Technologies to embrace the sun: solarpunk-based project as an exploration for a just energy transition

Tecnologías para abrazar el sol: un proyecto basado en el *solarpunk* como exploración para una transición energética justa

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Abstract

The national implementation of electricity generation projects directly threatens the livelihoods of local and Indigenous communities in Latin America. Therefore, it is crucial to search for solutions to energy supply considering local needs and cosmologies. This article focuses on micro-energy production in rural settlements on the Colombian Caribbean coast. The aim is to provide insights into the relationship between energy, technology, and ancestrality through the lens of solarpunk storytelling. To explore this theme, we present the «tech to embrace the sun» initiative as a case study to co-design and imagine desirable futures by the local community of Selvatorium, in La Guajira. The results consist of the development of seven future ancestral stories co-written by community members and guests, two guides to build two prototypes, and a fanzine. The project concludes with empirical and theoretical insights for development studies about sustainable energy futures.

Keywords: ancestrality, solar energy, just energy transition, solarpunk, La Guajira.

Resumen

La ejecución nacional de proyectos de generación de electricidad amenaza directamente los medios de subsistencia de las comunidades locales e indígenas de América Latina. Este artículo se centra en la producción de microenergía en asentamientos rurales de la costa caribeña colombiana. El objetivo es ofrecer una visión de la relación entre energía, tecnología y ancestralidad a través de la lente de la narración *solarpunk*. Para explorar este tema, presentamos la iniciativa «tecnología para abrazar el sol» como un estudio de caso para codiseñar e imaginar futuros deseables por parte de la comunidad local de Selvatorium, en La Guajira. Los resultados consisten en el desarrollo de siete historias futuras ancestrales coescritas por miembros de la comunidad e invitados, dos guías para construir dos prototipos y un fanzine. El proyecto concluye con reflexiones empíricas y teóricas para los estudios de desarrollo en relación con futuros energéticos sostenibles.

Palabras clave: ancestralidad, energía solar, transición energética justa, *solarpunk*, La Guajira.

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1
Introduction

Industrialization, globalization, and the world's rapid population growth over the last hundred years have transformed a wide variety of ecosystems to ensure the progress of humankind and the production of commodities. This industrial, economic, and demographic expansion requires enormous environmental, territorial, and cultural sacrifices, both to produce goods and services, as well as for the sustainability of the energy sector, especially electricity production, leading to extinction and unprecedented damage. We must postpone the end of the world. It was declared by an Indigenous thinker from Brazil Ailton Krenak in his book *Ideas to Postpone the End of the World* (2019), In it, Ailton stimulates other ways of thinking beyond utopia-dystopia and the Cartesian duality imposed by Anglo-Eurocentric thought. Facing the present ecological and energy crises and those to come, it is imperative to imagine other possible worlds through dialogues between engineering and the ontological and epistemological worldviews of rural communities on the Caribbean coast.

It is necessary to inquire into the impacts of energy and mineral consumption that technological development entails. It is possible through expanding the spaces and disciplinary boundaries for imagination and action to create other types of technologies linked to biocultural memory and ancestral cosmologies. Our relationship with energy as a human collective has changed over time. It was considered a fundamental part of life on the planet maintaining its ecological and spiritual dynamics (intrinsic relationship with nature). Since the development of the transformation of solar radiation into electricity, it is managed as a good or a commodity negotiated in international markets traded by corporations and national states. The latter would perpetuate the extractivist regimes of colonial and neo-extractivist economies of green capitalism (Carpenter & Jampolsky 2015; Hess 2018; Roa 2021). By making energy an element in the transaction of nature shielded by sustainable development, the capitalistic view over nature is expanding into new territories and searching for new minerals and «cheap merchancies» it had not been able to conquer (Moore 2016).

Culture has also been part of the energy crisis and fueled our dreams of a carbon democracy (Mitchell 2011). Indian thinker Amitav Ghosh (2016) has stated that culture and the crisis of the imagination are part of the problem in the sense that hegemonic cultural models have stimulated imaginations of endless resources and energy consumption. In the environmental humanities area, «energy humanities» (Szeman & Boyer 2017) are an emergent field focusing on intersections between energy and culture. This field has almost exclusively focused on fossil energy and petrocultures (*e.g.,* LeMenager 2014, Wilson *et al.* 2017), and post-fossil imaginaries

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in situated places (*e.g.,* Castro & Prádanos 2023), thus scarcely considering the conflicts and dilemmas arising currently with the so-called «green energies» in the current context of the energy transition, especially on Indigenous lands. Furthermore, cultural studies focusing on energy questions have often excluded the views and aspirations of the people involved in and affected by those transitions (Stripple *et al.* 2021). The questions «what is energy?», «energy for whom?», and «whose energy future imaginaries?» are central in this study that attends to «energy justice» (Barandiarán *et al.* 2022, Krüger *et al.* 2022) to reveal inequality in the energetic transition. These questions are intrinsically linked to the territory's future(s).

Around the world, transnational corporations are erecting «green» megaprojects, especially in the Global South. These projects are affecting the ecological, cultural, and political conditions of the territories and even causing territorial and epistemic dispossession. Wind projects that take the name of a spiritual being (Jepírachi) in the Wayuu community in Colombia and affect their relationship with the territory (Noriega 2020); dams, such as the Belo Monte on the Xingu River, which displaced approximately 25,000 people in the city of Altamira and 18,000 traditional riverside dwellers in the Brazilian Amazon (Fearnside 2017), and corporate solar initiatives that have caused damage to geoglyphs (large patterns in the form of animated figures) in territories that have been inhabited by Indigenous communities in Blythe (California) (Mulvaney 2013). The latter are examples of this territorial and cognitive dispossession. The above implications are embedded in the socioeconomic relationships between energy generation and consumption, particularly in Latin America (Furtado & Sodateli 2019).

Image 1
Global map of environmental conflicts
Source: https://ejatlas.org.

From the increase of environmental conflicts distributed around the world —mainly based on unlimited energy consumption, especially

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in the Global North—, climate and energy justice has emerged as a space of academic and activist dispute (Liu *et al.* 2022) for the analysis of these ontological and political conflicts concerning energy. On September 8, 2020, 3,266 cases of environmental conflicts have been registered *(World Atlas of Environmental Justice)* (see Image 1). Particularly, there are 402 conflicts over «dams and water distribution conflicts», 19 conflicts over «solar energy projects», and 5 conflicts over «wind energy projects», all of which are registered under the Clean Development Mechanism.

The implementation of energy-oriented projects to feed the accumulation of capital makes countries such as India, Brazil, China, the United States, and Colombia the five nations with the highest number of environmental conflicts on the planet. In this way, the exploitation of energy is one of the vehicles for the neocolonization of territories affecting mainly Indigenous communities, peasants, and the African diasporas. The decolonization of energy and cultural perspectives on energy is crucial to inhabit possible future(s). The «tech to embrace the sun» project initiative is concerned with decolonizing renewable energy and its views, under which territories are being grabbed using the green discourse. These projects are affecting millions of lives and ecosystems in the light of sustainable development, thus eliminating conceptions of collective well-being.

This article opens spaces for the voice of collectives carrying out these environmental and energy struggles from the territories and strengthening their dynamics, but likewise creating spaces to dispute the imagination about the production of the future not only from technoscience but also from art. «Embracing the sun» refers to a concept based on the action-research tradition exploring the speculative framework of solarpunk as a way to imagine and design grassroots futures linked with the people's ancestral pasts (Reina-Rozo 2022). In this context «solarpunk», as a literary genre and art movement seeking alternative forms of existence rooted in grassroots movements and local communities, provides a way to reimagine sustainable energy futures for Latin America beyond dystopia and apocalypse. In the *Solarpunk Manifesto* (2019), its authors define the movement as «an optimist, a path and practice to appropriate technology to empower local communities in the face of ecological collapse and to provide tools to imagine other futures rooted in the needs of people that were seldom asked what a desirable future for them and their community was». There lies the power of this genre and movement.

Drawing on solarpunk as a tool and method, and energy justice theory, this article addresses solar energy as a space of dispute in the local Indigenous communities in La Guajira. In the following section, we deal with the complex relationship between technology, sovereignty, and ancestry in these territories traversed by colonial extractivism. This gives way to addressing the decolonization of energy as an opportunity to deconstruct our relationship with

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it and its cultural and social implications. Afterward, we refer to the territorial context where this process is being addressed: the Department of La Guajira, located in the northernmost point of South America, in Colombia. Later, the concept of «technologies to embrace the sun» is discussed as an alternative within the framework of energy justice. Finally, the last section presents some final considerations and the future work planned together with the communities in the territory.

2
Vernacular technologies, sovereignty, and ancestrality

Several programs centering on the relationship between creation, technology, and Indigenous peoples have emerged recently. Some examples are initiatives around the arts, such as the research on the conception of «technology» by native communities in Vaupés (Colombia) (Santos 2019). A common element of these experiences is the tension in the definition of the concept of «technology», expanding its margins according to the ontologies of the communities; that is, how they perceive and understand the world and our relations to tools beyond the hegemonic Western conception (Mumford 2004). Thus, there is a contradiction between the true value of Indigenous or vernacular technologies and the fact that they are «incredibly undervalued because they are not even recognized as technologies» *(ib).*

So, in this framework, what can be considered as «technology»? The Hongkonger philosopher of technology Yuk Hui has made groundbreaking research on the relationship between the technol-ogy and the cosmology of ancestral traditions in China that can be transferred to Latin America and La Guajira: «Though Heidegger's thesis has been widely adopted, this blind spot remains. People tend to equate Greek *technē* with Chinese, Japanese, or Indian technology without really looking into the meaning of technology that was already present in Heidegger's discourse, but also in the history of technology» (2022 p. 2). If the hegemonic definition of «technology» was taken from Heidegger and used to separate which societies were technological and which were not, what happens when we break that dichotomy through perspectives of «sovereignty» and «ancestry»? This question leads us to defy the reduction of technology to simple and «neutral» artifacts. Thus, expanding its meaning and practice to imagine new sociotechnical systems, technology becomes only one of the interdependent elements that allow it to add up to sovereignty in all its forms. One of the cases that can allow these sociotechnical and ancestral systems is the eighth section and, particularly, articles 385, 386, and 387 of the Ecuadorian Constitution under the Rights of Nature framework, where a system of science,

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technology, innovation, and ancestral knowledge is proposed (*Political Constitution of Ecuador* 2011). Specifically, paragraphs 2 and 4 of Article 387 are relevant, as they set out the responsibilities of the State regarding a system of knowledge construction that challenges the division between technology and ancestrality. Thus, the commitments related to ancestral knowledge are:

> Paragraph 2: «Promote the generation and production of knowledge, encourage scientific and technological research, and strengthen ancestral knowledge, in order to contribute to the realization of good living, to *sumak kawsay*».

> Paragraph 4: «To guarantee freedom of creation and research within the framework of respect for ethics, nature, the environment, and the rescue of ancestral knowledge».

Authors from the field of social science, such as Garcia dos Santos and Antunes Caminati, argue that, from this normative space that divides technology from ancestrality/cosmology, «provocative new horizons open up for development in Latin America since there is, for the first time in our history, the interest and willingness to promote synergies between ancestral knowledge and techno-scientific knowledge» (Garcia dos Santos & Antunes Caminati 2010). In this way, the action of sharing both knowledge, know-how, and cultural practices allows the shaping of a people and therefore it opens the possibility of generating technology from the sovereignty of the community, that is, the freedom to the know and the know-how.

One element that has driven the sharing of knowledge in recent years has been the Open Science movement, which from its plurality aims to open the scientific process to historically excluded sectors, but additionally to broaden the conception of «science», in all its frontiers, through the opening of reviews, data, publications, and tools, among other things. It is a platform to change the world and the dichotomic Western paradigms, as Lafuente (2020) affirms. Moreover, in the context of the social and historical context of the COVID-19 pandemic, this open science movement is called to integrate free culture based on solidarity to face the challenges that still exist, such as inequality, racism, and xenophobia, among many others (Reina-Rozo & Medina-Cardona 2021). One of the biggest challenges for Indigenous populations in the Global South is access to electricity, given that they are mostly located in non-interconnected areas.

Energy, in this framework, must be understood from a situated context and from the relationships of the communities with it: what is it used for, and what are the main needs and opportunities? This process is sustained by the collective recognition of what energy represents and how it is used. Therefore, energy sovereignty understood as projects and political visions directed towards a fair generation, distribution, and control of energy sources by mobilized communities is imperative. This act of sovereignty has an ecological

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and cultural basis, both in urban and rural communities, in ways that respect the ecological cycles (Del Bene *et al.* 2019). This vision is included in the constitutions of Ecuador and Bolivia, framing Buen Vivir as a philosophy that allows space for direct action and ancestral and cultural anchorage in the relationship between energy and society.

In addition to access to and control over solar energy technology, another equally asymmetrical element is access to knowledge or know-how related to it. In this sense, the processes of building knowledge and expertise around solar energy are key elements for the development of productive activities, care, and reproduction of life in the territory. Consequently, political strategies become determinant in defining knowledge relations between actors; one of these is popular education applied to solar energy university extension courses (Ravelo 2018): particularly, an example is the development of processes in agrarian reform settlements in Brazil (Ravelo & Souza de Alvear 2019). Therefore, experiences around the creation of solar technologies and the appropriation of know-how related to the above are relevant to the extent that they are transformed into knowledge management exercises. Thus, some references in rural territories linking the creation of devices based on solar energy by local communities are Barefoot College (India),[1] Kara Solar (Ecuador),[2] and Onergia (Mexico).[3]

3
Toward a redefinition of energy from the Global South

Decolonizing energy entails a collective process to deconstruct the relationship that industrialized society has woven with energy, mainly as an input for production and consumption that feeds unlimited economic growth, in addition to other uses for survival. The link between energy and equity is crucial to create new meanings and actions toward energy sovereignty (Illich 2006). Therefore, this adventure must be nourished by the debates, questions, and ideas of decolonial studies and struggles of social and popular movements; one of the many academic groups in Latin America was Modernity / Coloniality (Escobar 2003), while at the level of social struggles, Ríos Vivos, in Colombia, and Oilwatch Internacional can be pointed out, as well as coalitions towards energy democracy (Hess 2018).

However, this commitment must not only materialize in the Global South. Decolonization also passes through the Global North. It is a process that encompasses all geographies hand in hand with social movements and anti-racism, including Black Lives Matter (Lennon 2017). This stake is complex; it must be imagined and created from the plurality of social, cultural, political, and material

1   Barefoot College was born in the 1980s. Since then, the Barefoot approach has spread to more than ninety-seven countries. They are currently expanding with regional facilities in Africa, Latin America, and South Asia (Roy & Hartingan 2008). Their work is a direct result of the approach taken from the principles of Mahatma Gandhi (Kummitha 2017). This is one of the few places in India where Gandhi's spirit of service and thoughts on sustainability are still alive and respected in relation to energy and technological sovereignty (Fallone 2016).

2   It is a river transport initiative, based on a community enterprise in the Ecuadorian Amazon that runs on solar energy (Vila-Viñas & Crespo 2015). Since 2012, a team of engineers and designers, together with members and leaders of the Achuar community, have been working together on this shared dream (Vila-Viñas *et al.* 2020, Dalmases 2020). Likewise, it has been analyzed as a post-growth experience-oriented to other economic, technological, and environmental relationships (Hollender 2018).

3   It is a project that arose from the concern of its partners and collaborators for the environment and social transformation. Onergia Cooperativa is interested in collaborating with society towards energy transition and sovereignty, where energy producers and users actively participate in decisions regarding the equitable distribution of energy resources (Aguilar & Rátiva-Gaona 2022).

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dimensions, represented by social movements, activists, and academics, aiming to be as broad as possible. The dispute over the so-called «renewable energy» at the global level is leading to struggles for the respect of Indigenous peoples' rights when the demand and generation of energy are growing exponentially (Shah & Bloomer 2018).

Renewable energy projects not only pose threats to communities but also to biodiversity, especially birds. It is estimated that thousands of birds die annually in the United States alone on solar projects (Walston *et al.* 2016), not to mention in Patagonia (Argentina and Chile). Currently, their direct implications are unknown, so research is being developed to determine the main causes of their death (Oberhaus 2020). In addition, wind and solar energy projects are the cause of ontological conflicts, that is, of worldviews; for example, in the case of Blythe (California), where geoglyphs directly related to the ancestry of native peoples have been transformed due to the transformation of the landscape, impacts on biodiversity linked with to Colorado River Native American creation story and the transformation of a suspected prehistoric cremation site (Mulvaney 2013).

From this point of view, various ontological and socioecological conflicts have been recorded and documented, especially in Mexico through audiovisual documentaries, such as *La energía de los pueblos* (La Sandía Digital 2019), *Gente de mar y viento*[4] (Fabián González 2016) and *Somos viento – resistencia en el Istmo contra el proyecto eólico*[5] (2013), among many others. Likewise, from other creative scenarios, literary works on the collective role of energy such as the book of short stories *Huellas de energía* (Heinrich Boell Foundation 2019) and the science fiction movement called «solarpunk», as a countercultural science fiction space to imagine and create other inhabitable and possible futures. It can be defined as an emerging cultural movement to reimagine the relationship between technology, society, and nature, nurturing speculative scenarios for rural societies (Reina-Rozo 2021). A seminal solarpunk work is *Sultana's Dream,* written by Begum Rokheya Sakhawat Hossain (1905) in Madras (India), about speculative future solar technologies created by women. According to Raven (2017), science fiction is a tool to question energy futures and related research.

To accompany the process of energy decolonization, it is vital to nurture the reflections and actions around just energy transitions, so that these transitions happen under a framework that includes climate, environmental, and energy justice from a restorative perspective (McCauley & Heffron 2018). In Colombia, work has been underway for actions and articulations when it comes to generating a movement for just transition at the national level (Roa *et al.* 2018, Roa, 2021). This process for the decolonization of energy must be nourished by the relationship between technology, sovereignty, knowledge, and ancestry, as a scenario for the gesta-

4   To see the documentary, go to https://www.ambulante.org/en/documentales/gente-de-mar-y-viento/.
5   To see the documentary, go to https://www.youtube.com/watch?v=JaV56DYy1NU.

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tion of ideas, actions, and struggles. The latter in the context of just energy transitions is a socioecological transformation that disputes the sociotechnical hegemonic model and its economic implications (Bertinat 2016, Rátiva-Gaona 2021).

4
La Guajira: a territory of energy disputes

The department of La Guajira is in the extreme north of Colombia. It is the northernmost point of South America and has ecosystems ranging from desert to cloud forests. It has been inhabited for centuries by Indigenous Wayuu (who live between the Colombia-Venezuela border), Arhuacos, and Koguis, as well as Afro-descendant and mestizo communities. In this department, the Wayuu *resguardo* of the Middle and Upper Guajira, one of the largest collective territories in Colombia, is located. At a socio-economic level, it is a territory that has experienced state exclusion and racism towards Indigenous populations for years, making it one of the departments with the greatest unmet priority needs, as well as sociocultural exclusion on a structural level due mainly to the extraction of coal (Caro 2021).
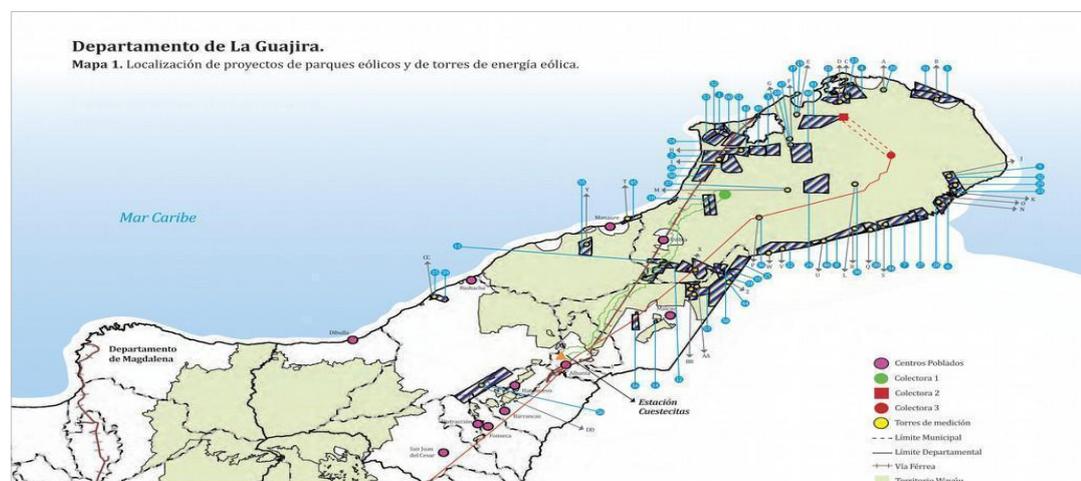

Image 2
Map of future wind energy projects in the Department of La Guajira
Source: González Posso and Barney (2019, p. 22).

Since 2018, this territory has been consolidating at the corporate and state level as a space of «renewable futures», according to González Posso and Barney (2019). The construction of around 60 wind farms is being planned and managed by 19 national and multinational companies, expecting to cover around 20 % of Colombia's energy consumption by 2031. These wind farms will have around 2,618 wind turbines producing approximately 6,862 megawatts of electricity. This plan, developed by national government institutions

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and corporations, is based on «clean» technologies. Then, these future production plans translate into the alteration of the territory as investment opportunities in the international market, which are related to national and international commitments to climate change, with social, cultural, and ecological impacts at the local level (González Posso & Barney 2019). The Image 2 shows the map of La Guajira with the location of wind projects, transmission lines, and wind power towers.

The above map functions as a device for the future of the territory. It is a sample of the energy transition model immersed in a centralist process of capital accumulation using the sacred territory of Indigenous communities. Additionally, these communities still do not have informed knowledge about the characteristics of the projects, their implications, and useful life (see, for example, Vega-Araújo & Heffron 2022). This is a macro-project that began in 2004, with the installation of the pilot project of the Colombian company EPM called the Jepírachi wind farm (a sacred entity for the Wayuu communities, which in Wayuunaiki corresponds to North Wind – Viento del Norte). This project is part of the five cases of socio-ecological conflicts mapped in the Atlas of Environmental Justice (EJOLT n. d.). The managing company created alternative mechanisms to the payment of rent, for the payment of «transit and infrastructure» and has a clause that establishes that the transfer of territory is for an indefinite term (González Posso & Barney 2019).

Colonization processes continue for the communities and their environments, designed, planned, and executed from other geographies and under other parameters of both spiritual and environmental values. These interventions are impacting and will continue to impact in the coming years 288 Wayuu communities, located in the rural areas of Uribia and Maicao, particularly at the level of mobility at the local level and customs in the collective territories and their ancestral uses (González Posso & Barney 2019). In the face of the above, the erosion of the Wayuu communities is evident, due to its implications in the social, political, and cultural fragmentation of the communities, losing their collective sense of territory. In this regard, the United Nations Special Rapporteur on the Rights of Indigenous Peoples, Victoria Tauli-Corpuz, has expressed concern about the imposition of renewable energy installations —solar, wind, and hydro—, without the right of consultation with local communities (Tauli-Corpuz 2018). Noriega (2020) states that communities could lose control of collective lands to wind energy companies, considering the territory as the mother of the Indigenous nation, according to the elders of the Wayuu culture.

Concerns about the implementation of these macro-projects are increasing, due to the possibility of transforming the territory into an energy «powerhouse» (*El Espectador* 2019, Ochoa Suárez 2020). Hence, in August 2020, the Attorney General's Office request-

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ed the halt of the projected wind projects and transmission lines, the grabbing of indigenous lands by transnational companies, and the absence of binding processes of prior consultation in the territory (Semana Sostenible 2020). At the beginning of 2020, the closure of the Jepírachi Park had been requested, according to some inconsistencies in its operation; however, by July it returned to operation (Ardila 2020).

Alternatives for regulating access to and use of wind energy, such as «wind regulation» processes or «wind bonds», are currently being discussed, as well as reflections on the decolonization of energy. This is happening with the emergence of projects and plans for territories, especially in ethnic territories, where cultural and spiritual rights must be protected, ensuring the survival of communities and their life plans. Similarly, models of collective ownership of wind farms should be explored, where communities can be key players in the management and implementation of projects, inspired by Danish, German, and American energy models (Noriega 2020).

5
An initiative to «embrace the sun thorough solarpunk»

This study draws insights from the collaborative project carried out with the Wayuu community in La Guajira in 2021, funded by an art-technology grant. It was a creative space for conversations and practical activities aimed at rethinking the relationship between technologies, the sun, and the territory. The sun has been a central element in the cosmogony of native communities around the planet, and it is intrinsically related to ancestry. These communities view the sun as a source of energy for their agricultural practices, but also for their spiritual practices. In the Sierra Nevada de Santa Marta – Gonawindúa, or La Guajira, the native communities, among them, the Koguis, Arhuacos, and Wayuu communities have a link with the sun, which manifests itself, for example, through the creation of representations such as backpacks, where the sun is represented (Chacín 2016, Villafaña Mejía 2022).

Solar energy can also be understood from the technical conception of «engineering»; in this case, through the devices that allow access to electricity from renewable sources and that provide electricity mostly to non-interconnected areas. Inequities between urban and rural areas are high but in the Global South they are more drastic. Rural communities particularly are excluded from energy dynamics, which increases the level of energy poverty, *i.e.,* they cannot meet their basic energy needs (Day *et al.* 2016). In this context, autonomy plays a decisive role in the community's

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survival and permanence in the territories, making decisions and taking actions to strengthen community sovereignty (Carpenter & Jampolsky 2015).

Intellectual and practical initiatives to question the hegemonic model of imposed development have emerged in multiple geographies (Escobar 2010). The future must be, then, collective creation and must also start from the communities and their collective intentions from their relationship with ancestrality. In this framework, the category of «technology» takes relevance, given that this is not a neutral construction far from interests and motivations (Winner 1980). On the contrary, it is immersed in a network of beliefs, knowledge, and desires, where ancestrality will play a role in the territories where native communities create their world (Reina-Rozo 2023a).

From the literature of development studies, a crucial debate has been taking place around the alternatives to development or related to the concept of «post-development». Based on this discussion and from the indigenous community's ontology, the idea of a world in which many worlds fit is gaining more and more strength. In the academic world, this idea has been taken towards the concept of «pluriverse» (Carrillo Trueba 2006), where the need for systemic and ontological justice linked to the generation of futures beyond development and economic growth is raised. Some authors, such as Escobar (2018), have linked it to design processes or related to convivial technologies (Illich 1978). Meanwhile, other authors have edited a volume around an emerging vocabulary on technology and development directly nourished by the Pluriverse paradigm (Kothari *et al.* 2019).

Precisely, the articulation between dissimilar actors is a challenge in the social appropriation of technology processes. One of the proposals to overcome these processes is the dialogue of knowledge (Echeverri & Román 2008), as a meeting and mutual nutrition of the codified knowledge of the Western Academy and the tacit or empirical knowledge of local communities (Nonaka & Konno 1998). Thus, having as a theoretical and conceptual basis the dialogue of knowledge, «codesign» is proposed as a tool to generate collaborative processes where the various people involved in technological creation projects have an active agency in the process, with their experience, but also their intentions, motivations, knowledge, and interests. This method has the potential to achieve what Escobar (2017) calls the «realization of the communal through autonomy and design», thus materializing in a common future.

The idea of the «rational» as the only vehicle to create technology is distorted, to integrate the emotional and the spiritual in this complex framework for the transformation of reality. Thus, using a natural analogy, like the Hicotea turtle, knowledge must have the condition of being amphibious and be able to connect with both emotion and reason; this is what is called *sentipensar*

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(Fals Borda 2007). In this context, solarpunk plays a crucial role which will exemplify with a case study from the «technologies to embrace the Sun» collective project. This project was developed in 2020 and was accompanied by the Asociación Solar y Pedagógica de la Zona Rural de Nazareth (ASOPERNA), located in the rural area of the municipality of Nazareth – La Guajira, and hand in hand with the organization Selvatorium as rural laboratory located in Dibulla, in La Guajira. The rural area of Palomino and Nazareth are territories considered «non-interconnected zones», which are the municipalities, townships, and localities not connected to the Colombian Interconnected System.

At the methodological level, the project used the framework of action-research, based on the theoretical and conceptual developments of Orlando Fals Borda (1981), as well as considerations of the social studies of science and technology. From these general elements, the project seeks to generate processes of codesign of solar technologies within the territory; therefore, the limitations of the COVID-19 pandemic created a scenario of virtual collaboration and then, physical activities in the territories. The project phases were three.

5.1. Collective research

The main objective of this phase is to understand what are the energy deficiencies that the Indigenous communities of the Sierra Nevada de Santa Marta and La Guajira have in general, the latter without leaving aside the correct implementation of artifacts and technologies conceived from Western knowledge. This process must radically transform it to develop platforms where Western and ancestral knowledge can coexist in Indigenous communities and make the use of modern artifacts in rural scenarios. In this case, the diagnosis was carried out virtually due to the COVID-19 pandemic with members of ASOPERNA and Selvatorium communities, particularly with nine individuals. The methodology for the diagnosis was by means of telephone and virtual calls, specifically, interested in the needs and desires of the members of these communities at the energy level. The result of this phase is the finding of two main energy desires: first, to have light during the night and second, to charge the batteries of their cellphones or other devices. Then, we had two challenges: to build a solar charger and a solar lamp in the territories.

5.2. Inter-epistemic codesign of solar devices

According to the diagnosis, we opted for the codesign and construction of the two artifacts in the settlements, a solar lamp, and a solar charger with low-cost elements, so that the largest number of people in the no interconnected areas could access its construction. Thus, at the initial level, open hardware websites, which were

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searched for references of free license artifacts that can be built at low cost. Once some options with generic materials were identified, we proceeded to evaluate their advantages for the territories. The devices were inspired by other collectives or initiatives of energy sovereignty, particularly, having in mind that the materials could be found easily, were affordable, and don't need a lot of energy to its construct.

In addition, we have conducted several video calls with community members to talk and create questions about place-based designs. This was the most complex phase, because it was necessary to have the approval of the community to introduce terms within the constructive guide of the artifacts (there are some words in Spanish that don't exist in Wayuunaiki or Iku, for example), but still doing it through telephone calls due to the impossibility of visiting the territory. Once the final design was generated collectively with the communities, a first prototype was built in Bogota (the capital of Colombia) to verify its usability, and then, when the health authorities authorized travel, the solar lamp and solar charger were built jointly by the members of the communities (adults and children).

Image 3 shows one of the places where a solar workshop was codeveloped when the conditions to travel to indigenous land were positive. Each scenario had a solar workshop to build the prototypes after the design validation. The total of people that participated in the workshops were 12 adults and 3 teenagers and, by gender, were 8 females and 7 males.

Image 3
Solar workshop in Selvatorium in October 2020
Source: Authors.

Image 4 shows the prototypes codesigned virtually with the members of the organizations, considering the ontology of the communities.

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Image 4
The solar charger and solar lamp built in the solar workshops conducted in La Guajira
Source: Authors.

In this context, the prototypes could be built in the community with some kits ready to begin the construction of the lamp and charger. Particularly, there were two focus groups discussing the meaning of energy in the Indigenous territories and life, from the solarpunk framework, beyond techno-determinism. The main question that drove the collective space was «what does energy mean and how is it represented in the life of Arhuacos and Wayuu communities?». In this case, energy has a broad framework linked with spiritual elements and ecosystem functions, beyond the limited Western conception related to electricity. It is related with the territory, the ancestors, and the interrelationships within the community. According to one workshop participant: «The importance of the sun for us of the Wayuu people lies in the fact that Kai, as we call him, is a spiritual entity in the form of a benevolent old man who rises every morning to awaken human beings». Meanwhile, for Arhuaco community, «Jwi was a very beautiful robust boy, with luminous hair, and all his skin was glowing; his piercing eyes flashed, fleeting glances of power; he had impeccable brilliance; the strong light he gave off from his body made it impossible to see him».

5.3. Dissemination and systematization

From the previous phase, despite the difficulties existing during the process, the communities were able to be part of it. In the process of inspiration from the solarpunk narrative, a collection of seven stories were created and complied in a book published after the project. They were based on three pillars: Future, Solar Technologies, and Territory. As a result, in asynchronous exercises of cowriting, seven authors from international rural communities shared their narratives based on their ontologies and epistemologies. Particularly,

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the initial question of the dialogues was: «How can we reimagine our relationship with the sun in rural settlements?». After a couple of months, the titles of the short creations were: «De la oscuridad a la luz a través de la energía solar», «Las cinco wayús iluminadas bajo el sol de la India», «Cuento antes del sol», «Yuika corazón de oro», «Una breve historia: el Sol y la Luna», «La niña que hizo que el sol alumbrara de noche», and «Sueño solar». These narratives complement the academic analysis generated in the Academy, in relation to the energy transition. Speculation, particularly, becomes a creative space for new conversations and thus, for local actions, to create capacities and change energy use regimes in the territories.

In addition, two introductory guides, one for a solar charger and one for a solar lamp, were generated with technical terminology of the circuits, understood from nature and the environment in which these communities live, both in Spanish and Wayuunaiki. All the systematization process was illustrated by emerging solarpunk references. In addition to this, images of the users in context were created (Image 5) to illustrate the proper construction of each artifact. The main impacts of the initiative for the region have been related to the visibility of the Arhuaco and Wayuu ontologies to the national and international debate of just energy transitions, particularly, in the context of Eolic parks located in the department of La Guajira.

Image 5
Illustrations of technologies to embrace the sun project
Source: Luzángela Brito in Reina-Rozo (2022).

Finally, a fanzine was elaborated in two languages as a low-cost complement for the dissemination of the process. The fanzine is central to punk culture, as a pillar of the «do it yourself» movement. The experience with fanzines is the easy way to send them through the internet and the audience can print locally, cut and fold to create a «small» book (Images 6 and 7).

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Image 6
Technologies to Embrace the Sun, fanzine in Wayunaiki language
Source: Alejandra Cala Vergel.

Image 7
Design of the fanzine in the Wayuunaiki version
Source: Alejandra Cala Vergel.

Image 8
Design of the fanzine in the Wayuunaiki version
Source: Alejandra Cala Vergel.

6
Discussion

As a discussion of the project development, some limitations and potentialities arise. There were four activities that generated reflections towards an explorative process of just energy transitions as a socioecological transformation from the territories, exploring the link of energy production, consumption, and meaning, beyond a utilitarian view. The interaction that existed within this activity was purely telephone and virtual, due to the mobility restrictions existing in the country because of the COVID-19 pandemic. However, it was possible to have nourishing conversations for the development of the project, with several people who are part of the community and were active participants during the construction of the prototypes and the written and graphic material for the implementation of the project.

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This work was much more complex to carry out, due to the lack of input from the communities at that moment, and the impossibility of visiting the territory. For this reason, the participatory workshops became more focused on how they would like the devices to be visually, and on the collection of the testimonies, anecdotes, and stories about the conception of the sun, but also about the energy needs that the communities have. After a long wait, a visit to the territories was possible with inputs for the construction of the devices and people with the necessary capacities to be able to carry out learning workshops with the communities. In these workshops, women, children, young people, and adults participated, to encourage the good use of energy in residents of all ages.

This activity was developed in two main parts. First, is the support of a member of the community who actively participated in correcting the use of language, both to introduce technical terminology and to respect beliefs about the conception of Mother Earth and the Sun. Also, this person collaborated in the translation of the texts written in Spanish into the natural language of the Wayuu communities, which is Wayuunaiki. The second part has to do with the illustrations made by a woman originally from La Guajira, who had the ability to fully capture what she wanted to capture through the texts. The graphics helped a lot in understanding the guides generated for the construction of the artifacts.

Conceptually, «embracing the sun» opens cultural considerations of energy beyond the traditional view of electricity and the sun as a being rather than a resource to extract (Timofeeva 2022). In this sense, solarpunk-based research permits deconstructing energy as a narrative, to analyze how it has been narrated, from what positions of power, and how we can transform those narratives. In this transformation, new methods are required, new procedures that include those views that have been excluded from the dominant narratives on energy and its uses. The latter generates new images of the future related to sociotechnical context (Reina-Rozo 2023b). This understanding would add to the approaches in the energy humanities to understanding how energy (understood in the Western sense) shapes society, the possibility to think how societal views can influence views and uses of energy and diversify its meanings.

The aim of this initiative was to embrace alternative visions of the future using the solarpunk genre as a medium to reflect on what kind of energy technologies are needed and how they are designed, built, and maintained; thus, with the perspective of generating conceptual, practical, and relational elements with energy sovereignty from the Indigenous peoples of Northern Colombia. Experiences from Latin America, and especially from the Caribbean Colombian, as the one discussed above, are pioneers showing the way how this can be achieved.

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7
Conclusions

The development model based on economic growth has prevailed for the last five hundred years in the world. With the onset of climate change, the pressure for «green» energy projects has expanded on the planet, and more than 3,000 socioecological conflicts have been mapped to date. However, we do not precisely know the number of conflicts around the world, especially related to «renewable» energy projects, such as hydroelectric, solar, and wind farms, that impact local communities versus certification processes around clean development mechanisms linked to international commitments. Solar energy has established itself as one of the strongest renewable alternatives worldwide. However, despite its potential, its environmental, social, and cultural impacts are currently under investigation. Additionally, their implications in economic and organizational terms on the communities have not been established and, in territories such as La Guajira in Colombia, the impacts they will bring are still unknown: in this way, thinking about the decolonization of energy as a political project in the sense of reconsidering humanity's relationship with energy, beyond electricity.

The ancestry of the communities has a fundamental role in the relationship with the territory; in fact, as in the case of the Wayuu nation, the territory is the mother of this Indigenous culture. Through an empiric and theoretical study, such as «technologies to embrace the sun», we were able to explore and understand sociotechnical assemblies in the territories from a perspective of creative just energy transition. In this context, energy transitions need to include diverse epistemologies, ontologies, and aesthetics to be just, equitable, and close with social groups that can be affected by the «green economy» growth. Hence, energy meanings and cultural relationships with the territories are a critical part of the emergency of the pluriverse.

This explorative initiative contributes to the emerging literature of energy transition, and energy humanities, but also with the collaborative design of artifacts in Indigenous territories considering the views of the people and habitats affected by energy development. We offer an emergent methodology relating to technology and ancestrality through solarpunk, that can be applied in other contexts seeking for energy justice. This study aimed at creating a space for inter-epistemic dialogue around sun and energy, that does not exclude cosmological conceptions. In the case study described, solar workshops and focus group discussions allowed the trust-building process using the solar lamp and solar charger as excuses to practice mutual support through the «do it with others» (DIWO) ethics.

The projects and literature on energy justice addressed in this article in relation to the context of La Guajira open new spaces for

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learning and exploration of future scenarios around solar technologies. Particularly, our project has demonstrated that solarpunk has a creative value to add to the debate on just energy transitions from the aesthetic and artistic field, allowing the creation of autonomous futures and territorial dialogue to foster speculation and imagination of the social fabric and generate socioecological transformations.

8
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