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(Counter)mapping renewables.

Space, justice, and politics of wind and solar power in Mexico

Abstract

The ongoing expansion of large-scale renewable energies entails major spatial reconfigurations with socio-environmental and political dimensions. These emerging geographies are, however, still in the process of taking shape, meaning that their future configurations are still very much open to intervention and contestation, especially so at this relatively early stage in large-scale energy transition. While one important line of recent research highlights the prominent role that maps will play in shaping and directing such processes, the potential effects of countermapping interventions on these evolving geographies have not yet been explored. In this article, we present a countermapping initiative promoting a dialogue between critical geography, political ecology, and environmental justice. We take the case of Mexico's low-carbon development strategy to critically dissect the spatial expansion of wind and solar mega-projects at both national and regional scales. Our countermapping consists of a series of databases and maps aimed to "fill" the spaces and relations otherwise "emptied" by the State's cartographic tools. Our work is the result of an alliance between Geocomunes - a collective of activist cartographers based in Mexico- and the EjAtlas -a global collaborative project tracking cases of grassroots mobilizations against environmental injustices-. When presenting our results, we discuss the role of maps in defining a neoliberal project for the energy transition, pinpointing the spatialities of environmental injustice produced. We close our research by highlighting the role of critical cartography and countermapping in advancing a political ecology of renewable energies.

Keywords

Maps, energy transitions, neoliberalism, land, environmental justice, political ecology.

Highlights

- The political and contested character of maps is discussed for the case of wind and solar power development.
- Renewable energy maps are embedded in multi-scalar relations of power: from the global political economy to the regional politics around property and access to resources.
- In Mexico, renewable energy maps are part of larger assemblages expanding neoliberal capitalist relations in the country.
- Our counter-map shows how renewable energies are expanding through the misrecognition of territories and their socio-ecological relations.
- Countermapping unveils these dynamics, becoming relevant for political ecology analysis, but also communities facing injustices on the ground.

1. Introduction

In February 2021, the Financial Times Magazine published an 18-page piece discussing "*How the race for renewable energies is reshaping global politics*," with two global maps on wind and solar resources framing the article. As part of a series entitled "*The green gold rush*," the FT article suggests a vast untapped potential for global investors to shift their portfolios towards the emerging green economy (see: FT, 2021). Several mapping initiatives precede this publication, including global and regional assessments provided by international agencies, national laboratories for renewable energies, and a variety of think tanks. This global proliferation on renewable energy maps accompanies noticeable momentum in the expansion of renewable energies across the Global South (Bloomberg NEF 2018, 2019; REN21, 2020), as well as a concomitant emergence of local claims for justice in the low-carbon transition (Finley-Brook & Thomas, 2011; Yenneti et al, 2016; Avila 2017; 2018; Del Bene et al., 2018).

Research in human geography widely recognizes that the transition towards renewable energies is a deeply contested project in which different geographical futures are at play (Juisto, 2009; Bridge et al. 2013; Calvert 2016; Bridge and Gailing, 2020). Along with changes in the governance of natural resources and technologies, shifting patterns of energy production and consumption and other profound spatial reconfigurations are expected to take place as contemporary societies push for an energetic return to the earth's surface (Mayumi, 1991; Huber & McCarthy, 2017). With renewable energy infrastructures spatially expanding over territories across the globe, new questions arise regarding who the major movers, beneficiaries, and perhaps victims of current energy transitions are, and what the socio-ecological outcomes of such processes are on the ground (for a review, see Sovacool, 2021).

While an increased body of work is discussing the spatial dimensions of renewable energy implementation, less scholarly attention has been given to how mapping practices will become a central moment for contending the low-carbon future (for grounding explorations see: Castán-Broto & Baker, 2018; McCarthy & Thatcher, 2019). In the Global South, where rural and indigenous communities have historically claimed recognition over land rights and continue to resist enclosures and resource extraction from both States and private corporations, attention to cartography in shaping the expansion of renewable energies appears as a vital intellectual and political endeavor.

This article seeks to contribute to an emerging research agenda in the political ecologies of renewable energies, by exploring the central role of maps in the politics of the low-carbon transition. In particular, we interrogate how different cartographic representations for renewable energy resources reinforce or recreate unequal power relations at different scales. We follow recent debates in human geography to reflect on how energy system developments are spatial expressions of political-economic projects and geographical imaginaries (Calvert, 2013; Bridge, 2018) and then explore how maps shape and contest particular decarbonization pathways.

The development of critical cartography and countermapping practices provides essential context and resources for our work here. Literature in the field has strongly advanced in understanding maps as political tools producing knowledge about the world, serving specific purposes and actors (Harley, 1989; Peluso 1995; Kitchin & Dodge, 2007; Crampton, 2010). Critical analyses and practices of map-making seek to shed light on how visual representations mobilize particular understandings of space, enabling specific political-economic agendas. In this light, countermapping practices are seen as a variety of methodological and representational processes in which dominant spatial knowledge is challenged, contested, and potentially reimagined (Elwood 2006; Severin et. al., 2018; Dalton & Thatcher, 2019).

Following Wood's approach (2010) in that mapping and counter-mapping practices are situated in relation to one another (Dalton & Stallmann, 2018: 96); we discuss here two cartographic propositions around wind and solar power development in Mexico. We first provide a critical analysis around the State's cartographic tools promoting the low-emission development strategy, and then we present a countermapping initiative aiming to shed light on a variety of spatial relations otherwise ignored by such devices.

Our work is developed as a collaborative process relying on two platforms on critical cartography: EjAtlas and Geocomunes. The foundational layers of our maps were produced with Geocomunes, a collective of activist geographers based in Mexico working with communities and grassroots organizations affected by the privatization of the commons. The maps were then complemented by cases of social mobilization registered on the Environmental Justice Atlas, a platform created to document environmental injustices and struggles emerging from the expansion of different resource frontiers.

Our analysis adheres to a longstanding emphasis in political ecology, understanding the production of environmental change and injustice, as the result of larger trends in political-economy and politics of particular biophysical environments (Blaikie and Brookfield, 1987; Bryant, 1992; Watts and Peet, 1996; in McCarthy & Prudham, 2004). In particular, we discuss how broader processes of economic liberalization in the country are shaping the new geographies of energy in ways that triggers local injustice and conflict. We follow here Newell and Phillips in understanding (neo)liberalization not as an end state, but rather as a spatially and socially uneven process through which ever more areas of political life are subject to market discipline which increase the dependence on private actors for the provision of public goods (2016:39).

In critically dissecting Mexico's low-emission development strategy and "filling" the spaces and relations otherwise obscured by its cartographic tools, we highlight the political value of local struggles for environmental justice in opening alternative geographical imaginaries for the energy transition. As such, our project contributes to ongoing debates on how sites, scales and spatialities of energy systems are key contemporary sites of struggle, through which broader questions of political economic governance (and the social relations of capitalism) are being worked out (Bridge & Gailing 2020: 4).

In the next section, we provide a conceptual proposal to bridge insights between energy geography, critical cartography and environmental justice. Section three analyses the neoliberal configuration of Mexico's "low-emission development" strategy and the cartographic tools supporting such vision. After presenting our methods for countermapping, we discuss some key results of our project at both national and regional scales. Here, we emphasize the cases of Oaxaca and Yucatan to analyze both the geographies of maldistribution, as well as the spatialities of misrecognition, vulnerabilities and participation in the expansion of wind and solar power projects in the country. We conclude by discussing our countermapping insights and highlighting the future role of critical cartography and countermapping in articulating alternative spatial ontologies for the low-carbon future.

2. Theoretical background

This article engages with two strands of literature that frame concepts critical to our articulation of our countermapping project. The first explicates the idea that energy systems not only *require* space but also *produce* space. The second demonstrates that mapping practices are contingent processes in which knowledge is produced and contested. As we argue below, these insights enable a broader understanding of the political role of maps in renewable energy implementation, opening space to explore the possibilities of representing counter-hegemonic voices in the low-carbon transition.

2.1 The production of space in the low-carbon transition

Human geographers explicitly reject understandings of space as a fixed and frozen ground on which events take place or processes leave their marks (Gregory, 2009:709). Instead, research in the field explores how space is socially produced, transformed, and contested over time (May and Thrift, 2001; Massey, 2005). Space, therefore, is not a canonical grid, but the result of a constant dialectical process between society and its environment (Soja, 1980). While biophysical features condition human activities over space, human activities simultaneously intervene in the environment, producing space in multiple ways.

The production of space, it follows, is historically contingent and deeply political. Space is actively produced both materially and discursively through a series of technologies and power arrangements, becoming a field of integration and differentiation in favor of specific social groups and interests. Therefore, as much as space can sustain power, it is also subject to juxtapositions, transformations, and contestations throughout time (see Massey 2005).

In energy studies, the theoretical commitment around the *production of space* "seeks to reconnect the spatiality of energy systems with the economic, political, cultural and environmental processes around energy production and consumption" (Bridge, 2018: 13). In the energy transition, for example, new spatial demands associated with the differential power densities of renewable energy sources brings questions on how much space will be required for particular transition targets, but also how these spatial demands will produce new geographies at different scales (e.g. Bouzarovski, 2009; Zimmerer, 2011; Baptista, 2017; Pasqualetti & Stremke, 2018)

Critical to these processes, therefore, are estimations around the land demands and potential competition in land-uses and values associated with different energy transition pathways (e.g., Scheidel & Sorman, 2012; Capellán-Pérez et al., 2017). Yet one step ahead are questions around the political economic forces leading these processes, and the ways in which these spatial reconfigurations will reinforce or recreate uneven relations among geographical regions and social groups (e.g., Coenen & Truffe, 2012; Bridge et al. 2013; McCarthy, 2015; Huber & McCarthy 2017).

Of course, the modification and transformation of space through the implementation of energy systems is not a neutral process. The idea that energy systems *produce space*, rather than just 'taking' or 'being located' in space, cast our understanding of energy as a political question (Huber, 2015; 2019), and highlights that recognized prospects for new flows of energy bring together different social groups into uneven negotiations around the allocation, costs and benefits, and acceptable end uses (Calvert, 2013: 11).

Bridge et al. (2013) stress this point when thinking about the energy transition as a geographical process in which different spatial projects are at play. A low-carbon energy system, they write, can be achieved by large, remote entities (nuclear, large-scale wind and solar) and long-distance transmission lines; via local mini-grids, or through highly decentralized micro-generation" (331). These transition pathways, in sum, are ultimately spatial projects that would have largely different implications on the social and environmental spheres. These perspectives both challenge traditional conceptions of spatiality in energy problems and invite us to rethink how the dynamics of energy provision can modify and transform spaces (Castán-Broto & Baker, 2018:2)

2.2 (Energy) maps and the contested politics of representation

Critical cartography contends that mapping practices are not a neutral pursuit of science, but rather ones that are laden with power (Kitchin & Dodge, 2007). In contrast with the idea that maps *reveal knowledge* about the world, critical cartographers have shown that the process of mapping consists of *producing knowledge* about the world (Harley, 1989 cited in Kitchin & Dodge, 2007). As visual representations of space, maps produce effective abstractions over territories, favouring specific actors, interests and purposes (Wainwright and Bryan, 2009). Mapping practices thus are the result of a series of decisions in the selection, analysis, and representation of the information used to make them, by those who make them.

To say that maps are political implies that maps are useful means to organize and produce particular knowledge about the world. Yet, it also follows that such knowledge is situated within specific relations of power that are subject to change across time (Crampton 2010). Maps are, thus, propositions (Wood, 2010) in which specific assumptions about space shape particular narratives and actions over territorial management and control (Castán-Broto & Baker, 2018). What stems from such lenses is that spatial representations are not a neutral or objective act of cartography, but instead are part of larger assemblages and political choices (Li 2014; Fogelman and Basset, 2017).

The centrality of maps in the low carbon transition resides in the fact that those having access and control over lands will have access and control over the flows of energy (see: Ribot and Peluso, 2003: 157). This draws attention to how cartographic representations deal with aspects of property and tenure in rural lands, but also with how such exercises integrate or disintegrate territorial relations of social and environmental nature.

Relevant to these concerns are analysis on how states and capital “come to see and know about land” (a review in: McCarthy & Thatcher, 2019). The work of Tania Murray Li (2014) around maps and developmental narratives appears here as particularly relevant. In dissecting international trends around acquisition and development of lands in the Global South, Li highlights the central role that maps play in rendering land as socio-technical objects, subject to negotiation and investment. Maps – along with laws, statistics, categories and story lines – work together as “inscription devices” in which land is assembled as a resource, making it available for specific actors, interests and intentions.

As Li argues, assembling land as a resource implies a great deal of symbolic work, making it available for some purposes while excluding others. This process entails a simultaneous movement "of erasure and reimagination, such that these spaces are simultaneously emptied and full" (Bridge, 2001: 2155). As such, land and other strategic resources become "geographical features" that potentially overlie, overlap or even obliterate other geographical features such as agricultural plots, indigenous territories, water sources, grazing grounds or customary property of political boundaries (Lohman, N/D).

In tune with such observations, recent research highlights that the expansion of renewable energy infrastructures across the developing world is facilitated by specific representations of territories as “unproductive” and “empty” leading to variegated forms of enclosures, land grabs and territorial dispossessions (Baka 2014; 2017; Rignall 2016; Yenetti et al, 2016). In a mirrored yet distinctive fashion, McCarthy & Thatcher highlight how contemporary politics of development permeate over mapping renewable energies, producing “spectacular visualizations” around the abundance of resources on/above lands, strongly implying that these resources will be effectively “going to waste” until or unless it is developed. What stems from such particular inscriptions is that, in the making of such spatial representations, many other features of the land become erased: from in-place land uses such as natural medicine and subsistence farming, to other cultural values that are incommensurable with those assigned by investors (see also: Martinez-Alier, 2002; Nalepa and Bauer, 2012. Baka, 2013).

While there is a wide methodological heterogeneity around mapping practices and the outcomes they produce, these insights suggest that dominant mapping practices identifying energy resources tend to reinforce notions of *absolute space*, in which the socio-ecological relations of place are obscured (Castán-Broto & Baker, 2018). In accepting the notion of absolute space, "energy maps become tools for the naturalizations of specific propositions about the availability of resources, the most appropriate provision systems, or the distribution of demands (…)" (5). Yet, when looking at the energy transition as geographical process, a diverse range of spatial conceptualizations and cartographic representations might be at play.

2.3 Counter-mapping renewables: bridging critical cartography and environmental justice

Challenging dominant spatial orders in the ongoing expansion of renewable energies necessarily involves exposing the politics of mapping and the data that is bounded to them (McCarthy and Thatcher, 2019). Yet, and more critically, the emergent political ecologies of renewables also involve diving into the multiple possibilities of countermapping practices, to "foreground socio-ecological relations, spaces for political action and justice" (Castán-Broto & Baker, 2018).

Critical cartography, in general, and countermapping in particular are seen as powerful interventions to counterbalance dominant constructs of spatial knowledge (Elwood 2006; Iliadis and Russo, 2016; Schuurman and Kwan, 2004). These exercises contend that if maps actively produce knowledge and exert power, they can also be a powerful means of leading to social change (Crampton 2010; Drozdz, 2020).

Countermapping initiatives take many different forms in different cultural and political situations (Dalton & Stallmann, 2018: 96). Harris and Hazen (2005: 115) define countermapping as "any effort that fundamentally questions the assumptions or biases of cartographic conventions, that challenges predominant power effects of mapping, or that engages in mapping in ways that upset power relations." As such, countermapping practices can mobilize a variety of purposes and materialize in a variety of forms, producing counter-hegemonic forms of knowledge and representations about the world (Cobarrubias, 2010; Severin et. al., 2018; Dalton & Thatcher, 2019; Drozdz, 2020).

With this countermapping project, we work through the appropriation of geo-spatial technologies to produce alternative spatial representations around the expansion of wind and solar power projects. In particular, we seek to unveil the spatial juxtapositions between mega-corporate energy projects and different territorial dimensions of rural Mexico. Our ultimate aim here is to provide counter-hegemonic knowledge around the new geographies of energy, articulating and amplifying claims for socio-environmental justice in the low-carbon transition.

The connections between critical cartography and environmental justice are certainly not new. From its origins, Environmental Justice has developed as a community-led science emphasizing how environmental injustices are unequally distributed across space and across society simultaneously (e.g. Bullard, 1993; 1999; Pellow 2005; Mohai et. al, 2009). Building on such perspectives, we emphasize here the *spatialities of environmental justice* (Walker, 2009), extending the understanding of what justice means and how it is reclaimed. Following Harvey's (1996) argument that "justice and geography matter together" (629), Walker points out that the politics of space are significant for EJ in two ways. First, in the ways that environmental injustices are produced, and second, in the ways in which claims for justice are put forward through different means and in different contexts.

The spatialities of environmental injustice include well-established articulations on the unequal spatial distribution and disproportionate proximity of risks and impacts of specific investments. However, it goes beyond this approach by introducing nuanced understandings on the spatialities of participation, recognition, responsibilities and vulnerabilities that are produced and contested in specific contexts and time frames. In response to such processes, Environmental Justice research and activism is progressively leveraging the spread and accessibility of spatial media (such as GIS), which is providing new strategies and resources for questioning, confronting and reestablishing the legitimacy of peoples' claims (see: Elwood and Leszczynski, 2012), including those revolving around energy and the climate (e.g. EjAtlas Featured Map on Blockadia; Fracktracker Alliace).

Our countermapping project stems from such concepts and practices and develops an alliance between two platforms on critical cartography: Gecomunes and the Environmental Justice Atlas (from now on the EjAtlas).

The EjAtlas is a collaborative initiative promoting the co-production of spatial knowledge around claims for environmental justice. The EjAtlas understands conflicts as mobilizations by local communities against particular economic activities whereby environmental impacts are a key element of their grievances" (Temper et.al 2018). As a project on critical cartography, the EjAtlas works as a shared platform, repository and database in which researchers, activists and communities contribute to filling cases of environmental justice struggles across the globe. The platform provides a concise and codified structure to systematize stories of struggle, constituting the largest existing inventory of claims for EJ (with 3,448 cases documented by May 2021). This methodology allows it to go beyond the "case study-based approach" of most political ecology and EJ literature, providing a useful research tool to identify patterns, reveal relationships among multiple cases and actors, and describe how such conflicts are shaped by the larger political economy (Temper et al., 2018. See also: Robbins, 2014).

Geocomunes is a collective that works in Mexico with communities and researchers to systematize information on processes of privatization and dispossession of the commons. It produces bottom-up maps to support peoples, grassroot movements and organizations in building maps about specific investments and infrastructures, while making claims for social and environmental justice. The cartographic information produced by the Collective aims to prevent injustices and strengthen local organizational processes and strategies- be it knowledge production, media dissemination, or legal grievances. The cartographic information produced by the Collective is available in different formats (e.g. shape and google earth) for its usage with free-software (QGis). As an initiative on critical cartography, the outcomes produced by the Collective are also sought in support of critical analyses of the spatialization of capital, and of the local strategies mobilized to defend the integrity of territories (e.g Geocomunes, 2019 a,b).

3. Mexico: unpacking the “low-emission development” strategy

Since 2008, Mexico has become a leading country in implementing large-scale renewable energy projects, particularly of wind and solar power, through a comprehensive set of climate change laws, energy policies and development programs. Three main drivers have been shaping this process. First, a discursive component framing “low-emission development” as a project to propel market-oriented and private-led transition towards renewables. Second, a set of liberalization reforms enabling private participation in both land acquisitions and the electricity sector. Third, the production of geographical information rendering rural territories legible to investment in the sector.

Previous studies have discussed how the neoliberal agenda in Mexico is playing a fundamental role in the expansion of renewable energy projects (Avila-Calero, 2017). In its more general terms “neoliberalism combines a commitment to the extension of markets and logics of competitiveness with a profound antipathy to all kinds of Keynesian and/or collectivist strategies” (Peck and Tickel, 2002). As a complex assemblage of theoretical propositions, institutional practices, and specific class alliances, neoliberalism is better understood as *a process* that diffuses globally and configures itself in different spatial and temporal scales (Peck and Tickel, 2002; McCarthy & Prudham, 2004; Glassman, 2009). In what follows, we highlight how neoliberal processes in Mexico shape the low-emission development strategy, defining how renewables are promoted and spatialized throughout the rural landscapes of the country.

3.1 The discursive component

In the Mexican state’s narrative, low-emission development is conceptualized as an economy that grows sustainably, is competitive, and is socially inclusive, especially for the most vulnerable (NCCS, 2013). The “low-emission development” vision is articulated in a strategy with short-medium- and long-term objectives, placing “an accelerated transition towards clean energy sources" as one of its basic axes. Practically speaking, this translates into a set of goals to reach a share of at least 50% of clean energy sources in the national electric sector by the year 2053.

Low-emission development is articulated through a vision in which private capital plays a critical role in accelerating the opportunities of renewable energies, covering for high initial investments costs and overcoming the inefficiencies of public management. As stated in its National Climate Change Strategy, "Mexico has a great potential in energy generation through clean and renewable sources, and even when new possibilities have emerged for the exploitation of such resources with the participation of the private sector, such mechanisms have not been enough." The strategy therefore aims "(…) to focus efforts in overcoming the main barriers that have stopped the complete immersion of renewable energies into the national energy system" (NCCS, 2013: 49).

This narrative was further articulated with the Energy Reform (2013), which established that "(…) the slow phase in which the country is transitioning from fossil to renewable energy electricity production largely responds to the exclusivity of the Federal Commission of Electricity (CFE) to provide the public electricity service (…) that was preventing to develop at "maximum speed" the potential sources to generate low-cost electricity." (SENER, 2013: 20).

3.2. The regulatory component

Through the narratives of public inefficiency and urgency, the Energy Reform established a new model in the electricity sector in which planning and control are still done exclusively by the nation, but opportunities are opened for private capital in the generation, transmission, distribution, and commercialization of electricity (SENER, 2013)[1]. Changes in the electricity sector established by the Energy Reform have largely defined the ways in which renewable energies will increase their participation in the

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[1] The Reform included measures to promote private participation in the renewable energy sector, such as: 1) Allowing private capital to finance, install, maintain, manage and operate transmission and distribution lines interconnecting regions with high potential on renewable energy resources. 2) Allowing private companies to generate and commercialize electricity through a Wholesale Electricity Market, including measures for "qualified users" to participate into the "self-supply scheme" -investing in renewable projects and consuming large amounts of electricity from such market. 2) Creating a Clean Energy Certificate Program in which all the electricity providers and qualified users should comply the proportion of clean energies established by the SENER.

national energy mix. These measures, however, have only been possible due to the previous liberalization of rural lands in Mexico.

The Agrarian Reform enacted in 1992 established constitutional changes to transform communal tenure regimes regulating land across the country. This reform enabled drastic changes to *ejidos*, founded after the Mexican Revolution, and *agrarian communities*, indigenous institutions, by allowing their collective owners to legally sell, lease and subdivide[2] the communal land rights which were obtained after decades of social struggle (Rivera-Herrejón, 2007). In practical terms, the Agrarian Reform represented the end of land distribution processes initiated in the country after the 1917 Constitution and more than eight decades of state protection over peasants and indigenous livelihoods (Toledo, 1996). As a result, this Reform has also triggered a progressive suppression of communal autonomies in the use and management of natural resources (Merino, 2006).

An essential mechanism facilitating such processes has been the cadastral survey promoted by the State, also known as PROCEDE. While in the State's discourses, such program would benefit communities by providing certainty and protection to their land rights, PROCEDE has been key in enabling land transactions required for a variety of private investments to take place (Maldonado, 2010). While in some regions, communities contested the Agrarian Reform by denying their participation in the cadaster (De Ita 2003), PROCEDE has succeed in practice. The progressive erosion of communal tenure is evident not only in the great number of land transactions that have materialized since the implementation of the program, but also in the complex political dynamics unfolding between local elites, communities, and corporations seeking to invest in such lands (Fernández-Moya, 2012).

3.3 The cartographic component

[2] By registering common lands into the cadaster, communities have been allowed to divide common property into three different figures: land plots for community uses, land plots for individual uses (also known as parceled lands), and land plots for human settlements.

In resonance with the discourse and regulations supporting the low-carbon development strategy, the Mexican Energy Secretary (SENER) developed two cartographic platforms on renewable energy resources: the National Inventory of Clean Energies (INEL) and the National Atlas of Zones with High Potential for Clean Energies (AZEL).

The INEL provides cartographic information on the potential and ongoing development of clean energy resources to produce electricity. It is an online platform with national maps for solar, wind, geothermal, tidal and biomass potential; as well as an inventory of projects operating and in construction phases. According to its official description, the INEL is a vital tool to facilitate information to investors; promote research to harness renewable sources; measure the role of renewables in expanding the electric sector (particularly through the self-supply scheme); and support public decision-making processes.

The INEL is financed by the Mexican State, yet a diverse set of public and private organizations appear to be involved in the construction of the platform and its databases. As such the INEL involves a new governance scheme, in which non-state actors increase their influence in public matters (see: McCarthy and Prudham, 2003). This network includes the participation of foreign corporations, international development agencies, foreign scientific agencies and corporate associations. For example, the National Renewable Energy Laboratory (NREL) directed by the United States Department of Energy, works in alliance between the Mexican State and USA public agencies developing a Geospatial Toolkit with technical information to develop large-scale wind power projects (Elliot et al. 2004; NREL, 2005).

A similar alliance between the Mexican Government and US agencies is reflected in a document of public access, in which a series of recommendations for attracting investments in the renewables sector are highlighted. These include the importance of defining *priority zones* to develop large-scale facilities, and of identifying the major barrier that comes with access to rural lands (Watson et. al, 2015).

The AZEL has been developed in a seemingly resonant way. This platform provides a series of interactive maps identifying regions with different potential to develop large-scale projects. What differentiates AZEL is that the platform includes a set of layers for evaluating “areas of exclusion” following technical-economical; environmental; social; and associated risks. Yet, and as further discussed below, both INEL and AZEL provide inaccurate, disconnected, or even absent information on some key aspects of space and the socio-ecological relations within. While these initiatives might be well-intended, their top-down approach exemplifies the problem with cartographic tools that display an "over-reliance on broad, technical solutions with insufficient engagement with the social, contextual issues of a particular place and time" (Dalton & Stallmann, 2018: 95).

4. Countermapping aims and methods

Countermapping practices take the tools of institutional map-making at government agencies and corporations and apply them in situated, bottom-up ways (Dalton & Stallmann, 2018:93). Our project took this premise as a guiding principle, intending to collectively define a set of purposes for both critical research and grassroots activism. As an iterative process, our initiative was developed in different stages. Key initial questions for our project revolved around how the INEL-AZEL hinders or empowers local communities in the spatialization of renewable energies. In this process, we identified that while Mexico State’s cartographic tools are of public access, they provide inaccurate, disconnected, or absent information on key dimensions of territories. In particular, we identified the following aspects:

INEL

- The information available is not updated and provides inaccurate locations of projects, hampering any attempt for a citizen tracking of renewable energy expansion.
- Renewable energy projects are only represented by points. There is no georeferenced information available on the polygons occupied by such facilities, obscuring their

intersections with relations and variables such as tenure, property, populations and livelihoods.

- The platform lacks data on specific companies, investors and end-users of electricity produced, with no possibilities for addressing corporate accountability and concerns around inequalities in energy access.

AZEL

- No layers for communal property and their subdivisions.
- Indigenous groups are only recognized by layers indicating states with a majority of such populations, with no further details available at municipal localities.
- No layers included for Areas of Importance for Bird Conservation, nor further information on the territorial management strategies of specific regions.
- Absence of land uses and vegetation cover.

In response to such concerns, we sought to develop a national-scale cartographic database to reverse the means, purposes and uses of renewable energy mapping. By reflecting on *how geographic knowledge is produced, what are the motivations and what uses will serve*, we defined three main purposes for our project. First, to provide open-access cartographic information for grassroots movements and engaged scholars actively articulating counter-hegemonic debates around the energy transition in the country. Second, to make visible some of the key socio-ecological dimensions of territories that are so far obscured by the INEL-AZEL (land tenure, land uses and land cover where projects are/will be sited). And third, to develop a participatory process with organized communities in order to make visible cases of local injustices produced by the spatialization of renewables under the low-emission development strategy.

The process of gathering and analyzing data was carried out in four different stages (Table 1). Stages 1-3 of show that much of the information was gathered from government sources themselves. Our purpose here was to condense information that is otherwise scattered in different databases and permits produced by different Ministries; but mostly, to make visible the cartographic information that is so far absent in the INEL and AZEL. In the case of Stage 4, our work was conducted in alliance with local activists and researchers engaged in local mobilizations against the injustices produced by the expansion of wind and solar investments. Each case of conflict is published in the EjAtlas, including detailed description of the case, features of the project triggering conflict, perceived and potential impacts, affected populations, actors mobilizing, and outcomes of the conflict. The Ejatlas has its own standardized methodology in which cases are revised by an internal board and stakeholders assuring accuracy before its publication (further details in: Temper et.al. 2015; Temper et.al. 2018). Each case included is this text is referenced as *Ejatlas, year* and all authors are listed in the reference section.

TABLE 1: MATERIALS AND METHODS

Stage	**Purpose**	**Sources**	**Outcome**
1	Identifying wind and solar power investments across Mexico Systematize the information available from 2008-2019	-National Inventory of Clean Energy (INEL) -Permits issued by the Energy Regulatory Commission (CRE) -Environmental Impact Assessments (EIA) issued by the Ministry of the Environment (SEMARNAT) -Mexican Association of Wind Power (AMDEE) -Mexican Association of Solar Power (ASOLMEX).	A list with a total of 150 projects on wind power and 243 on solar power. The list includes all the projects operating, under construction and planned until the end of 2019.
2	Georeferencing the projects. Map coordinates and polygons for each of the projects identified.	EIA and CRE permits	A national map with all the projects identified
3	Building an attributes table in GIS with 26 variables for all the projects identified	-EIA and CRE permits -National Agrarian Register (RAN) -National Institute of Statistics, Geography and Informatics (INEGI)	A comprehensive database with: 1.-Technical and financial information of projects 2.-Details of companies involved 3.-Resolutions of regulatory procedures 4.-Land tenure and land use change.
4	Tracking cases of environmental injustice by identifying conflicts emerging against wind and solar power projects in Mexico.	Documents from activist and civil society organizations, newspaper articles and official documents from companies, governments and investors.	Georeferenced sites of conflict, standardized information on the perceived impacts, actors mobilizing, claims and outcomes of conflict.

In addition to the insights analyzed in this article, our cartographic database is available via a variety of outlets. This initiative is working as the backbone for an interactive map available on the Geocomunes website. The interactive map enables different users (citizens, communities, grassroots movements, and researchers) to access comprehensive information around the spatialization of energy infrastructures (from production to consumption ends), with the possibility to scale down into different regions. With such a tool, several sub-projects are being held to produce regional maps in alliance with organizations concerned with the expansion of wind and solar power projects in particular localities. As a parallel process, the continual documentation of environmental justice movements around wind and solar power projects in the EjAtlas is being enhanced with these regional maps, which are integrated into the EjAtlas entry as part of the visualization of injustices. In what follows, we present some relevant insights into our initiative at both national and regional scales.

5. Countermapping insights

5.1 The emerging geographies on wind and solar development

In tune with the narratives of the low-emission development strategy, the expansion of wind and solar power investments in Mexico has been accelerated through the consolidation of economic liberalization policies, particularly after the Energy Reform and the promotion of auctions in the sector. Under this new regulatory system, Mexico has reached a total installed capacity of 5,847 MW of wind power and 5,859 MW of solar power (2019).

The roll-out of wind and solar power in Mexico has followed a pattern of saturating regions with high potential to develop large-scale, private-led facilities. These emerging geographies are favoring an increased concentration of rural lands and the control of renewable energy production in favor of private developers, with only 15 multinational companies holding the great majority of projects[3].

Maps 1-4 highlight the spatialization of mega wind and solar power projects across the country. In our counter-map these national maps work as a compass, making it possible to track where market capitalism is “creatively” expanding across the country, to then explore what type of spatial rearrangements are produced at local scales. We are here

[3] This list is leaded by Enel Green Power (holding 4577 MW of the total installed capacity in wind and solar), Iberdrola (2617 MW), Acciona (1914 MW), Engie (1466 MW), and Actis/Zuma (1466 MW).

particularly interested on how these new energy geographies juxtapose with local landscapes, people, and resources (see: Massey 2005; Radcliffe, 2007), and how such interactions reinforce or recreate histories of exploitation and injustice.

MAPS 1-2

WIND POWER: OPERATING AND PROJECTED CAPACITY PER STATE (MEXICO 2019)

MAPS 3-4

SOLAR POWER OPERATING AND PROJECTED CAPACITY PER STATE (MEXICO 2019)

Juxtaposition with common lands

Land tenure is one of the key aspects in the implementation of renewable energies, yet these elements are so far absent in the INEL and AZEL platforms. Data gathering and analysis conducted in our project show, however, that a great proportion of wind and solar power projects are and will be allocated in communal lands (Figure 1). In the case of wind power, almost half of the operating facilities already operate in communal lands, while in the case of solar power these numbers are expected to increase as granted projects start to be developed.

FIGURE 1.

LAND TENURE IN WIND AND SOLAR PROJECTS (MEXICO 2019)

Leasing contracts for wind and solar projects allocated in communal property require formal procedures with communities holding land titles. This includes provisions to protect communal instances of decision-making, where *ejidos* and *communidades agrarias* must approve the leasing of lands through the participation of *asambleas duras:* 75% of the electoral register (LIE, 2014). However, a growing number of leasing contracts for wind and solar have been formalized through the approval of only some local representatives, reviving the long-lasting struggles for agrarian justice in the country (Aguilera-Hernández, 2018).

Once contracts are activated, a deep restructuring over lands is at stake. Leasing contracts for wind and solar projects allocated in communal property are granted for 30 years, with the possibility of extending corporate rights for an equal second period. While in letter lands continue to be owned by the community, these long-term contracts translate into partial or even *de facto* privatizations, where access and control of lands and their resources shifts in favor of large corporations. Such power reconfigurations over space, in turn, progressively disarticulate communal instances for decision-making and hamper the political participation of communities in envisioning alternative geographies for the energy transition.

Juxtaposition with land uses and land cover

The spatialization of renewable energies under the Low-emission development strategy is driving important changes on the land uses and cover across the country. The fact that these territorial dimensions are obscured by the INEL-AZEL platforms is not minor. Agricultural, pastoral and other land uses, on one side, and the conservation of vegetation cover, on the other, are fundamental in protecting indigenous livelihoods and providing regional climate resilience. Hence an erasure of such elements would jeopardize the material, symbolic and political representation of indigenous and rural communities in a low-carbon future (e.g., Corbera et al. 2017; Whyte, 2020).

FIGURE 2.

PROJECT AREA AND LAND USE CHANGE OF WIND AND SOLAR INFRASTRUCTURES

(OPERATING AND PLANNED. MEXICO 2019)

FIGURE 3.

LAND COVER ON WIND AND SOLAR POWER PROJECTS

(OPERATING AND PLANNED MEXICO 2019)

Cartographic data retrieved in our project shows that the production of new energy geographies in the country is restructuring rural territories without further integration on land cooperation and conservation schemes (Figures 2-3). This is particularly relevant for the case of solar power production, where large-scale infrastructures tend to have direct and indirect land demands that juxtapose with different landscapes and resources. Shifts in agricultural uses and land cover for solar power raise concerns on how such territorial shifts are taking place in favor of large energy corporations, without integrating concerns around local livelihoods and ecosystems.

Wind power projects, in turn, tend to entail larger land demands, yet have fewer direct impacts due to the distribution of turbines across large territories. While the technical aspects of wind power provide direct opportunities for land coordination, these provisions require further regulations and more inclusive approaches that are absent in Mexican regulations.

As we further discuss in our regional examples, the absences and erasures of the Low-emission development strategy matter. Rather than reading such omissions as faults of the strategy itself, these are better seen as part of a technocratic approach to render territories available for both investments and development programs (Li, 2014; McCarthy & Thatcher, 2019). In rendering land investable in such ways, however, the Low-emission development strategy seems to jeopardize the very will to promote a sustainable and inclusive future for the most vulnerable (see also: Li, 2007).

5.2 Oaxaca: the wind power map is not the indigenous territory

The Isthmus of Tehuantepec, located in the coast of the State of Oaxaca, was the first region in Mexico to experience a rapid expansion of large-scale wind power projects. Plans to install an ambitious wind power corridor in the Isthmus started to be articulated since the 1990s, with technical studies highlighting the remarkable potential of the region to implement commercial wind farms (see: Elliot et al, 2004).

Early mapping efforts to develop the wind power corridor largely ignored the complex configuration of land tenure and indigenous struggles for autonomy that have characterized the region in the last century. Maps 5-6 show that technical studies mobilizing a powerful visualization of wind flows in the Isthmus was followed by a regional map in which the territory was distributed into different land plots assigned to energy investors. This latter map, produced by the then Government of Oaxaca, was part of a larger process of internal negotiations between the State's representatives and energy corporations, where the rights of indigenous communities were largely ignored, with a few exceptions of informal meetings with some landowners (as documented in: Oceransky 2010, SEGEO n/d).

MAPS 5-6

TECHNICAL ASSESMENT OF WIND RESOURCES.

DISTRIBUTION OF LAND PLOTS FOR ENERGY CORPORATIONS

While wind power in the region has since then been promoted as a win-win formula for rural communities, state' agencies and private investors (Howe et. al, 2015), the cartographies promoting the wind power corridor have been instrumental in the dispossession of both indigenous lands and resources. In over just a decade (2008-2019), the expansion of wind power projects in the Isthmus matured to take on its ambitious character as a corridor, triggering a long-lasting mobilization of *Zapotec* and *Huave* communities, denouncing the *dispossession of the territory* and new forms of green *colonialism* (details in: EjAtlas, 2020d; APIITDTT/UCIZONI 2013; CDHT 2008).

As observed in Map 7, wind power projects in the Isthmus are located in both lands under agrarian dispute and lands under common property regime (including subdivided plots for community use and parceled plots for individual farming). Our data indicates that 67% of the surface occupied by wind power projects are lands under agrarian dispute. These lands have been historically considered as the commons of *Zapotec* communities who explicitly refrained from registering in the PROCEDE program. Local elites, however, maintained a *de facto* control over such lands, enabling an obscure process of individual negotiations with wind power companies (Alonso and Mejía, 2019).

The remaining surface occupied by wind power facilities coincides with registered communal lands. Negotiation between wind power companies, communities and holders of individual parcels have, however, been shadowed by illegal means, as denounced by local organizations (Forum, 2005; Oceransky, 2010; Juárez and León, 2014).

MAP 7.

WIND POWER, LAND TENURE AND CONFLICTS IN THE ISTHMUS OF TEHUANTEPEC

The overlapping institutions – formal and informal – regulating land tenure, and the intervention or omission of State authorities in such processes, have shaped the rollout of wind power projects in the area. The misrecognition of indigenous territories in the production of wind power maps has consequently been followed by the lack of participation of communities in envisioning and managing wind power infrastructures in their territories.

The mobilizations of *Zapotec* and *Huave* communities have relied strongly on pre-existing institutions of communal decision making, articulating multi-scale geographies of resistance (see: Walker, 2009). At a regional scale, communities have been organizing through different Assemblies that challenge the wind power corridor in its integrity by articulating common strategies and narratives against the large-scale transformation of the territory (see: APIIDTT, AODTT). Discourses mobilized at a regional scale denounce that land acquisitions have taken place both through the lack of proper consultation processes, and through the illegal signing of individual contracts between local elites and companies (EjAtlas, 2020d). Yet, these narratives have also strongly emphasized the uneven distribution of benefits in wind power production, as 75.8% of operating facilities are granted to provide electricity to large industries[4], while average rent per hectare largely differs from those registered in other countries (see: SEGOB, n/d, Manzo, 2019).

[4] The main industries include mining, cement, industrial food produces and retailer. Details in: Geocomunes, 2017.

The multi-scalar dynamics of resistance against the wind power corridor has led to different political processes in different localities across the region. For more than 13 years, communities in the Isthmus have organized mobilizations in different municipalities, most of them in the form of confrontations, blockades and barricades (Castillo, 2011; Howe et.al, 2015; Dunlap, 2017 a,b). Map 7 highlights the case of San Dionisio del Mar, located in the coastal bar, as a paradigmatic case of struggle in this regard (Ejatlas, 2017a). San Dionisio was targeted to deploy one of the largest wind farms of the corridor and granted to supply electricity to large multinational companies operating in the country. Multiple stages and forms of mobilization where triggered by the lack of procedural justice in the planning of the project and the leasing of land by the *Mareña Renovables* company.

The San Dionisio case became key as community resistance achieved to stop the construction of the project, triggering larger debates on the politics of the transition. As documented elsewhere (Avila-Calero 2017), the political character of local struggles against corporate wind power evolved into the proposal to implement a cooperative scheme to deploy wind power in the Ixtepec community (Ejatlas, 2017b). While the cooperative was not granted by the government in turn, it nevertheless illustrates that the contested geographies of wind power in the region have continuously pushed towards counter-hegemonic visions around territories and energy provision.

5.3 Yucatan and the Mayan bio-cultural territories

Since the launch of renewable energy auctions in 2015, the State of Yucatan became one of the most attractive spots for wind and solar investments in Mexico[5]. However, the features of the region also make it particularly vulnerable for the expansion of industrial-scale renewable energies. Despite omissions of INEL-AZEL platform, Yucatan has the second largest extension of rainforest in the country, and is the ancestral territory of *Maya* communities, who hold communal lands and the institutions deriving from them. Yucatan is also a state with great biodiversity, with a unique hydrological system of *cenotes* and mangrove areas.

[5] By the end of 2019 the state of Yucatan has 2 wind power projects operating, 12 under construction or planned and 3 suspended. In addition, Yucatan has 1 solar power project operating, 10 under construction/planning, and 2 suspended.

Countermapping these dimensions of territory was conducted in alliance with organizations currently mobilizing a variety of territorial concerns involved in the spatialization of projects. Map 8 indicates that, by the end of 2019, 45% of the surface covered by wind power projects in this state are located in forestlands and 53% of the surface covered by projects are located in common lands. For the case of solar power projects, numbers are even higher, as 86% of the surface covered by projects in the state are located in forestlands and 19% of these facilities are also located in common lands. This data indicates that percentages of land use change in Yucatán surpass national averages for all criteria considered[6], highlighting that the region is experiencing a disproportionate burden in the spatialization of the low-emission development strategy.

MAP 8.

WIND AND SOLAR POWER IN YUCATAN

Local responses to the ongoing expansion of wind and solar power highlight the territorial dimension that compounds both agrarian controversies and threats to biocultural conservation (details in Maps 9 and 10). Different actors such as community assemblies, civil society organizations and scientists are leading such responses by stressing the lack of proper consultation processes following the ILO 135 Convention and national regulations, the lack of unified and transparent processes for both Environmental and Social Impact Assessments (EIA and SIA), as well as the increasing need for an integral and democratic approach defining the transition agenda (detailed information in: Sánchez et.al, 2019).

Regarding the agrarian question, our countermapping tool highlights that the expansion of wind and solar power has presented similar patterns as to those observed in the Isthmus. As speculation on land increases with renewable energy auctions, community institutions become highly exposed to external pressures and internal divisions. In addition, some communities and individual landholders have signed leasing contracts

[6] National average of wind power projects located in forestlands is 11% and common lands is 35%. National average of solar power projects located in forestlands is 5.4% and common lands is 38%.

without proper information on the nature of projects and their distribution of risks and benefits. Local groups denounce a strong presence of intermediaries (*coyotes*) who are manipulating community and individual decisions in favor of illegal leasing contracts, affecting access and control over lands for 30 years or more. Local protests highlighted in Map 9 and documented in the EjAtlas provide examples in this regard, including the Chicxulub wind power project and the Ticul solar power project (Ejatlas, 2019a; Ejatlas, 2019b).

Increasing responses to these territorial dispossessions are led by *ejidatarios* and members of *Maya* indigenous communities organized through assemblies. The most visible face of such collectives is the *Asamblea Múuch Xíinbal*, which emphasizes land as the central axis for sustaining both livelihoods and the continuation of *Maya* traditions. With a direct learning process from the Assemblies in the Isthmus, *Múuch Xíinbal* clearly specifies that "the land is not for sale or rent", suggesting that collective institutions are vital for the protection of their lands and cultural identities (ADTMMX, 2020; López-Gómez et.al, 2019).

In terms of the biocultural conservation, our countermapping sheds light on the varied dimensions obscured by the State's cartographic tools. Civil society organizations and local scientists are providing systematic analysis of Social and Environmental Impact Assessments, highlighting their structural deficiencies and demanding revisions before projects are constructed. Concerns regarding SIAs include the explicit misrecognition of communities that will be affected by both the siting of facilities and the transmission lines associated with them (Tizimin Project in Map 9, Ejatlas 2020a). In a similar vein, concerns over the EIAs are observed in the case of wind power projects located along the coastline (Map 9). As detailed in the case of the Chicxulub Wind Power Project (Ejatlas 2020b), these facilities are to be sited, despite these lands being both mangrove and bird conservation areas.

MAP 9

WIND POWER IN YUCATAN: AGRARIAN AND BIOCULTURAL ASPECTS

The increasing socio-ecological vulnerabilities claimed by local groups are also observed in the case of solar power. Map 10 shows the scale of deforestation triggered in the region by illustrating in detail the Yucatan Solar Project (South of Map 10). In this case, *Asamblea Múuch Xíinbal* and other supporting organizations claimed irregularities in the EIA and SIA documents, including the misrecognition of the forest, the cenotes and their bio-cultural importance; as well as the erasure of nearby localities in the social impact assessment (Ejatlas, 2020c). While this project has been successfully suspended, Map 10 serves as a visual tool for local communities showing that the forest is already deforested and similar impacts could be trigger with the Uyama Solar Project (Northwest of Map 10). Communities and organizations using these maps claim that impacts over local ecosystems will be cumulative, affecting larger time and spatial scales (see: Sánchez et.al, 2019).

MAP 10

DETAILS ON SOLAR POWER AND DEFORESTATION IN YUCATAN

6. Conclusions

In this article, we analyze the central role of maps in shaping and contesting the low-carbon future. In particular, we explored one of the multiple possibilities of critical cartography and countermapping practices in contributing to a new research agenda on the political ecologies of renewable energies. Previous work has explicated how maps become tools of political power to secure dominant spatial orders when dealing with energy matters (Castán-Broto & Baker, 2018; McCarthy & Thatcher, 2019). We build upon such insights to integrate the perspective of countermapping into the debate. We argue that, as crucial as it is to dissect hegemonic mapping practices in the energy transition (their underlying interests, representations, and outcomes), it is as important – and arguably more consequential – to also \ counteract such practices by reworking the uses, means, and ends of mapping in relationship to the low-carbon future.

The political role of maps in shaping the expansion of renewable energies turns particularly relevant for countries in the Global South, where energy regimes have been shaped by histories of colonization, state-led development, and market-oriented liberalization (see: Power et. al, 2016). This goes in hand with the development of cartography in general, as a practice inextricably interwoven with colonial and capitalist spatial orders (e.g., Li 2014; Ferguson 2014; Rignall, 2016). As an increasing number of studies unveil, many historical trajectories, forms of action, and environmental consciousness that are central to the "developing world" are re-emerging in the face of the mega wind and solar power expansion (Avila, 2017; 2018; Del Bene et.al, 2018; Temper et. al, 2020). This calls for new forms of critical and radical mapping practices that center 'Indigenous land and life' at the forefront of any debate for a just transition (see: Rose-Redwood et al, 2020: 153; Whyte; 2020).

Our countermapping project echoes long-standing traditions in political ecology, understanding processes of environmental change and injustice as embedded in multiscalar relations of power: from global trends in political economy to national and regional politics around the property and access to resources (Blaikie and Brookfield, 1987; Bryant, 1992; Watts and Peet, 1996; Ribot and Peluso, 2003; McCarthy & Prudham, 2004). In taking the case of Mexico as a case of praxis and analysis, we situate the implementation of renewable energies in the broader process of economic liberalization that undergoes in the country and many others contexts of the Global South (Cupples et. al. 2011; Baker et. al, 2014; Power et. al, 2016; Newell & Phillips, 2016; Furnaro, 2020). Throughout our work, we show that, in the case of Mexico, the energy transition is mobilized through a series of inscription devices (Li, 2014) -

discourses, regulations, and cartographic tools- working to maintain and expand the socio-spatial order necessary for the functioning of markets (Bryan, 2012).

When tracing the expansion of wind and solar power in Mexico, our analysis sheds light on how the geographies of market capitalism in the energy transition expand opportunities for corporate accumulation by obscuring communal institutions, indigenous livelihoods, and bio-cultural dimensions of specific locales. These processes, in turn, reinforce the uneven distribution of privilege and power enabled by the dismantling of the agrarian revolution and the restructuring of rights of access and control over land and its resources (Radcliffe, 2007). Countermapping sheds light, however, on how the juxtapositions with local landscapes, people, and resources, produce new forms of environmental injustice and contestation on the ground Massey, 2005).

As discussed in our results, the spatialization of environmental injustices (Walker, 2009) in the energy transition takes place with the misrecognition of territories and the socio-ecological relations of place. The case of Oaxaca highlights that cartographic omissions produced by top-down mapping practices, drive into neo-colonial practices of dispossession that hamper the participation of indigenous communities in actively producing the future geographies of energy. Countermapping the case of Yucatan provides parallel insights in this regard. As observed through our analysis, technocratic approaches in renewable energy mapping produce an uneven and often disproportionate distribution of burdens for vulnerable communities and ecosystems. Remarkably, grassroots responses in both of these regions unfold through the spatialization of resistances: articulating multi-scalar networks of opposition, and mobilizing concerns over the material, cultural and ecological transformations taking place in their territories.

Countermapping practices are powerful ways to unveil these dynamics in ways that are relevant not only for critical research, but also for communities and organizations mobilizing in prevention and/or reaction to such injustices on the ground (see also: Dalton & Thatcher, 2019). As highlighted in our countermapping aims, this project is part of a broader process seeking to socialize critical geographical knowledge in the energy transition. In appropriating dominant cartographic technologies and State/corporate data, this project is producing an iterative set of interactive outlets, including 1) an interactive platform of public access to track the expansion of mega wind and solar power projects in the country; 2) the ongoing documentation of claims and injustices in the EjAtlas platform, and 3) the development of sub-projects to support grassroots initiatives with the production of particular regional maps.

Critical cartography and countermapping practices provide conceptual and practical tools to challenge energy strategies that ultimately reinforce the socio-political *status quo*, rather than achieving more egalitarian socio-ecological transformations. Countermapping exercises, thus, become a key tool to promote what Swyngewdow (2010) refers to as the politicization of climate change strategies. In the case of Mexico, our project aims to re-center and amplify indigenous and popular environmental struggles centering on land and territory as central political questions in the low-carbon future. As these movements unfold, they suggest new ways to think about space beyond "the perceived inevitability of capitalism and the market economy as the basic organizational structure (...), for which there is no alternative" (Swyngedow, 2010: 215).

We consider that our initiative is just a starting point with its limitations. While the reappropriation of dominant technologies for spatial representation has served here as a powerful way to dissect and challenge the low-emission development strategy, these technologies continue to operate around pre-established agreements around space and its geographical possibilities (see: Castán-Broto & Baker, 2018). Diving into the multiple prospects of countermapping involves moving from Cartography (with capital C) and its discontents to collectively produce new ontologies of space and political citizenship (see: Wood, 2010; Dalton & Stallman, 2018).

We believe that there are at least two ways of advancing in such a direction. First, by going beyond the practice of anti-colonial mapping (which is characterized by its resistance to colonialism in all its contemporary forms) and engaging with decolonial mapping practices. This involves reclaiming indigenous cartographies as place-based, geographical Indigenous knowledge, enacting ancestral and contemporary world-making practices of its people (Rose-Redwood et al, 2020). Second, and in close relation to the previous point, by re-centering the notion of *territory* as a more-than-state power, through which organized communities exercise practices of sovereignty and autonomy (Clare et al, 2017). While countermapping practices operate, by definition, with localized concerns, discourses, and tactics, a focus on these approaches could simultaneously integrate ongoing struggles over indigenous lands, with larger citizen movements pushing to de-commodify the production of electricity in different territories (see for examples, experiences around energy sovereignty in XSE;2015).

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