10.1111/anti.12454>

- Zarate Toledo, E. (2010). La territorialización entre mareños y zapotecos en el Sistema. In S. Nahmad, M. Dalton, & A. Nahón (Eds.), *Aproximaciones a la región del Istmo: Diversidad multiétnica y socioeconómica en una región estratégica para el país* (pp. 257–285). Oaxaca: Casa Chata.
- Zarate Toledo, E., & Fraga, J. (2016). La política eólica mexicana: Controversias sociales y ambientales debido a su implantación territorial: Estudios de caso en Oaxaca y Yucatán. *Trace*, 69, 65–95.
- Zaremborg, G., Torres Wong, M., & Guarneros-Meza, V. (2018). Deciphering disorder: Participatory institutions and conflict in megaprojects in Mexico. *América Latina Hoy*, 79, 81–102.

Cited interviews and statements

Mexico:

- Contribution consulta Juchitán 1: 2015-03-04, Casa de Cultura, Juchitán de Zaragoza
- Contribution consulta Juchitán 2: 2015-03-04, Casa de Cultura, Juchitán de Zaragoza
- Contribution consulta Juchitán 3: 2015-03-04, Casa de Cultura, Juchitán de Zaragoza
- Interview CDI (Commission for Indigenous Development): 2015-03-10, Oaxaca de Juárez
- Interview EDF (Electricité de France): 2014-02-11, Mexico City
- Interview Grupo Solidario de la Venta: 2014-02-19, La Venta

Brazil:

- Interview Agrarian Secretary: 2011-6-15, Concórdia
- Interview Manager (Biopalma/Vale): 2011-6-17, Concórdia
- Interview Quilombola: 2011-6-11, Bujaru
- Interview trade union I: 2011-3-29, Acará
- Interview trade union II: 2011-6-16, Concórdia