Let Communities Lead Community Knowledge Capacities for Local Energy Transitions

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Let Communities Lead

Community Knowledge Capacities for Local Energy Transitions

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Rooted in place and aspiring for the future, knowledge empowers communities to cause and steward change.

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About: This report is part of the Let Communities Lead initiative, aimed at advancing the state of knowledge and informing action for community-led clean energy for sustainable development projects. Let Communities Lead is a joint initiative of practitioners from many parts of the globe, and researchers from Arizona State University (USA) and Karlsruhe Institute of Technology (Germany).

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Disclaimer: All views and opinions expressed in this report are solely those of the authors and the editors (for the editorial), and do not represent those of Arizona State University and Karlsruhe Institute of Technology. The accuracy of the content and information shared in the stories are the sole responsibility of authors.

Cover Art: An artificial intelligence (AI) generated image of the Mahabodhi tree, with its roots exposed and the Sun rising from behind. The Mahabodhi tree symbolizes the path to enlightenment in Buddhist philosophy, attained through a process of learning and reflecting on past experiences while striving for a higher state of knowledge. This stylized artwork depicts the idea of revisiting an ancient way of knowing using the latest advances for interacting with information.

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Executive Summary

The **Let Communities Lead (LCL) 2024** edition compiles nine stories illustrating how mobilization and making of knowledge leads to the integration of clean energy technologies, in pursuit of multiple social, environmental and economic objectives, within and beyond communities. The first three stories from Colombia, Brazil, and India, capture the experience of rural communities adapting energy technologies to be consistent with their social and cultural values, through knowledge partnerships. Another two stories describe how urban communities, one each in Switzerland and Belgium, seek to re-imagine citizen participation to make urban sustainability programs more democratic and effective. Then, two additional stories narrate the process of forming partnerships from the standpoint of individuals, who leverage their scientific training to assist communities in North Macedonia and India. The final two stories share how a growing movement of communities in Brazil are forming networks to share knowledge and collectively advocate for sustainable change.

The LCL 2024 collection offers four key insights on the characteristics of local energy planning and features of community-scale governance, necessary for delivering just and equitable outcomes from energy transitions:

1. Managing technological change must be a core knowledge making capacity for governing local transitions. This is mostly found in the form of practices, methods and people that bridge local forms of knowledge and expert knowledge.

2. Knowledge mobilization and mutual learning is essential for influencing the making of supportive policies, and informing appropriate designs of infrastructure. Community champions and knowledge keepers, technical and policy experts should welcome opportunities to learn from each other.

3. Knowledge-based networking is essential for creating and reinforcing positive outcomes. Community organizations need to be part of supportive networks for learning from each other, thereby reinforcing and improving their knowledge making capacities.

4. Adaptive learning is critical to long-term success of local projects and essential for project governance. This is a capacity built through specialized partners and facilitators, who can critically reflect, evaluate, and draw actionable lessons from previous actions and outcomes.

Governments, financing entities, project partners and communities should invest resources in building sustained and appropriate community knowledge capacities. This ensures projects continue to deliver sustainable development outcomes in the near, mid and long-term.

Managing change through civic leadership: how community knowledge capacities make local energy transitions just

1. Local energy – a movement for more than electrons and heat

Movements in society, that bring about transformative changes, are notable for building a community for sharing knowledge and investing in capacities to turn understanding to actions. This can take the form of translating general awareness to specific actions, as the Greenbelt Movement[1] does in Kenya, by inspiring diverse groups to act against the risks of deforestation and desertification. Sometimes it manifests as decades of advocacy to re-legitimize worldviews of marginalized people, like that of the Indigenous peoples in the Arctic regions in Canada and the US[2], by bringing traditional knowledge to influence policies on the extraction of natural resources in fragile environments. Movements are also platforms for shaping holistic and enduring societal transformations, like the anti-apartheid movement[3] which forever changed how racial discrimination in society is viewed and dealt with.

A common thread among these movements is the mobilization of knowledge to question, challenge and offer alternatives to the status quo of predominant and prejudiced knowledge cultures. In each case, they defined a new basis of knowledge to inform action - the systematic documentation of depleting water, food and fuel supply by women in rural Kenya; the collectivization of traditional wisdom about the importance of human-nature relationship to ecosystems; and developing a universal language of social justice and human rights that crossed national boundaries.

Similar movements with the goal of localizing energy transitions are taking shape in neighborhoods, small-towns, villages and cities around the world. In some places, this is pursued through struggles for a greater role and opportunity to place local needs within larger energy transitions. In other places, the objective is to leverage new energy technologies and policies to develop tailormade local energy systems.

Within this diversity, a new approach for mobilizing and making place specific knowledge emerges, helping plan and govern cleaner energy futures that deliver local goals of sustainable development, in greater magnitudes and with higher certainty[4, 5]. In this 2024 edition of Let Communities Lead, the focus is on a variety of such knowledge mobilization and making approaches that integrate clean energy technologies into initiatives for pursuing multiple social, environmental and economic objectives, within and beyond communities.

2. Why mobilize and make knowledge for energy transitions?

As energy consumers, many of us interact with our energy systems essentially through the flick of a switch or turn of a knob. However, in places that are underserved, excluded or otherwise burdened by the absence or presence of energy systems, a significant rearrangement of this interaction is required, so that social justice and human development can be delivered. Sustained access to sufficient, affordable and reliable energy services, which also helps accelerate human and environmental well-being, is contingent upon society's ability to manage technological

[1] https://www.greenbeltmovement.org/who-we-are

[2] https://www.arcticpeoples.com/#intro

[3] https://legal.un.org/avl/ha/cspca/cspca.html

[4] Biswas, S., Faheem H., and Parmentier, M. J., 2022. The human development paradigm and social value of energy. In Routledge Handbook of Energy Transitions, pp. 445-464.

[5] https://www.iea.org/data-and-statistics/data-tools/global-observatory-on-people-centred-clean-energy-transitions

change. And this ability is built through appropriate knowledge. It also differentiates earnest attempts at transformative change for sustainable futures, from those simply keen on profiting from sustainable development.

2.1 Managing technological change through knowledge

Technological change in society can produce a range of outcomes. Planned outcomes for economic and social growth, are often accompanied by unplanned and problematic consequences e.g., ecological damage, inequitable distribution of wealth and power, and continued exclusion of disadvantaged people or communities[6]. Society's ability to manage and apply knowledge largely determines which outcomes are produced, avoided and managed[7]. By applying knowledge to anticipate, measure and guide change, positive and desirable outcomes can be maximized while avoiding or guarding against undesirable outcomes[8]. In community energy systems planning, such an application of knowledge can produce a profile of economic, energetic, environmental and social benefits of energy technologies and infrastructures, alongside the risks and burdens it might produce[9]. The Let Communities Lead 2021[10] collection of stories illustrated several examples of this profile creation, termed as co-benefits of energy systems. The concept of co-benefits, for instance, helps shift the understanding of energy access and sustainable development in communities. We now better understand the nuance that both energy services and infrastructures should generate co-benefits and lower burdens, to positively impact human development at multiple scales in a community - households, demographic groups and community institutions. This is very different from assumptions that mere access to energy services, even at modest levels, will somehow result into positive impacts on human well-being.

2.2 Participation and civic leadership in making knowledge

From mapping co-benefits and anticipating outcomes, to acting on this information for making decisions, knowledge making processes require diverse perspectives at the table. Energy systems, however, have historically been an expert's domain in terms of its technical design, financial structures, and infrastructure planning. The emergence of ideas like 'prosumers', 'energy citizens' and 'energy democracy' reflects the dire need of including non-experts in energy system designs and decisions, to ensure equitable and just outcomes[11]. This underscores the urgency for course correction in standardized energy system designs, which have produced significant consequences for many communities[12]. Local energy initiatives must therefore be empowered by rapidly enhancing meaningful participation of diverse publics and knowledge forms, to avoid pitfalls. Whether it takes the form of self-learning and capacity building led by citizen groups and community organizations, or as policy making processes accompanying infrastructure investments - non-expert participation in knowledge making is critical to making equitable local energy decisions. This is also essential to actionable, democratic, and resilient strategies for self-governance of local energy transitions[13].

[6] https://unctad.org/system/files/official-document/dtlstict2019d10_en.pdf

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[10] https://letcommunitieslead.wordpress.com/wp-content/uploads/2021/11/let-communities-lead-report_2021.pdf

[11] See https://en.wikipedia.org/wiki/Energy_democracy#:~:text=Energy%20democracy%20calls%20for%20expanding,justice%20concerns%20of%20local%20communities

[12] Biswas, S., Faheem H., and Parmentier, M. J., 2022. The human development paradigm and social value of energy. In Routledge Handbook of Energy Transitions, pp. 445-464.

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3. About Let Communities Lead 2024

In this edition of Let Communities Lead (LCL), we document a variety of grassroots education and learning programs accompanying community energy initiatives. The authors have contributed concise narratives, illustrating collective knowledge making strategies that guide energy projects and holds them accountable for producing just co-benefits. In a first for this publication, some of the stories are presented both in English and the author's first language. We hope this will help engage readers in these languages, at the same time honor the author's first language. The stories bring out how actionable knowledge is created by those involved and invested in local sustainability efforts. This includes individuals, groups and other societal entities. They identify problems, increase awareness and educate themselves about root causes of problems, as they brainstorm solution strategies. The stories go on to critically reflect on the evolution of collective knowledge making and identifying improvements to it.

Nine stories in this volume cover a diversity of socio-cultural situations and contexts of knowledge making. The first three stories share the experiences of rural communities facing multiple sustainability challenges, including energy. Alfonso et al. share the story of Electropalmor, a community electricity enterprise, owned and operated by the residents of the town of Palmor in the Sierra Nevada de Santa Marta of Colombia. Their decades of experience illustrate the importance of investing in internal knowledge capacities and in building networks, in leveraging local and traditional knowledge of cooperativism, and the importance of multi-generational participation. François and co-authors follow-up on their report from the previous edition of LCL, sharing the progress made by the riverbank Community of Ilha das Cinza in the Brazilian Amazon. Following a reflexive and meticulous knowledge strategy, the community has managed to add newer energy projects and engage neighboring communities to generate co-benefits in sanitation, drinking water, food security and now livelihood generation. Completing the rural experiences section is the story from Murali et al., sharing lessons learnt from communities in Assam and Uttarakhand states of India. They document the process of mutual learning between technical experts and communities, helping socialize solar technologies in ways aligned to their values and needs.

The next two stories narrate the experiences of individuals who partnered with community groups to collectively develop tailored knowledge. Djinlev recounts his experiences of facilitating energy resilience in the community of Belica in North Macedonia, by using structured methods of exchanging and documenting information. Similarly, Botre and co-authors share the story of developing battery powered tricycles in collaboration with special mobility needs individuals, in the western Indian township of Pilani. Following these are two stories delving into knowledge making in urban settings. Sahakian et al. capture the evolution of knowledge processes that were part of action plans in four neighborhoods or communes in the Geneva area, Switzerland. Aiming to improve mobility, food and energy sufficiency, the story re-asserts the role of citizen participation in democratic decision making beyond casting votes in elections. Further to the north in Belgium, Borragán and co-authors evaluate the hits and misses in the development of TIVOLI Green City, a planned sustainable neighborhood project within the city of Brussels. They identify knowledge practices and gaps that contribute to successes and challenges being faced by the project.

The final two stories in this volume document the mobilization of knowledge between communities by sharing best practices, ideas and organizing for advocacy. Schneider et al. continue from their story in the previous edition of LCL and share the growth of the Energia Cooperativa network, helping mainstream energy cooperatives across Brazil and South America.

Within Brazil, another coalition, the Rede Energia & Comunidades network brings together diverse civil society actors to advocate for renewable energy deployment in the Amazonian forest communities. Lembi et al. describe the knowledge production and communication activities of this network.

Practical lessons from LCL 2024

- **Invest in Knowledge** - managing technological change must be a core knowledge making capacity for governing local transitions. This is mostly found in the form of practices, methods and people that bridge local forms of knowledge and expert knowledge.
- **Co-learn** - knowledge mobilization and mutual learning is essential for influencing the making of supportive policies, and informing appropriate designs of infrastructure. Co-learning is also important for the inclusion of and capacity building across and between generations. Community champions and knowledge keepers, technical and policy experts should welcome opportunities to learn from each other.
- **Organize** - knowledge-based networking is essential for creating and reinforcing positive outcomes. Community organizations need to be part of supportive networks for learning from each other, thereby reinforcing and improving their knowledge making capacities.
- **Re-learn** - adaptive learning is critical to long-term success of local projects and essential for project governance. This is a capacity built through specialized partners and facilitators, who can critically reflect, evaluate, and draw actionable lessons from previous actions and outcomes.

Happy reading.

Saurabh Biswas, Davi E. François, Mary Jane Parmentier, Witold-Roger Poganietz, Clark A. Miller

Palmor, located at the heart of the Sierra Nevada (1.1)

Associative Energy: Palmor's Community-Led Hydroelectric Success

Learning from challenges of new electricity infrastructure builds adaptive capacities, to successfully operate and govern the community owned energy project for more than three decades.

Electropalmor in a nutshell

Electropalmor is a community-owned nonprofit association dedicated to providing electricity in Palmor, a town in the Sierra Nevada de Santa Marta in Colombia (Electropalmor, 2024). This association stands out nationally, since they have been independently administering, operating, and maintaining a small hydroelectric plant since the early 1990s without any major support from external actors. The ~620 Palmoreños who receive the electricity own Electropalmor, make decisions through collective assemblies, and can be elected to manage the association or be part of its board of directors.

The origins of Palmor

The town of Palmor was founded in the 1960s following the displacement of campesinos (small-scale farmers) fleeing violence between Conservative and Liberal factions in Colombia (González & Rafael, 2024). These migrants found the Sierra Nevada an ideal place to continue their farming activities. Since it was familiar to most campesino settlers, coffee quickly became the primary economic activity in Palmor (Opinión Caribe, 2017). Moreover, coffee played a key role in Palmor's social structure, and with time, outside organizations (especially, the National Federa-

'Welcome to Palmor' Sign (1.2)

tion of Coffee Growers) became crucial to supporting the community's early development by helping to build essential infrastructure. Nowadays, Palmor is considered the Coffee Capital of the Sierra Nevada (Viloria De La Hoz, 2024).

However, Palmor has experienced significant socio-environmental conflicts, mainly the armed conflict involving the army, guerrillas, and paramilitaries in the 1990s and 2000s. In response, residents of Palmor have developed strong collective leadership, allowing it to stand out as a hardworking and resilient community. Nowadays, approximately 6,000 people live in Palmor.

The Arrival of Electricity

In the late 1980s, the community, led by Miguel Medina and Gabriel Castañeda, started discussing the need for a local source of electricity. Medina's connections with the National Federation of Coffee Growers, whose representatives used to stay at his home, helped in bringing together a group of organizations (PESENCA, GTZ, CORELCA, Colturbinas, and PNR) that materialized the community's electricity aspirations.

The project took advantage of the proximity of the Sevilla River to build a hydroelectric plant, a source of pride for the community due to its sustainable nature. During the project structuring, it was decided that the abovementioned organizations would provide most of the capital for the construction, while the community added the remaining funds (90 Palmoreños obtained loans from the Agrarian Bank for COP$90,000), securing community ownership of the plant. The story of Palmor's electricity project has been highlighted by several news portals such as El Espectador (2013), Opinión Caribe (2016), and Noticias Caracol (2017).

Proximity to Sevilla River allowed Palmor to use a local source of renewable energy (1.3)

Evolution of Electropalmor

Once the plant started operating in 1991, the community took over its administration, operation, and maintenance, and external actors' contributions were limited to occasional technical advice. The Community Action Board (JAC) assumed this task through one of its business committees. The JAC was the ideal body for this task, for it assembled individuals interested in participating in relevant community issues. Since 2016, Electropalmor has been collectively run by its users (Giraldo, Pening, & Avecedo Arango, 2017).

Despite Palmor's strong community spirit, electricity posed its own challenges:

- **Challenge 1:** Electricity insufficiency - Initial estimates for the plant's capacity were based on a census that underestimated the demand for electricity – when asked, Palmoreños expressed lower energy needs based on their previous energy realities, not their future consumptions. With a capacity of 125 kW, the plant soon proved insufficient as the community's energy needs grew, leading to blackouts and increasing community tensions. The JAC had to establish rationing rules, such as prohibiting certain appliances and setting usage hours, that shaped Palmor's energy reality for more than twenty years. Thankfully, the plant's designers anticipated this issue and left enough space for capacity expansions, and in 2016, the community (led by Marcel Pérez), the national government, and USAID worked on expanding the plant's capacity in 150 kW (Giraldo, Pening, & Avecedo Arango, 2017). Once the two generators started operating simultaneously, thanks to the work of Apolinar Velásquez in 2018, Palmor finally achieved energy sufficiency levels appropriate for a community with growing residential, commercial, and agricultural energy needs – nowadays, approximately 620 Palmoreños benefit from the hydroelectric plant.

- **Challenge 2:** Ensuring Payment for Electricity - Currently, Electropalmor does not receive any government subsidies (despite having the legal right to receive them) and relies on bill payments

The hydroelectric plant is a source of pride for Palmoreños (1.4)

for its day-to-day operations. This self-sufficiency has come with considerable challenges: Despite having one of the lowest electricity rates in the country, ensuring regular payments has been a persistent issue. Some Palmoreños believe electricity should be free, given its status as a public service and the plant's community ownership. Early efforts to deal with this issue involved community leaders physically disconnecting non-payers, which started conflicts. In recent years, Electropalmor has tried to raise awareness about the importance of payments to maintain the autonomy and community spirit of the project.

- **Challenge 3:** Relations with External Actors - Despite operating in an independent way, Electropalmor is increasingly aware of the importance of building strategic alliances with external entities, especially public institutions. However, this process has been extremely difficult. These entities often operate slowly and unpredictably, creating expectations that are not always met.

The Role of Education and Capacity Building in Overcoming Challenges

Electropalmor's ability to address these challenges stems from the links between new skills and broader community knowledge, from coffee-related organizational processes to everyday collective actions. It was particularly important to undertake learning processes about what it means to be an energy association: Managing a hydroelectric plant for over three decades has not been an easy task and has required the participation of many Palmoreños, each of which has contributed to creating and strengthening the foundations that sustain the association today.

- **Technical skills** have been developed through collaboration with external actors and internal training. Aware that proper system operation is crucial for the project's sustainability, the community focused on maintaining top-tier technical rigor during Electropalmor's early years. Furthermore, it is fundamental that the jobs generated benefit Palmor, so the technicians are community members, and the continuity of this knowledge over time has been ensured through generational handovers within the community. For example, Aníbal Varas operated the powerhouse for five years, and now his son Jonathan continues this work. Similarly, Tomás Varela, the new network technician, is learning from Miguel Ruiz, an experienced community technician, how to operate and maintain the local distribution network.

- **Business skills** were developed through formalization and training as a way to bring Electropalmor to the next level. In recent years, the company has improved its corporate structure, aiming for more robust statutes and a more proactive board of directors. Additionally, documentation and process practices have been enhanced thanks to the work of Adriana Sanguino. Strategic partnerships with former officials and sector experts are now providing training in legal and financial matters, equipping Electropalmor to engage in public and private sector discussions in the future.

- **Soft skills** have also been crucial in balancing business and technical rigor with community engagement. Improved communication, such as using WhatsApp to inform the community about electricity issues has built trust and credibility. Similarly, efforts to collect payments have been more effective by emphasizing the importance of community contributions and belonging, with recent successes attributed to individuals like Leidy Durán.

What's next?

Thanks to the challenges, educational processes, and developed capacities, Electropalmor's employees and members of the board of directors (currently led by Edqin Quintero) envision a stronger future, aiming to expand its presence to other communities in the Sierra Nevada and even venture into areas beyond

Electropalmor's Board of Directors and Executive Director (1.5)

energy, such as waste management. The association wants to inspire local development and gain recognition in the Colombian electric sector, leveraging its cooperative model to form new partnerships and foster growth. Balancing growth with maintaining its community spirit will be crucial, and ensuring new generations understand and value the company's history and community ownership is essential: Electropalmor's success will depend on integrating its historical resilience with strategic growth and community engagement. By doing so, Electropalmor can continue to improve the quality of life in Palmor and serve as a model for other communities, demonstrating the power of collective action and sustainable development. Moreover, Electropalmor hopes to continue being an example for other people and organizations. Within the community, Electropalmor aims to become an inspiration for imagining and materializing better local futures, like tourism that could be a sustainable economic activity in the future (Radio Nacional de Colombia, 2023), so that more people choose to stay in the area and contribute to community improvement. And under the management of Sol Zapata, Electropalmor's first female executive director, electricity is becoming a synonym of women empowerment, breaking down negative stereotypes and encouraging younger generations to acquire new skills and get involved in community projects.

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Palmor, situada en el corazón de Sierra Nevada (1.1)

Energía Asociativa: la historia de éxito de la hidroeléctrica comunitaria de Palmor

Los retos y aprendizajes propios de esta infraestructura eléctrica ha construido capacidades adaptativas para administrar y operar exitosamente este proyecto por más de tres décadas.

Electropalmor en pocas palabras

Electropalmor es una empresa de servicios públicos de propiedad comunitaria dedicada a suministrar electricidad en Palmor, un pueblo de la Sierra Nevada de Santa Marta en Colombia (Electropalmor, 2024). Esta asociación es única en el país, pues ha administrado, operado y mantenido una pequeña hidroeléctrica desde comienzos de los años 90 de manera independiente y con limitado apoyo de actores externos. Los ~620 palmoreños que reciben electricidad de Electropalmor son a su vez,los dueños de la empresa, toman decisiones en órganos colectivos y pueden ser elegidos para hacer parte de su administración o dirección.

Los orígenes de Palmor

El pueblo de Palmor fue fundado en la década de los 60 como resultado del proceso de desplazamiento y colonización de campesinos que huían la violencia entre Conservadores y Liberales que azotaba al interior del país (González & Rafael, 2024). Estos migrantes encontraron en la Sierra Nevada un lugar ideal para continuar con sus actividades agropecuarias. Dado quela mayoría de familias lo conocían, el cultivo de café se convirtió rápidamente en la principal actividad económica de Palmor (Opinión Caribe, 2017).

Cartel "Bienvenidos a Palmor" (1.2)

Además, el café jugó un papel fundamental en la constitución de las estructuras sociales del pueblo, y con el tiempo, organizaciones externas como la Federación Nacional de Cafetero se convirtieron en aliados fundamentales para el desarrollo de la infraestructura esencial de Palmor. En la actualidad, Palmor es considerado la Capital Cafetera de la Sierra Nevada (Viloria De La Hoz, 2024).

Sin embargo, Palmor ha atravesado conflictos socioambientales considerables, en especial el conflicto armado entre el Ejército, las guerrillas y los paramilitares en las décadas de los 90 y 2000. En respuesta, los palmoreños han desarrollado un liderazgo excepcional y un deseo de salir adelante que ha impulsado los procesos locales desde entonces. En la actualidad, aproximadamente 6.000 personas viven en Palmor.

La llegada de la electricidad

A finales de los años 80, la comunidad, liderada por Miguel Medina y Gabriel Castañeda, comenzó a discutir la necesidad de contar con una fuente local de energía eléctrica. Las conexiones de Medina con la Federación Nacional de Cafeteros, cuyos representantes se solían hospedar en su casa, ayudó a consolidar un grupo de organizaciones (PESENCA, GTZ, CORELCA, Colturbinas, and PNR) que apoyaron a la comunidad en la materialización de este sueño.

El proyecto aprovechó la cercanía del Río Sevilla para construir una planta hidroeléctrica, la cual se convertiría en motivo de orgullo debido a su independencia y sostenibilidad ambiental. Durante la estructuración del proyecto, se decidió que las organizaciones proveerían la mayoría del capital para la construcción de la hidroeléctrica, mientras que la comunidad contribuyó con los fondos restantes (noventa palmoreños sacaron créditos con el Banco Agrario por $90.000

La proximidad al río Sevilla permitió a Palmor utilizar una fuente local de energía renovable (1.3)

pesos colombianos), asegurando la propiedad colectiva de la planta. La historia de Palmor con la energía ha sido destacada en varios medios de comunicación, incluyendo El Espectador (2013), Opinión Caribe (2016) y Noticias Caracol (2017).

Evolución de Electropalmor

Desde que la planta comenzó a operar en 1991, la comunidad se encargó de la administración, operación y mantenimiento, mientras que los actores externos se limitaron a proveer asesoría técnica ocasional. La Junta de Acción Comunal (JAC) asumió esta tarea a través de uno de sus comités empresariales, pues reunía a todos aquellos palmoreños interesados en involucrarse en asuntos de relevancia para Palmor. Desde 2016, Electropalmor cambió su estructura jurídica y es administrada colectivamente por todos sus usuarios (Giraldo, Pening, & Avecedo Arango, 2017). A pesar de la fortaleza comunitaria de Palmor, la electricidad creó sus propios retos:

- **Primer reto:** suficiencia energética. Las estimaciones iniciales sobre la capacidad de la planta se basaron en un censo que subestimó la demanda energética (al ser entrevistados, los palmoreños expresaron unas necesidades eléctricas basadas en sus realidades energéticas pasadas, no en sus aspiraciones futuras de consumo. Con una capacidad de 125 kW, la planta rápidamente se quedó pequeña para las crecientes necesidades energéticas de Palmor, lo cual llevó a apagones y tensiones entre los miembros de la comunidad. La JAC tuvo que establecer reglas de racionamiento, como la prohibición de ciertos electrodomésticos y el establecimiento de ciertas franjas de menor consumo eléctrico. Estas reglas definieron la realidad energética de Palmor durante más de veinte años. Afortunadamente, quienes diseñaron la planta anticiparon este problema y dejaron suficiente espacio para una expansión de capacidad, la cual ocurrió en 2016: la comunidad, liderada por Marcel Pérez, trabajó con el gobierno nacional y USAID para expandir la planta en 150 kW (Giraldo, Pening, & Avecedo Arango, 2017). Luego, en 2018, Apolinar Velásquez logró poner a funcionar las dos plantas de manera simultánea, lo cual permitió que Palmor tuviese finalmente niveles de suficiencia energética a nivel residencial, comercial y agrícola. Hoy en día, aproximadamente 620 palmoreños se benefician de la hidroeléctrica.

La central hidroeléctrica es motivo de orgullo para los Palmoreños (1.4)

- **Segundo reto:** asegurar el pago de la electricidad. Actualmente, Electropalmor no recibe subsidios por parte del gobierno nacional (a pesar de tener derecho a ello), y su sostenimiento financiero depende del oportuno pago de las facturas. Esta "autosuficiencia" ha sido retadora, pues, a pesar de tener una de las tarifas más bajas de todo el país por kilovatio-hora, el recaudo siempre ha sido problemático. Por ejemplo, algunos palmoreños consideran que la electricidad debería ser gratuita, pues es un servicio público proveído a través de una planta que les pertenece a todos. En sus inicios, los líderes de la JAC lidiaban con esto directamente, desconectando a quienes no pagaban a tiempo, lo cual generó muchos conflictos. En años recientes, Electropalmor le ha apostado a la concientización sobre la importancia de pagar la factura para mantener la autonomía y el carácter comunitario de la empresa como estrategia para mejorar el recaudo.

- **Tercero reto:** las relaciones con los actores externos. A pesar de operar de forma independiente, Electropalmor es cada vez más consciente de la importancia de establecer relaciones estratégicas con actores externos (en especial, con el gobierno nacional). Sin embargo, este proceso ha sido muy difícil y lento. Las entidades gubernamentales suelen operar de forma lenta y difícil de predecir, generando expectativas que no siempre se cumplen.

El rol de la educación y la creación de capacidades para abordar estos retos

La capacidad de Electropalmor de abordar estos (y otros) retos se desprende de las habilidades y conocimientos más generales que la comunidad ha ido creando históricamente en temas no-eléctricos, desde los procesos relacionados con el café hasta las iniciativas comunitarias más nuevas. En este proceso, fue muy importante aprender cómo manejar una empresa de energía eléctrica de manera colectiva. Han sido muchos los palmoreños que han participado en este proceso de aprendizaje, cada uno de los cuales ha contribuido a la creación y el fortalecimiento de las bases que sostienen hoy en día a Electropalmor. Estos son algunos de los temas de mayor aprendizaje:

- **Las habilidades técnicas** han sido desarrolladas a partir de una mezcla de entrenamientos y capacitaciones internas con colaboraciones con actores externos. Conscientes de que una operación apropiada de la planta y las redes es fundamental para la sostenibilidad del proyecto en el tiempo, la comunidad priorizó asegurar un rigor técnico de primer nivel durante los primeros años del proyecto. Además, para Electropalmor es fundamental que estas labores sean desarrolladas por personas de la comunidad, por lo que los trabajos técnicos son ejecutados y mantenidos en el tiempo por palmoreños. Por ejemlpo, Aníbal Varas ha operado la casa de máquinas durante cinco años y ahora es su hijo, Jonathan, quien continúa con esta labor. Así mismo, Tomás Varela, el nuevo técnico de redes, está capacitándose con Miguel Ruiz, un experimentado técnico de la comunidad, cómo operar y mantener la red de distribución local.

- **Las habilidades empresariales** siguieron a las habilidades técnicas, y han surgido a partir de años de formalización y entrenamiento para llevar a Electropalmor al siguiente nivel. En años recientes, la empresa ha mejorado su estructura corporativa, apuntándole a fortalecer sus estatutos y su junta directiva. Además, la documentación y estandarización de procesos ha mejorado gracias a la labor de Adriana Sanguino. Así mismo, las alianzas estratégicas con personas que conocen del sector eléctrico (como exfuncionarios del gobierno nacional) han permitido adquirir conocimientos legales y financieros que fortalecen al personal de Electropalmor para participar en discusiones públicas y privadas sobre los temas eléctricos.

Consejo de Administración y Director Ejecutivo de Electropalmor (1.5)

- **Las habilidades blandas** han sido fundamentales para balancear el rigor técnico y empresarial con las relaciones con la comunidad. Mejoras en la comunicación (por ejemplo, utilizar WhatsApp como canal de comunicación) ha mejorado la confianza y credibilidad de la empresa con sus usuarios/propietarios. Así mismo, el recaudo ha mejorado considerablemente gracias al trabajo de Leidy Durán, quien aborda a los usuarios morosos desde la empatía y el espíritu comunitario para convencerlos de que pagar es importante para sostener a una empresa que les pertenece a todos.

Perspectivas a futuro

Gracias a estos retos, procesos de aprendizaje y desarrollo de capacidades, los empleados de Electropalmor y los miembros de su junta directiva (liderada actualmente por Edwin Quintero) sueñan con la expansión de la empresa a otras comunidades de la Sierra Nevada e incluso expandirse a otros servicios públicos (por ejemplo, el manejo de residuos). Este proyecto quiere servir de inspiración para otros focos de desarrollo local y ganar reconocimiento en el sector eléctrico colombiano, aprovechando su modelo cooperativo para formar nuevas alianzas y

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continuar con su crecimiento. Mantener el equilibrio entre crecer y continuar siendo un proyecto de arraigo comunitario no será fácil, pero será fundamental para que las nuevas generaciones entiendan el valor de lo que han realizado las generaciones previas y se comprometan a sostener el proyecto en el tiempo. Así, el éxito de Electropalmor radicará en su capacidad de articular su espíritu comunitario, la resiliencia histórica de los palmoreños y el deseo de progreso que los inspira. De esta forma, Electropalmor aspira a continuar siendo un factor de transformación de la vida de los palmoreños y convertirse en ejemplo para otras iniciativas y comunidades, y así ayudar a imaginar mejores futuros, como el turismo que podría ser una actividad económica sostenible en el futuro (Radio Nacional de Colombia, 2023), en los que más gente decida quedarse en la región y apostarle al bienestar de la comunidad. Y gracias a la gestión de Sol Zapata, primera directora ejecutiva mujer de Electropalmor, la electricidad se está convirtiendo en sinónimo de empoderamiento femenino, derribando estereotipos negativos e invitando a nuevas generaciones de mujeres a adquirir nuevas capacidades e involucrarse en proyectos de la comunidad.

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The community center of the island Ilha das Cinzas in the Brazilian Amazon (2.1).

Strengthening community organisation and governance through participatory and integrative energy projects

Diligent learning and knowledge sharing by community actors strengthens internal capacities, and diffuses success to neighbouring communities in the Brazilian Amazon.

Overview

This narrative follows the one written in the report Let Communities Lead 2021 on the community-based energy project developed from 2020 to 2023 in the island Ilha das Cinzas in the Brazilian Amazon. The narrative describes the organization process of the local families and the new project "Scaling-up solar energy for food sovereignty and production in riverbank families in the Amazon Delta" to be carried out until 2026 in communities neighbouring Ilha das Cinzas. Finally, the narrative presents some lessons learned on how community-based energy projects can be used to foster community organisation and local governance.

The pathway followed by the families of the Ilha das Cinzas towards community organisation

Until 2000, the riverbank families living in the island Ilha das Cinzas, located in the Brazilian Amazon, did not have a strong community organisation. This scenario contributed to keep families without or with limited access to basic services such as electricity, drinking water, basic sanitation and education. It also contributed to keep families working and commercializing their products, especially shrimp, individually.

It was with the support of the non-governmental organization Federação de Órgãos para Assistência Social e Educacional (FASE) that this scenario began to change. Using a participatory and integrative approach, FASE started to support local families to establish a community-based shrimp management. Systematically, addressing the socio-cultural, organisational and economic context of the Ilha das Cinzas. Besides strengthening shrimp production for family consumption and commercialisation, the local families of the Ilha das Cinzas founded in 2000 the association Associação dos Trabalhadores Agroex-

trativistas da Ilha das Cinzas (ATAIC). ATAIC's main objective is to generate collaborative actions, through community organisation and mobilisation, that can improve the quality of life of the local families, generate income, promote the sustainable development of the community and the access regional and national public policies.

Today ATAIC is a model of community-based organisation in the Amazon region. Many achievements have already been realized at Ilha das Cinzas, such as the introduction of sustainable management of the açaí, which is a basic food and income source for the families, and the construction of a school for basic education in the community. Another significant advance achieved by ATAIC is the universalisation of electricity access through the project "Solar Energy for Food Sovereignty for Riverbank Families". The project has already been reported in the Let Communities Lead 2021 (story 13 https://letcommunitieslead.wordpress.com/wp-content/uploads/2021/11/let-communities-lead-report_2021.pdf). The project was led by ATAIC supported by national and international research institutions that provided technical and academic support to ATAIC in all project phases (conceptualisation, implementation and management). The financial support came from the Honnold Foundation, USA.

In the original project, also known as phase I, all the families living in the Ilha das Cinzas (around 80 families – associated or not to ATAIC) received off-grid solar systems to generate electricity in their homes. The project sought not only to provide electricity to meet the families' basic needs, but also to strengthen food sovereignty and production in the community, mainly through the use of blenders connected to the solar systems to process the fruit of the açai palm.

From technical capacity building to community participation

During the execution of the phase I, the Federal University of Amapá (UNIFAP), which was responsible for the technical design of the solar systems, provided technical training of the community members to install, operate and maintain the solar systems. Throughout phase I, the solar systems were installed only by the community members. Today, they also provide technical assistance for the systems.

The participation of the community members in phase I aroused their interest not only in solar energy, but also in community organisation. This is the case of Benedito, 29 years old, who became an active member of ATAIC throughout the execution of the project. Today, Benedito is also the production director

A blender connected to a solar system to process the fruit of the açai palm (2.2; 2.3; 2.4).

of the Cooperativa dos Produtores Agroextrativistas da Ilha das Cinzas na Região do Marajó (ATAICOOP), a cooperative founded in 2024 at Ilha das Cinzas to add value to the processing and marketing of fruits and seeds collected in the forest by families living in the community and neighbouring communities.

Scaling-up solar energy and promoting community organisation in neighbouring communities

Phase I ended in 2023 with ATAIC and partners conducting the workshop, "The social value of energy for building participatory, inclusive and sustainable communities". The workshop aimed to celebrate with neighbouring communities the results obtained in phase I. Thereafter, two additional project proposals were written and submitted to the Honnold Foundation, one by the women association Associação de Mulheres Produtoras Agroextrativistas da Foz Do Rio Mazagão Velho (AMPAFOZ) and another by ATAIC. Both projects were approved.

The project approved by AMPAFOZ is entitled "Nexus water, energy, and food security of riverbank families in the Amazon Delta". It will focus on community organization, and on the installation and management of solar systems for access to drinking water, and food security of the families living in the rural settlement Foz do Rio Mazagão Velho. This project is scheduled to begin in 2024.

The new project approved by ATAIC is entitled "Scaling-up solar energy for food sovereignty and production in riverbank families in the Amazon Delta". In this new project, also called phase II, ATAIC and its partners will work with five communities located around Ilha das Cinzas, whose families still do not have access to electricity. These families have socio-cultural relations close to those of the Ilha das Cinzas families and share economic relations through the supply of seeds (for cosmetics) to be processed and commercialised by ATAICOOP.

In simple terms, phase II replicates the socio-technical knowledge acquired in phase I in the communities neighbouring Ilha das Cinzas.

Workshop on the social value of energy (2.5) and Benedito, a young leader in the community (2.6).

Thus, it is estimated that more than 100 families will benefit from solar systems in their homes. Besides solar energy, phase II focuses on the organisational capacity of the communities involved, given that they do not present a community organisation similar to the one experienced at Ilha das Cinzas via ATAIC. In other words, at the same time that solar energy will be used to meet basic needs, promote food sovereignty and help generate income for the families, it will also be the starting point for promoting community organisation and governance in the communities involved.

Therefore, just as FASE worked in a participatory and integrative way with the families of the Ilha das Cinzas in the 2000s on their community organisation through community shrimp management, today ATAIC and its partners will work on community organisation and governance in the communities surrounding Ilha das Cinzas through solar energy.

Sustainability of governance and multifunctionality community energy projects - lessons learnt

Since 2000, ATAIC has experienced an evolution from internal capacity building, a well-documented learning journey and management of knowledge in a collaborative and non-controlling way with neighbouring communities. That is how it has become an accepted and appreciated model of community organisation and governance in the Amazon region. However, ATAIC can also fall back to its pre-2000s level if the sustainability of its current governance is not strengthened. If there is no formation of new leaderships at the Ilha das Cinzas, the sustainability of local governance and community organisation could be compromised in the future. This challenge has already been identified in phase I and actions aimed at training new leaders are already being taken and will be intensified in phase II.

Finally, one aspect that should be emphasised is the multifunctionality that community-based energy projects can have. These projects, when managed by community members, not only bring access to clean energy to the community, but also a systemic and contextualised view of the challenges faced by the local families and how energy can help overcome such challenges.

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Vista do centro comunitário da Ilha das Cinzas na Amazônia Brasileira (2.1).

Fortalecendo organização comunitária e governança através de projetos energéticos participativos e integrativos

O aprendizado diligente e o compartilhamento de conhecimento por membros comunitários fortalecem as capacidades internas e disseminam o sucesso para comunidades vizinhas na Amazônia brasileira.

Resumo

Esta narrativa da sequência a narrativa escrita no relatório Let Communities Lead 2021 sobre o projeto energético de base comunitária desenvolvido de 2020 a 2023 na Ilha das Cinzas, na Amazônia Brasileira. A narrativa descreve o processo de articulação das famílias locais e novo projeto "Ampliando a energia solar para a soberania e produção alimentar em famílias ribeirinhas do Delta do Amazonas" a ser executado até 2026 em comunidades vizinhas a Ilha das Cinzas. Por fim, a narrativa apresenta algumas lições aprendidas de como projetos energéticos de base comunitária podem ser utilizados para fomentar a organização comunitária e governança local.

O caminho percorrido pelas famílias da Ilha das Cinzas em sua organização comunitária

Até o ano 2000, as famílias ribeirinhas moradoras da Ilha das Cinzas, localizada na Amazônia Brasileira, não possuíam uma organização comunitária fortalecida. Este cenário contribuía para manter as famílias sem ou com acesso limitado à serviços básicos essenciais, como eletricidade, água potável, saneamento básico e educação, assim como também contribuía para que as famílias trabalhassem e comercializassem seus produtos, principalmente o camarão, de forma isolada.

Foi então que com o suporte da organização não governamental Federação de Órgãos para Assistência Social e Educacional (FASE), este cenário começou a mudar. Utilizando uma abordagem participativa e integrativa, a FASE começou a trabalhar junto com famílias ribeirinhas o manejo comunitário do camarão em uma visão sistêmica, incluindo o contexto sociocultural, organizacional e econômico da Ilha das Cinzas. Além de fortalecer a produção do camarão, para consumo familiar e comercialização, os moradores da Ilha das Cinzas criaram no ano 2000 a Associação

dos Trabalhadores Agroextrativistas da Ilha das Cinzas (ATAIC). A ATAIC tem como principal objetivo gerar ações conjuntas, através da organização e mobilização comunitária, que possam melhorar a qualidade de vida das famílias locais, gerar renda, promover o desenvolvimento sustentável na Ilha das Cinzas e o acesso a políticas públicas regionais e nacionais.

Hoje a ATAIC é um modelo de organização social na região Amazônica e muitas conquistas já foram alcançadas na Ilha das Cinzas, como por exemplo na introdução do manejo sustentável do açaí, que é base alimentar e também fonte de renda as famílias, e da construção de uma escola de ensino fundamental na comunidade. Um outro avanço notório alcançado pela ATAIC foi a universalização do acesso a eletricidade na Ilha das Cinzas através do projeto "Energia Solar para Soberania Alimentar das Famílias Ribeirinhas". Este projeto já foi relatado no relatório Let Communities Lead de 2021 (narrativa nº 13 https://letcommunitieslead.wordpress.com/wp-content/uploads/2021/11/let-communities-lead-report_2021.pdf). O projeto foi liderado pela ATAIC com o apoio de instituições de pesquisa a nível nacional e internacional que deram suporte técnico e acadêmico à ATAIC em todas as fases de conceitualização, implementação e gerenciamento do projeto. O suporte financeiro veio da Fundação Honnold dos Estados Unidos.

No projeto, também chamado de fase I, todas as famílias moradoras da Ilha das Cinzas (cerca de 80 famílias), associadas ou não a ATAIC, receberam sistemas fotovoltaicos isolados (off-grid) para geração própria de eletricidade em suas residências. O projeto buscou não somente fornecer eletricidade para suprir necessidades básicas das famílias, mas também fortalecer a soberania alimentar e atividades produtivas na comunidade, principalmente através da utilização de batedeiras elétricas de açaí conectadas aos sistemas fotovoltaicos.

Da capacitação técnica à participação comunitária

Durante a execução da fase I, membros da comunidade receberam capacitação técnica através da Universidade Federal do Amapá, a qual também foi responsável pelo dimensionamento dos sistemas fotovoltaicos instalados nas residências. Da metade da fase I até o final do projeto, os sistemas solares foram instalados somente pelos membros da comunidade, os quais hoje também dão assistência técnica aos sistemas.

A participação dos membros comunitários na fase I despertou o interesse não somente pela energia solar, mas também pela organização comunitária. Este é o caso de Benedito, de 29 anos, que se tornou um membro mais ativo na ATAIC ao longo da execução

Batedeira movida a energia solar para processamento de açaí (2.2; 2.3; 2.4).

do projeto de energia solar. Hoje, Benedito também é o diretor de produção da Cooperativa dos Produtores Agroextrativistas da Ilha das Cinzas na Região do Marajó (ATAICOOP) fundada em 2024 na Ilha das Cinzas para agregar valor ao processamento e comercialização de sementes coletadas na floresta pelas famílias moradoras da ilha e comunidades vizinhas.

Expandindo a energia solar e promovendo organização comunitária em comunidades vizinhas

A fase I terminou em 2023 com a ATAIC e parceiros realizando o workshop "O valor social da energia na construção de comunidades participativas, inclusivas e sustentáveis". O workshop foi uma forma de celebrar junto a comunidades vizinhas os resultados obtidos na fase I. Na ocasião também foram escritas e submetidas mais duas propostas de projeto à Fundação Honnold, uma pela Associação de Mulheres Produtoras Agroextrativistas da Foz Do Rio Mazagão Velho (AMPAFOZ) e outra pela ATAIC. Ambos os projetos foram aprovados.

O projeto aprovado pela AMPAFOZ tem como título "Nexo água, energia e segurança alimentar das famílias ribeirinhas do Delta do Amazonas". O projeto terá como foco a organização comunitária e a instalação e gestão de sistemas solares para acesso à água potável e segurança alimentar das famílias residentes no assentamento rural Foz do Rio Mazagão Velho. Este projeto está previsto para começar neste ano de 2024.

Já o novo projeto aprovado pela ATAIC intitula-se "Ampliando a energia solar para a soberania e produção alimentar em famílias ribeirinhas do Delta do Amazonas". Neste novo projeto, também chamado de fase II, a ATAIC e seus parceiros irão trabalhar com cinco comunidades localizadas ao entorno da Ilha das Cinzas, cujas famílias, em sua maioria, ainda não possuem acesso à energia elétrica. Essas famílias possuem relações socioculturais próximas as das famílias da Ilha das Cinzas, além de relações econômicas no fornecimento de sementes a serem processada e comercializada pela ATAICOOP.

De forma simples, a fase II replica os conhecimentos socio-técnicos adquiridos na fase I nas comunidades vizinhas à Ilha das Cinzas. Assim, estimasse que mais de 100 famílias serão beneficiadas com sistemas sola-

Workshop sobre o Valor Social da Energia (2.5) e Benedito, uma nova liderança jovem na comunidade (2.6).

res em suas residências. Além da energia solar, a fase II centra-se na capacitação organizacional das comunidades envolvidas, visto que atualmente elas não apresentam uma organização comunitária semelhante àquela que as famílias da Ilha das Cinzas vivenciam através da ATAIC. Ou seja, ao mesmo tempo que a energia solar será utilizada para atender necessidades básicas, promover soberania alimentar e contribuir para a geração de renda das famílias, ela também será o ponto de partida para promover a organização comunitária e governança nas comunidades envolvidas.

Desta forma, assim como a FASE trabalhou de forma participativa e integrativa com as famílias da Ilha das Cinzas nos anos 2000 em sua organização comunitária através do manejo comunitário do camarão, hoje a ATAIC e seus parceiros irão trabalhar a organização comunitária e governança nas comunidades vizinhas à Ilha das Cinzas por meio da energia solar.

Sustentabilidade da governança e multifuncionalidade de projetos energéticos comunitários – lições aprendidas

Desde o ano 2000, a ATAIC tem experimentado uma evolução a partir da capacitação interna, uma jornada de aprendizagem bem documentada e gestão do conhecimento de forma colaborativa e não controladora com comunidades vizinhas. É assim que a ATAIC se tornou um modelo aceito e apreciado de organização e governança comunitária na região amazônica. Todavia, a ATAIC também pode retroceder e retornar ao patamar anterior aos anos 2000, caso ela mesma não fortaleza a sustentabilidade da atual governança. Se não houver formação de novas lideranças na Ilha das Cinzas, a sustentabilidade de governança local e organização comunitária pode se comprometer no futuro. Esse desafio já foi identificado na fase I e ações voltadas a formação de novas lideranças já estão sendo tomadas e serão intensificadas na fase II.

Por fim, um aspecto a ser ressaltado refere-se à multifuncionalidade que projetos energéticos integrativos com base comunitária podem ter. Ou seja, tais projetos, quando geridos pelos membros comunitários, não trazem somente acesso a energia limpa à comunidade, mas também uma visão sistêmica e contextualizada dos desafios enfrentados pelas famílias e como a energia pode auxiliar no superação de tais desafios e ao mesmo tempo, integração com outras tecnologias sociais existentes no local.

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Awareness drive with the communities in Golaghat district, Assam, India (3.1)

Learning Together and Building Trust: Experiences on Knowledge Co-Creation from Uttarakhand and Assam

Mutual learning between community members and technical experts plays a central role in creating community interest and participation for energy projects.

Overview

The Energy and Resources Institute (TERI) implemented solar projects in remote villages of two states in India - Uttarakhand in the Himalayas, and Assam in the North-East. The communities there faced similar challenges with infrastructure deficits, but also presented unique opportunities for co-creating knowledge on technologies that enabled addressing these challenges. The main actors in the process were the agrarian communities supported by TERI and funding organisations. Through knowledge generation and exchange of learning, innovative clean energy technologies were designed and implemented to meet the infrastructural gap impacting livelihoods and quality of life of the communities.

The village of Mukteshwar, Uttarakhand

Agriculture is the mainstay of Uttarakhand's economy and contributes around 11 per cent in Gross State Domestic Product (PRS, 2023). Though the state has just 14 per cent of its total land under cultivation, about 75 per cent of the population depends on agriculture for their livelihood (Govt. of Uttarakhand., 2024). Agriculture is mostly rain-fed, however, irrigated agriculture gained prominence due to climate induced vulnerabilities such as uncertain monsoons,

The components of the solar pumping system, comprising the motor (left) and solar panels (right) (3.2; 3.3)

intermittent flood and drought-like conditions, and forest fires among other extreme weather events. State-wide policies and national level schemes have been operational in the state to address the declining productivity and vulnerable livelihoods, linked to climate change through sustainable agricultural practices (Uttarakhand Agriculture Department, 2018; Uttarakhand Agriculture Department, 2014). Studies have also indicated the potential of increasing the net irrigated area through irrigation schemes, and the need to generate alternate sources of irrigation, which shall result in increased cropping intensity, and enhanced production and productivity of major crops in the state (Kishor & Kumar, 2022; Irrigation Research Institute, 2018).

In Mukteshwar, Uttarakhand, the installation of solar pump was identified as a sustainable way of tackling the triple threats of energy access, water availability, and food security. Solar pumps presented the opportunity to tap water resources without disturbing the fragile ecosystem, and have demonstrated success in other similar geographies (Nainwal & Punetha, 2023).

TERI already had a presence in the state and was working on sustainable farming practices in the nearby communities. Therefore, a channel was open for farmers to express their challenges regarding erratic rainfall leading to water unavailability and loss of crop. Acting on this feedback, the TERI team undertook a feasibility assessment to explore the possibility of solar pumps for irrigation. Once, the technical feasibility was established, the idea was discussed with the community. Potential benefits of the system were explained and the interest of the community to participate in the entire value chain was gauged - from project implementation to maintenance. The implementation process involved identifying a suitable location for installation, and designing the system, consisting of a unique experimental thin film solar photovoltaic panel connected to a motor and included a battery for back-up. The installed system drew water from a sump, filled by natural streams and delivered it to a tank placed at a height of 40 - 45 feet. Water from this tank was used to irrigate fields by gravity channels, benefitting a total of eleven households comprising around fifty people.

The villages of the Golaghat district, Assam

Assam is the second-largest state in North-East India and has the highest population amongst the North-Eastern states. Assam is home to several remote tribal communities that inhabit the peripheries of forests and have been on the fringes in terms of development. The story of the rural communities of Golaghat district is no different. Dwelling in the neighbourhood of the Kaziranga National Park and Tiger Reserve, the habitat of the renowned Indian one-horned rhinoceros and a UNESCO World Heritage Site, the communities of 184 villages in the zone of influence of the park are vulnerable to climate change, loss of livelihoods, restrictions of use of forest resources, and the demands of an expanding population (Misra, 2005; Ghosh, Nandy, & Kumar, 2016). Human-wildlife conflict is one of the most pressing and persisting issues faced by the already vulnerable population of the forest-fringe villages, having led to crop loss, property damage and even the loss of human lives (Das, 2017).

In Assam, Numaligarh Refinery Limited (NRL), a prominent public sector oil company, was undertaking various projects under their corporate social responsibility (CSR) activities. These projects for rural development were being undertaken in Golaghat district, which later expanded to Jorhat, Majuli, Karbi Anglong, Nagaon, and Charaideo districts. The villages of Golaghat situated in the periphery of the Kaziranga National Park faced severe energy access challenges. The population comprised mainly of underprivileged and landless farmers, tea garden workers, and members from socially disadvantaged groups and tribes. Electrification in the forest fringe villages had always been challenging due to safety considerations for the wildlife. Therefore, communities relied on kerosene for lighting since there was no awareness regarding alternate sources of electricity. In 2015, TERI partnered with NRL to assess the potential of solar technology to address the energy gap. Off-grid standalone solar photovoltaic systems were designed and customised to meet the basic energy needs of the households. These battery-backed systems supported lighting appliances

Group awareness programmes with rural women in Uttarakhand (3.4)

like bulbs, a fan, a portable light, and a mobile phone charging point. In addition, solar lighting was implemented in the village streets. Community spaces and cultural and religious buildings were also illuminated with solar lights.

Lack of awareness was a foreseeable bottleneck in the acceptance of a new technology. Electricity, for the communities, was always associated with installing poles and transformers. Though the introduction of solar was a novel concept- where one could have their own private energy source- bringing about acceptance was a gradual process, involving community mobilisation through extensive awareness programmes. The first step was leveraging the local networks of NRL, developed over years of local engagement and employment in their plant. The first level of awareness was conducted with village elders, village council (Panchayat) members, and local leaders, supported by NRL, as their influence in the community was useful for the introduction of the intervention. This was followed by larger campaigns with the community on a regular basis. Information was provided on the basic functioning of solar systems, the benefits of having modern lights in the house, the potential savings earned from elimination of kerosene, and the maintenance of the system, among others.

Table 1: Systems installed in Assam

Technology	Installation time period	Number of Installations
Solar Street Lights (SSLs)	2018-23	1139
Solar Home Lights (SHLs)-including portable light, fan, mobile charging	2015-21	1129

The newly generated curiosity, and the trust they had in NRL, further cemented the community's decision to adopt solar. The success of the solar home lighting systems improved their knowledge about the utility of an alternative energy source. This new knowledge led to demand generation for more interventions. Since the villages were forest fringe, public safety was the next aspect to be addressed. People realised the importance of lighting to avoid animal conflicts and enhance the safety of people. They expressed a demand for lighting in public spaces, which led to the implementation of the solar street lights. This was followed by lighting in the cultural and religious centres, driven by the community's demand. Over the years, the community and TERI worked together to address several energy challenges through knowledge exchange fostered by open discussions, leading to design innovations.

Group awareness programmes in Golaghat district, Assam, India (3.5)

Lessons on mutual learning and combining expertise for co-creation

The important learning from these case studies is that for any community-energy intervention to be successful, accepted and sustainable; three important parameters should be met. First, it should cater to the specific needs of the community and designed accommodating their socio-economic situation. Second, there should be a sense of trust between the community and the project implementers. And the most important aspect is awareness and knowledge co-creation with the people. Such programmes have the potential to strengthen the knowledge and application of clean energy to address local infrastructure challenges, and create opportunities for the community to take up alternative livelihoods.

In Mukteshwar, the community had laid out common guidelines to collectively manage the irrigation system. These included harmonizing the cropping pattern and a water sharing mechanism. The TERI team built on this place-based knowledge and expertise of the farming community to develop the technical aspects of the solar irrigation system to complement the guidelines. In turn, project development experiences of TERI helped guide the community to identify and outline their contribution towards maintenance of the irrigation channels and the solar system. Women in the community utilised this co-creation experience to recognize the opportunity and express interest in getting trained as solar technicians as an additional livelihood option.

In Assam, the co-creation process helped identify mechanisms for equitable sharing of benefits, by

holding community-wide discussions, especially with women, to identify locations for street light installation. Training on system maintenance of the home lighting systems was given to both men and women members of the households. For maintaining street lighting local youth were trained. Unlike in Mukteshwar however, women's participation in operation and maintenance of the systems was underwhelming. This can likely be attributed to lower levels of educational attainment.

Remote rural areas of India have historically fared poorly on development indicators, and are one of the last to benefit from infrastructure development. The challenges faced by the communities in these areas range from insufficient physical infrastructure, to inadequate support for livelihood enhancement. In addition, these communities are especially vulnerable to the vagaries of climate change. Any solution to address these complex issues must therefore have environmental sustainability and social acceptance at the core, which are essential preconditions for physical infrastructure development supported by knowledge creation for long-term adoption.

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The rural community of Belica in North Macedonia (4.1)

From Community Collaboration to Energy Transformation: A Story of Co-Production in a Rural Community in North Macedonia

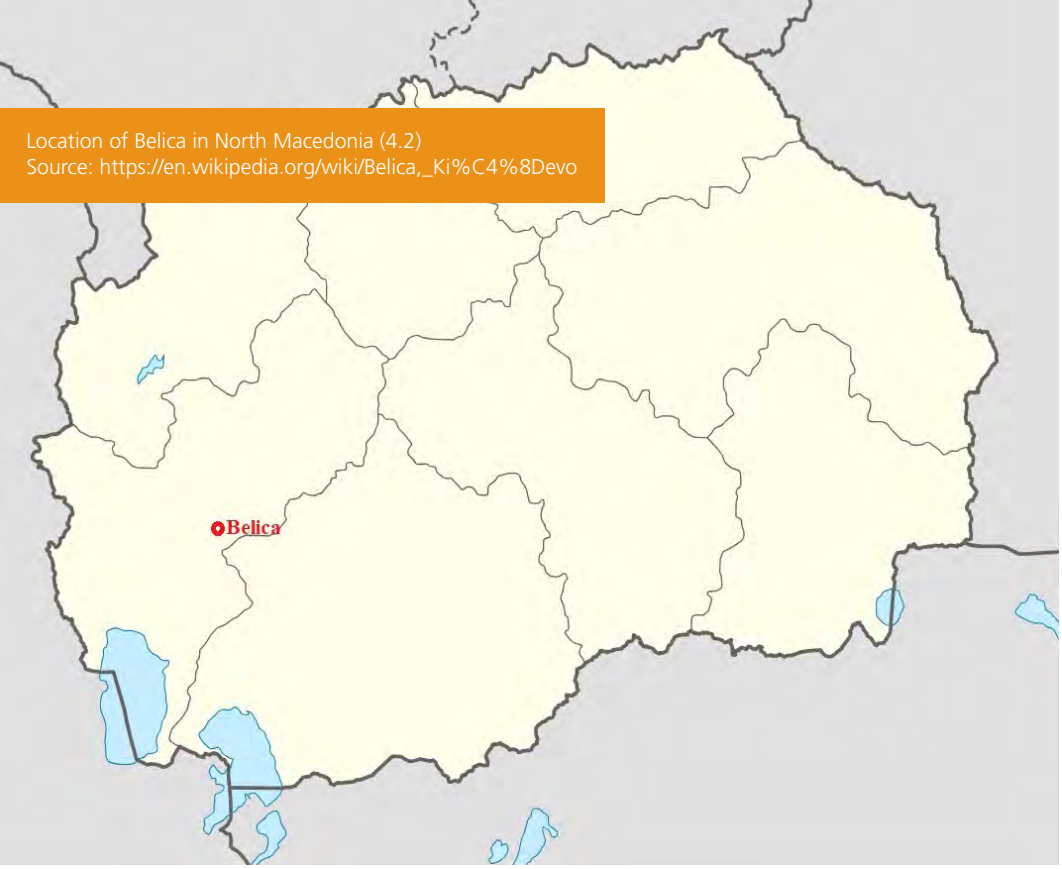
Understanding problems and exploring solutions together, founded on an inclusive and transparent communication strategy, is creating long-term partnerships for resilience.

Overview

In this story, I present the transformative journey of Belica, a rural community in North Macedonia, pioneering citizen-led energy initiatives. Facing outdated infrastructure, high energy costs, and dependency on fossil fuels, the community adopted a collaborative, bottom-up approach to reshape its energy future. Through workshops, field research, and continuous dialogue, sustainable solutions like substituting the heating system and installing solar PV were co-produced by local leaders, residents, and other stakeholders. The project highlights the significance of community-driven actions in fostering resilient energy systems, overcoming regulatory challenges, and integrating social, technical, and economic knowledge. Belica's experience serves as a model for sustainable energy transitions in similar communities.

Introduction

This is the story of Belica, a small rural village in North Macedonia, where citizens took the initiative to transform their energy system from the ground up. Faced with outdated infrastructure, high energy costs, and a dependence on fossil fuels, the people of Belica realized that waiting for top-down help from the local or the central government was not enough. Instead, they embarked on a journey to become active participants in shaping their energy future. Through collaborative efforts, open dialogue, and a commitment to co-production, the community embraced innovative solutions that were not only technically feasible but also socially inclusive and economically viable. In this



Location of Belica in North Macedonia (4.2)
Source: https://en.wikipedia.org/wiki/Belica,_Ki%C4%8Devo

process, Belica emerged as a pioneer in citizen-led energy initiatives, showcasing how grassroots, bottom-up action can drive meaningful change.

Belica faces numerous challenges typical of underdeveloped rural regions that rely mostly on fossil fuels. With outdated infrastructure and limited access to alternative energy sources, the community has been vulnerable to rising energy costs and environmental impacts. As a small village surrounded by forests, wood is the primary fuel for heating, while the old electricity network constantly creates problems for the residents, with frequent blackouts (having no electricity for a certain period of time).

However, Belica is also a place of strong social bonds, with local leaders and community members keen to explore sustainable energy alternatives. Their journey to transform their village into a green, self-sustainable community began with the realization that traditional top-down approaches such as governmental help was insufficient to address their needs and goals. The ultimate goal is for the community to be self-sustained in both energy and food production, with lots of educational and leisure activities that would bring people from the urban areas closer to nature. To achieve this, the community wanted to embark on energy transition which has their well-being at its core, following an 'all hands on deck', collaborative and bottom-up approach that empowers citizens.

A view of the village and its surroundings (4.3)

The Project

- **Objectives:** the project aimed to establish North Macedonia's first energy community in Belica, as part of the larger program of creating a green, self-sustainable community[1]. The objectives were clear: to create a resilient and sustainable energy system driven by community engagement and to develop practical solutions that address technical, financial, and social challenges. And the way to do this was to substitute the fossil fuel with renewable energy – solar panels instead of wood and heating oil. This was the crucial first step inrealizing the big idea of having a self-sustainable community. Belica hopes to pave the way for citizenled energy initiatives by offering a model other communities in the country can benefit from.

  Having no previous ties with Belica, I got in touch with the representatives of the community through a mutual friend. I learned what the community wanted to achieve, their big ideas and motivations. I was immediately hooked on their energy and grand plans! As an energy engineer conducting workshops to understand the energetic needs and wants of people, I knew that I could help out somehow.

- **Activities:** over several months, together with the community leaders, we organized workshops, conducted field research, and engaged in continuous dialogue with the interested community members (in the beginning they were just a few, but at a later stage, the whole community was on board). With these activities, we aimed at bringing together local leaders, residents, and experts in energy systems to discuss the current energy challenges, potential solutions, and the roles each stakeholder could play. This inclusive approach ensured that the solutions we developed were well-informed and relevant to the specific needs and context of Belica. For example, we used the 'rich picture'[2] to understand the energy challenges and associated understandings of community members. I was personally asked to do a series of lectures regarding energy technologies and successful use-cases, so that community members can enhance their understanding of the different energy technologies, their applications and benefit.

- **Key Outcomes:** using this collective approach, we identified the energy requirements of the community members and created a database of the types and condition of buildings in the community, existing energy infrastructure, and of the natural resources available for potential energy sources, such as solar. The data collection went beyond technical aspects and included sociological insights on daily energy practices (to understand if there is energy saving practices can be introduced), social dynamics (including the trust among the community members and the support that they would provide to this project), as well as their financial situation. Such broad understanding was crucial for developing solutions that were technically viable, socially acceptable, and economically feasible.

  Setting up the energy community will be done across several phases. The first phase included the installation of solar photovoltaic (PV) systems on the main community building, along with raising awareness about energy-efficient practices, and enhancing the capacity of the existing electrical grid. These solutions addressed specific challenges identified during our research and collaborative activities. For example, the decision to install solar PV systems was informed by both technical feasibility and the community's desire to maintain a functional social center year-round, especially during winter when high heating costs previously limited its use.

[1] https://transitiongroups.org/group/green-commune-belica/

[2] https://naturalsciences.ch/co-producing-knowledge-explained/methods/method_factsheets/rich_picture

Installing the solar photovoltaic (PV) system on the community building (4.4)

Role of Co-Production and Collaboration

The early success of the project is rooted in co-production and collaboration at every step. Engaging the community was not just about gathering input; it was about building a shared vision. Local leaders were integral to mobilizing community members and facilitating workshops. Their involvement ensured the solutions were contextually relevant and widely accepted.

For instance, during the initial phases of the project, we held workshops that were not only informative but also interactive, allowing community members to express their concerns and aspirations. This approach enabled us (both me and the community leader) to understand the community's priorities better and to a greater extent, and fostered a sense of ownership and commitment to the project. Additionally, representatives from the municipality and local NGOs participated in these workshops, providing valuable insights. This helped us navigate the different policies and align our efforts with broader regulations.

Challenges Faced and Lessons Learned

The journey has not been without challenges. One of the significant obstacles was the lack of national legislation on energy communities or bottom-up citizen-led energy initiatives in North Macedonia. This regulatory ambiguity created uncertainty and potential roadblocks. However, by involving external stakeholders such as governmental bodies and NGOs, we received the support needed to align our project with the existing policies.

A challenge for me, as an outsider of the community and facilitator of the workshops, was to understand and manage the existing knowledge, beliefs, and values within the community. Adopting a deliberative communication strategy helped navigate this challenge. I followed a direct, clear and informal way of talking. A set of values were foundational to our communications – encourage asking questions, strive to ensure that all voices are heard, and make decisions transparently. This approach helped build trust and fostered a sense of collective ownership.

Key lessons from this work include the importance of addressing and bringing together different knowledge (from research, practice, and the public/community), fostering continuous learning, and ensuring inclusive decision-making processes. We learned that sustainable energy transitions require an approach that integrates technical, social, and economic considerations. Ongoing education and training for community members are essential for maintaining the momentum of initiatives, as is having a clear expansion plan to support future growth.

Path Forward

Navigating the energy transition requires more than just engineering solutions - it requires the understanding of complex interplay of social, economic, and environmental considerations. An energy transition that solely focuses on technological advancements often overlooks the importance of inclusivity, local context, and the participation of the people directly impacted by these changes.

The efforts in Belica demonstrate the potential of community-driven initiatives in addressing energy challenges. Moving forward, we must continue to focus on integrating technical and social knowledge for sustainable energy transitions, addressing regulatory and financial barriers, and fostering continuous learning and adaptation. By sharing this journey of collective effort, it is my goal to inspire other communities to embrace a collaborative approach in addressing their energy challenges. Together, we can drive sustainable energy transitions and build resilient communities.

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Empowering individuals with the freedom to achieve self-sufficiency while fostering a positive environmental impact exemplifies the transformative potential of e-Assist technology. Prof. Bhausaheb A. Botre on the left and the CSIR - CEERI team with e-Assist Tricycle (5.1)

Empowering physically challenged individuals to grow their livelihood in Pilani, India

Partnership between scientists and a group of physically challenged citizens is helping find a shared understanding of problems, and build solutions that makes renewable energy technologies useful as disability aid.

Overview

A learning attitude and collective knowledge provides a new horizon for the physical disability community, and renewable energy powered mobility opens the path. This narrative tells the story of an individual's journey to build a coalition of actors culminating in developing the e-Assist Tricycle. e-Assist Tricycle combines scientific knowledge and life's experience of the physically disabled community. These two groups collaborate to generate necessary data and design field assessments needed to improve the technology and its quality according to market standards. e-Assist Tricycle opens up possibilities by empowering disabled individuals to pursue livelihood and inclusivity.

From sensibilization to technological structuring

In 2016, as I made my way to the Pilani market, I was drawn to a person with physical disabilities struggling to navigate his tricycle. Pilani is a small and remote village in Tehsil Chirawa, District Jhunjhunu, Rajasthan, India.

A divyang before e-Assist Tricycle (5.2)

Seeing him, a fellow divyang with locomotor challenges, brought back memories of my own experiences in Pune, Maharashtra, where I, Prof. Bhausaheb A. Botre, relied on a manual tricycle to get around during my college and university years. From 1997 to 2009, I traversed nearly 10-12 kilometers daily, pedalling my way to education. I understand the physical toll that extended use of such manually operated tricycles can take, having personally endured the strain on my shoulders and the potential for musculoskeletal issues. With my educational development, having a personal connection and understanding of the challenges faced by physically challenged individuals, I felt compelled to act. I know that this reality and the scarce conditions faced by a majority of the people in this region often lead to isolation and exclusion from society. I made it a mission to develop e-Assist Tricycle technology to alleviate those challenges. My goal was twofold: to enhance mobility for disabled individuals and contribute to a cleaner environment by integrating green energy solutions.

Since 2016, my research has centred on developing electronic motor control systems, assistive e-tricycles, and low-power electric vehicles (EVs) for disabled individuals in India. This journey however, has been a collaborative effort built on strong relationships among scientists, disabled end users, and manufacturers. The Societal Electronics Group's team of scientists, along with the technical and administrative staff, worked hand-in-hand with disabled individuals who were not just as end-users but active co-creators. These locomotor-disabled individuals, mainly daily wage workers and vendors from nearby villages in Pilani, played a crucial role in shaping the project by sharing their personal mobility challenges. The engagement between the disabled community and scientists is a process of mutual learning. As researchers, my team and I gained firsthand insights into their unique needs, which helped us refine the designs. At the same time, study participants learned about the technologies and how they could transform their mobility experiences. As the principal facilitator of this collaboration and as an individual living with locomotor disability, I act as the bridge between the scientific team, the disabled individuals, and the manufacturers, ensuring clear communication and fostering trust. For innovators, the key lesson is that collaboration with disability communities must involve their direct engagement throughout the process. By valuing their experiences, we ensure the developed innovative assistive technology is meaningful and effective in addressing real-world needs.

The roles of other partners has been crucial too. Since 2018, researchers from Birla Institute of Technology and Sciences (BITS), Pilani, have helped refine the mechanical aspects of the e-tricycle. In 2020, field trials with the Artificial Limbs Manufacturing Corporation of India (ALIMCO) of Kanpur, gave the disabled users direct experience with the e-tricycles in industrial settings. By 2022, M/s Sanjay Cycle Engineering Works Pilani assembled the mechanical components, guided by ongoing input from the disabled community. This process highlighted the importance of co-creation, where all stakeholders - researchers, manufacturers, and users - learned from each other, ensuring the technology was truly inclusive and responsive to the needs of the disability community. The involvement of these stakeholders, alongside others, underscores our collective commitment to providing diverse solutions for enhancing the outdoor mobility of individuals with disabilities through E-tricycles. Our project's phased approach, including the leadership and coordination of CSIR – Central Electronics Engineering Research Institute (CEERI) in electrical and electronic device development, signifies a comprehensive integration and field-testing strategy. Moreover, the active engagement of end-users since 2023, contrib-

uting to extensive field trials, monthly data generation, and invaluable feedback, further strengthens our pursuit of inclusive mobility solutions.

As part of extensive field trials and batch processing endeavours, we successfully manufactured 25 units of the e-Assist Tricycles. The e-Assist Tricycle consists of a series combination of two 12 V 18Ah lead-acid batteries. They were chosen due to their easy repair and maintenance accessibility in remote villages and places across India. The fabrication of e-Assist Tricycles benefited from the invaluable guidance of Director, CSIR –, CEERI. The work of making 25 e-Assist tricycles has been carried out under the institute budget approved by Director CSIR – CEERI. We also received valuable guidance from BITS-Pilani and ALIMCO. Collaborative research has enabled and inspired me to create electronic and electrical devices that provide e-assists for challenging terrains such as inclined roads and flyovers.

Pragmatic technology testing and developing capacity

In 2023, 15 prototypes of the e-Assist Tricycles were deployed to end-users (EU). Initially, they were curious about the E-tricycle and its contribution to their life since the selected divyang individuals were used to the hand-peddled tricycles. We faced challenges to train these EU's however, technological solutions helped us to come up with innovative solutions like coordination over Whatsapp mobile application, short videos and text messaging. Our team members guided each EU about the different kinds of the data to be collected weekly and monthly. A training program was developed for EUs at the CSIR - CEERI campus, to train them on the handling and maintenance of the e-tricycles. This capacity was built over a period of 4 to 5 years and helped track the performance of the tricycles including charging and discharging cycles of the battery, as well as the speed and distance covered on a weekly and monthly basis. A Google Form is shared with EUs, who fill out all the information online and submit it monthly. Divyang EUs contributions in collecting this data are significant for us to continue improving and optimizing the e-Assist tricycle technology.

Our results are gratifying. One of our participants owns a small grocery and vegetable shop in Jherali village near Pilani. He started using this e-tricycle for his daily 12-14 Kms commute to procure supplies

A divyang after e-Assist Tricycle from Jherali Village near Pilani (5.3)

from Pilani Market to his shop. He reports that the e-Assist has brought more comfort and has significantly reduced fatigue from hand peddling, improving his efficiency and productivity. It has increased his earnings as well as the quality of his life in the village of Jherali. Another participant from Dulaniya village near Pilani has started using an e-tricycle. It has helped him establish his livelihood and contribute to his family's income. It has also enabled him to overcome barriers and break taboos related to local transportation in the village.

My efforts at sensibilization with the collaboration of a committed team has been recognized with a national award. We have successfully completed the design and deployment of E-tricycle, but challenges of repairing and maintaining of electronic, electrical and mechanical devices employed in the e-tricycles exist. Operating failures need to be reduced and the possibility of improving trainings for end-users remains in the area of decision-making on maintenance scheduling.

Conclusion

Seeing the individual user's gratitude and the change in their quality of life reinforces our commitment to engineering better mobility solutions. Through collaborative efforts, we have made significant strides in developing e-Assist technologies for inclines and flyovers, refining mechanical structures and gathering crucial field data. Our partnerships and learnings mark a meaningful step towards inclusive mobility, which is responsive to the needs of the disability community. Our focus is scaling up the deployment of these e-tricycles for end-users in other villages. This endeavour will demand substantial support from start-ups, young entrepreneurs, and the CSR departments of various industries to make it accessible to a broader market, thereby benefiting society and the environment as a whole.

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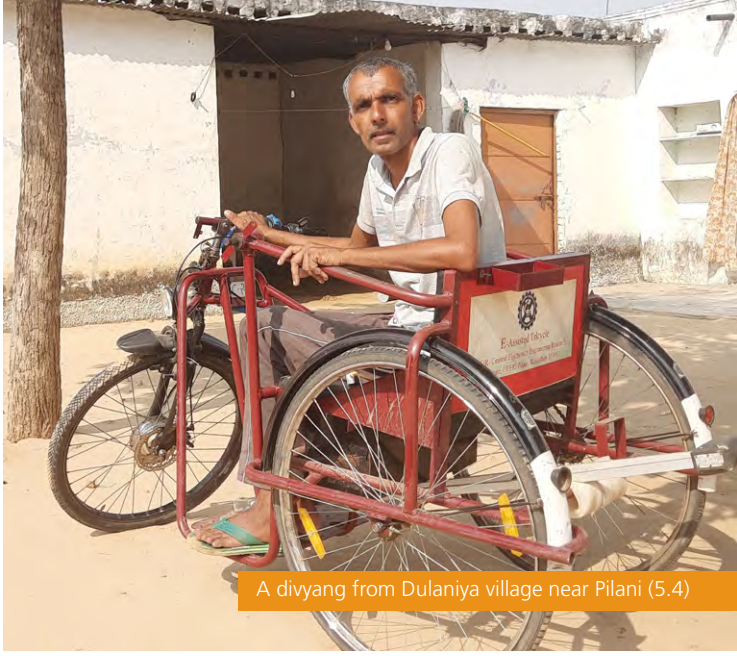

A divyang from Dulaniya village near Pilani (5.4)

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(5.1; 5.2; 5.3; 5.4) CSIR-CEERI

This image is of the very first session, where citizens kicked-off the initiative "DIALOGUES - Energy citizenship for a sustainable future". We discussed our vision and shared ideas. The notion of respect for diversity was a strong theme (6.1).

Citizen engagement in energy transition planning: the case of four communes in the Geneva area

Making knowledge and owning the knowledge-making process, lays the groundwork for democratically pursuing collaborative sustainability actions in four communities of Geneva.

Overview

In the Geneva area, groups of citizens came together to formulate an energy transition action plan, following several months of deliberations. The ideas needed to be ones that the community could implement, with four focus areas emerging: mobility, food production and consumption, energy sufficiency in buildings, but also citizen participation. The responses from local authorities varied greatly, suggesting that it is not always evident to imagine citizen engagement beyond voting. And yet, the need to engage citizens more actively in the energy transition is essential: all hands are needed on deck to weather the climate crisis.

Engaging citizens in the energy transition

All sectors of society will need to play a role in changing how energy is produced, distributed, and used.

In Switzerland, both the Canton and City of Geneva have issued climate action plans, that lay out the steps for an energy transition. But how can ordinary citizens[1] engage in the energy transition, and how can their engagement go beyond individual behavioral change towards more collective forms of change? During spring 2020, with the pandemic in full swing, a group of citizens came together to discuss the need for sustainability initiatives in Collonge-Bellerive (Geneva area). The authors of this contribution were present, and one author used her position at the University of Geneva to submit a grant application to the European Horizon 2020 scheme, to support such initiatives. In parallel, other citizen collectives were coming together in neighboring 'communes' or towns. We started to host events together, mostly conferences on sustainability themes, but also events, like yard sales and film screenings. Once the project funding came through[2], we agreed to work together to plan a series of events that would lead up to our final goal: an energy transition plan written by citizens, for citizens.

[1] The use of the word 'citizen' here is not tied to national identity: rather, it's a word that captures the ability of people to be engaged in the spaces where they live and work.
[2] See the European project website, DIALOGUES, https://www.dialoguesproject.eu

At this last session (January 2023), we came together to develop an energy transition plan. Different priority themes were identified, as well as possible action steps (6.2).

Collective knowledge-making was at the heart of our initiative: we felt that if we created the space and time necessary to reflect on the energy transition, and if we gathered enough people along the way, we would have the knowledge necessary to develop an actionable plan. We hosted five events: the first event (Vandoeuvres, September 2022) was about bringing diverse people together and sharing ideas and visions for the future. We discussed how there were no right or wrong ideas, and that we wanted to be as inclusive as possible in taking this discussion forward. At the second event (Meinier, October 2022), we used cartoons that represent Swiss energy scenarios to discuss the links between energy transitions and human needs satisfaction[3], answering the question: can we still live a good life with less energy? In Choulex (November 2022), we discussed energy in buildings and introduced the notion of sufficiency, or how citizens might be able to reduce their overall energy usage. Neighbors shared how they came together to agree on a group carbon emission limit, and how they negotiated their different needs in relation to energy usage. For the last event in Collonge-Bellerive (December 2022), we realized that we had more questions than answers. We thus invited specialists from the public, private sector, and civil society, to share their knowledge on topics as diverse as: green and renewable energy investments, waste reduction, and local food production among other topics. Organized as a World Café, citizens were able to move between tables and ask their questions. Based on these deliberations, we hosted a last event in January 2023, where the energy transition plan was formulated. Four main themes emerged, each with a series of actions: mobility, food production and consumption, energy sufficiency in buildings, and citizen participation.

When it comes to the types of actions that were proposed, some could clearly be organized by citizen collectives. For example, in the following year, the citizen collectives agreed to host a series of events

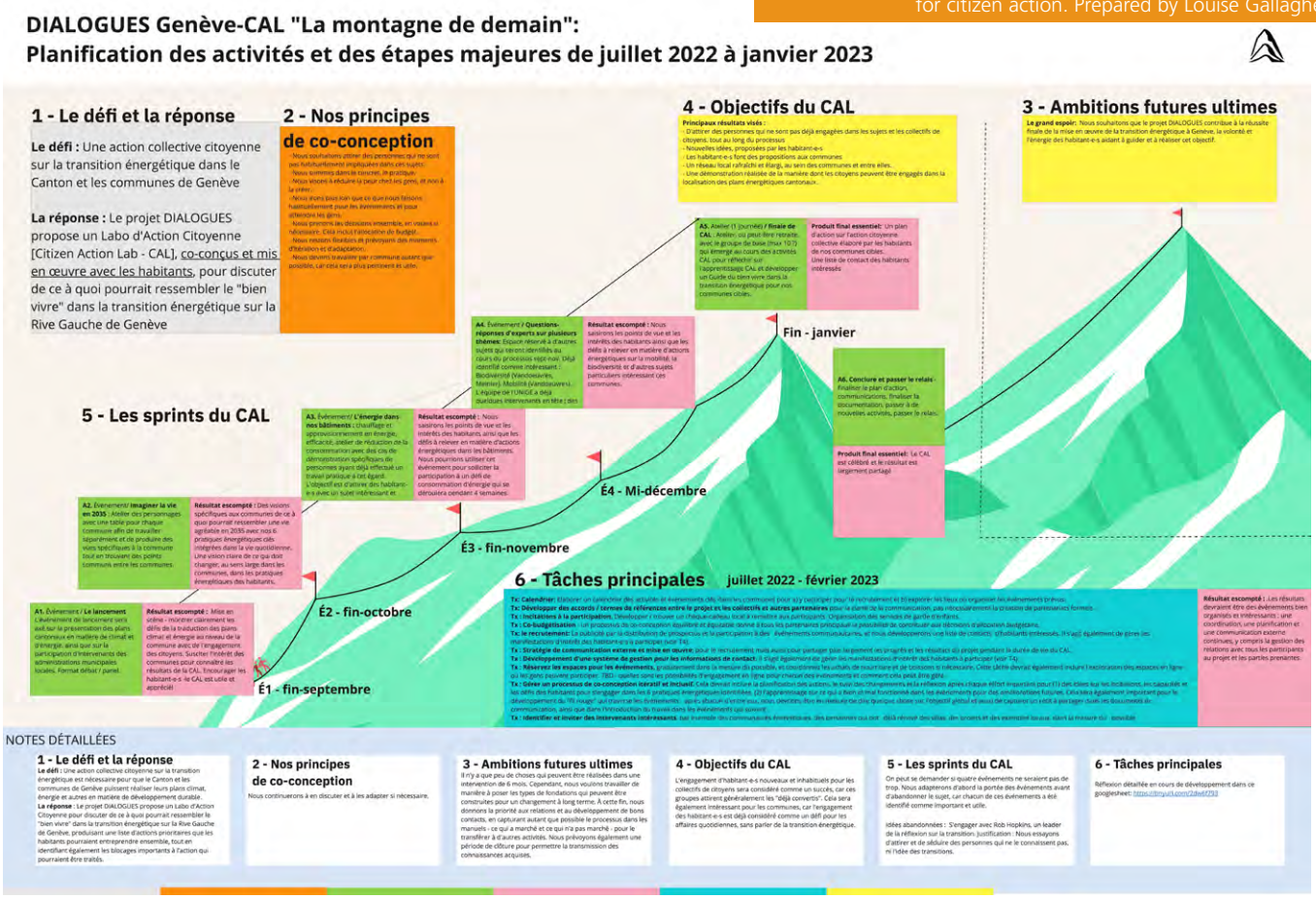
> "We realized that some issues are cross-cutting, others more local, hence the importance of creating citizen collectives or forums to encourage citizen participation. These participative bodies have enabled us to reflect, debate and come up with interesting proposals that have been presented to the local authorities and, I hope, will lead to concrete achievements for the benefit of the community." – Tazara Spafford, president, Collectif Durabilité Collonge-Bellerive.

[3] See the project website Wellbeing, energy futures and everyday lives, where the cartoon material is available in French and in English, in open access. https://www.unige.ch/netzero2050/en

on local food production and consumption. As one person put it, "Manger, c'est la vie (Eating, that's what life is about)". In March 2024, the Collective Durabilité Collonge Bellerive hosted a tasting event: a dozen voluntary amateur cooks prepared local and seasonal meals, and people came to taste the dishes and rate them based on different sustainability criteria. But there were also actions that were beyond the remit of citizen organization: for example, the need for more secure bike lanes in the communes, or forms of public transport that connect the communes to each other, rather than to the city center. Here, the local authorities have a crucial role to play. At the start of the project, we had letters of intent signed with all local Mayor offices. For each event, a local representative was present. At the end of the project, we presented the results to each Mayor's office. The reception of the action plan varied greatly, with some local representatives resistant to the idea that citizen forums can make proposals that challenge their authority. This was expressed by one person as, "We live in a participant democracy, why do we need citizen forums?". While in another commune, the results were presented to all elected officials and the feedback was quite different, as expressed by this citation: "We see the citizen actions as small waves that can grow into a larger wave, and together, we can bring about significant change".

There are several limits to this approach. One is that there were many more ideas in the action plan than what we, as a citizen collective, were able to implement at once. We decided to focus on the theme of food for the first year, but perhaps next year we will go back to the plan and pull out another theme, such as energy sufficiency. How to keep the momentum going is always a challenge: organizing events is something we do well but bringing about broader structural and institutional changes (like introducing more bike lanes or promoting work time reduction) are more difficult to tackle. Another limit is that the University of Geneva funding made the organization

The mountain of tomorrow, visioning session around key milestones for citizen action. Prepared by Louise Gallagher (6.3)



rather comfortable. The citizen collectives in each commune brought much voluntary work, but the resources of the University of Geneva team made it possible to: communicate before each event; issue reports after each event, which ensured transparency and gave a sense of momentum; provide drinks and food, as well as babysitting services. The event budget was publicly available.

Lastly, we realize that citizen collectives are made up of volunteers, and some are more proactive than others. Some prefer to be guided, others to lead, but this also means that the work share is not always equal.

Key lessons

The results were innovative in several ways. First, while the economic and political elite in Europe tend to focus on technology as the silver bullet solution for the energy transition, the citizen collectives were more interested in sufficiency measures – or ways in which overall energy usage could be reduced. Second, citizens are often seen either as consumers, or as voters. This effort created the time and space needed to reflect on how collective change could be supported. Third, new ideas were brought forward which were quite innovative, such as the need to reduce work time to engage more in collective, community-based activities. Fourth, we realized that participation is a human need: as one person put it, "Just showing up tonight makes me feel so much better". Although there is always the risk that participatory processes might not deliver on their promises, the momentum is continuing in this region. Lastly, several members of the citizen collectives have or are running for public office, at the level of the Communes and the Canton of Geneva. Thus, the citizen collectives provide opportunities to experiment with public engagement, that can then be transferable into public service.

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For more information on the project, see the following website where different reports, press hits and other materials are made available:
https://www.unige.ch/projetdialogues/

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Photo credit:
(6.1; 6.3) DIALOGUES 2022;
(6.2) DIALOGUES 2023

The buildings in Tivoli GreenCity are fully insulated, with expected primary energy consumption of 40.57 kWh/m² per year. In the upper left side of the photo, a shared greenhouse can be seen standing over another unit (7.1).

Building local resilience: The collaborative journey of Tivoli GreenCity in Brussels

Improved governance, local energy ownership, and long-term education emerge as essential conditions for creating sustainable and equitable neighbourhoods.

Overview

Tivoli GreenCity is a sustainable development project in Brussels designed to bridge the residential neighbourhood of Laken with the industrial Port of Brussels. The project includes eight housing blocks for 397 households, featuring energy-efficient infrastructure like solar panels, a district heating system, and green roofs. It promotes community engagement through citizen assemblies and sustainability education. However, challenges remain, ranging from limitations in local energy benefits, to mismatches with surrounding infrastructure, and to inadequate efforts to address education disparities. As a model for sustainable urban living, Tivoli GreenCity highlights the importance of thoughtful planning and active community participation.

About the initiative

TIVOLI GreenCity is a project initiated by CityDev, the regional development authority for the Brussels-Capital region in Belgium. The initiative is situated in the neighbourhood of Laken, a residential suburb in the north-western part of the Brussels-Capital Region. Over the past decades, the neighbourhood has undergone significant restructuring, including industrial transformations that have attracted a diverse workforce and thus led to rapid population change. These rapid changes have given rise to specific and pressing needs, such as the development of financial models that enable people from various income levels to access residential complexes equipped with renewable technologies. In response to these challenges and as

part of its role to address socioeconomic challenges, CityDev proposed to build a series of housing lots in one of the poorer areas within the neighbourhood. Unlike the typical large apartment buildings associated with traditional social housing, the TIVOLI GreenCity complex is a hybrid model combining units of social housing and privately owned homes at moderate prices, supported by state aid (Citydev Brussels, 2022). The project strategically complements the creation of Greenbizz – a centre for sustainable enterprises – in the area.

Facilities and infrastructure

Today, the complex consists of 8 collective housing blocks hosting a total of 397 households (Brussels Environment, 2019). Construction began in 2016 and was completed in 2019. TIVOLI GreenCity is designed to be sustainable, with buildings expected to consume less than 50 kWh/m2 per year and infrastructure in place for sustainable heat and electricity production (Construction21, 2019). For comparison, the average heating consumption for apartments in Brussels was 109 kWh/m² per year in 2017 (ICEDD, 2021). A district heating system provides both heating and domestic hot water, and consists of 3 condensing gas boilers, 2 gas cogeneration units, and a pellet boiler. Solar panels, installed on all buildings, have been managed by a third-party investor but will eventually become community property. Additionally, green roofs, contributing to biodiversity and rainwater retention, are installed on all buildings, including beneath the photovoltaic panels. Sustainable irrigation methods are thoughtfully implemented for the rooftop plants, and the design even incorporates bird nests. Buildings are passive and oriented southward for solar gains, with at least 35 % meeting zero-energy standards. Cross-ventilation is provided in all apartments, complemented by individual dual-flow ventilation systems with heat recovery [5]. For the neighbours' convenience, a system for sorting and collecting household waste via underground containers is installed in public spaces. In terms of mobility, the use of electric cars is supported through the installation of charging stations in each parking area, alongside a total of 678 bike parking spaces available (Cousin, 2022).

Community driven initiative

Beyond technical equipment and infrastructure, TIVOLI GreenCity sets a new standard for sustainable districts by promoting energy savings and citizen participation. This collaborative approach began with pre-construction workshops where local residents were consulted. Residents were then invited to sign a sustainability charter, committing to actions like adopting energy-saving behaviours (e.g., using energy-efficient appliances, turning off lights when not in use) or prioritizing green mobility options (e.g., cycling, walking, using public transportation) (Bilande et al. 2019).

Each building block fosters community activities by offering shared, cultivable rooftop space for the residents. Private and public spaces available around the buildings further enhance community dynamics. Residents meet regularly in citizen assemblies to address various issues related to the project's infrastructure, including consumption of locally generated energy, use of rooftop gardens, and maintenance of common areas. Efforts to promote sustainability literacy in the area occupy a significant part of the community efforts, with informational sessions and creative awareness-raising elements being implemented.

From theory to practice

TIVOLI GreenCity stands out as a pioneering initiative, successfully establishing a harmonious connection between the densely populated residential neighbourhood of Laken and the industrial hub of the Port of Brussels. The project, located in a developing neighbourhood, has shown strong ambitions in integrating social housing with sustainability principles. It has been honoured with numerous national and international awards, including BREEAM certification (awarded in 2021 with a score of 95 %) and

the "Golden Rules of Urbanism" (awarded in 2019) (Citydev Brussels, 2022). Several years after construction and with people living there, TIVOLI GreenCity thus emerges as a prime location for studying sustainable engagement.

How does all of this play out in practice?
The authors interviewed community members - including a family living in the block, a project leader, and a technical expert, to assess the some of the practical challenges and lessons-to-be-learned from the project, in addition to the successes described earlier.

- **Local energy generation and management benefits are limited for the neighbours.** The initiative faces a significant setback due to a key oversight: the solar panel installations do not belong to the neighbours during the current initial operational period. To ensure access to solar equipment, the project promoters decided to engage a third-party to handle payment, installation, and management of solar panels. In return, the third-party benefits by exchanging green certificates on behalf of the property owner. Additionally, neighbours are required to pay a fixed fee for electricity to this third-party, regardless of fluctuating market rates. This significantly undermines the benefits of onsite generation for the residents until ownership is transferred after 10 or 20 years. This system can lead to additional costs on electricity bills during winter months when little solar energy is generated. During summer months when energy surplus is generated, another entity participates in redistributing locally produced energy. Despite the surplus being prioritized for local use, any additional selling to the market benefits the third-party once again (Institut Économique Belge, 2019).

- **Mismatch in some community innovations and city services.** Another important lesson arises from not having adopted a holistic perspective when conceptualising how the community works. Despite efforts to engage local populations in the earlier phases of the project, the community still encounters some displeasing realities. For instance, the presence of hidden bin containers, allowing residents to dispose of their garbage every day, contrasts with the city's garbage system service, which only collects garbage twice a week. Consequently, neighbouring areas also

View of one of the building blocks with solar panels on the roof (7.2).

utilize these systems, leading to overloading as the containers are only sized for local use. This highlights the consequences of a local system planned without accounting for pragmatic issues of the community as part of a larger system, the surrounding city.

- **Gaps in continuing education and awareness to address information and community participation barriers.** One of the key assets of the project is its commitment to inclusivity, aiming to provide access to all residents and including vulnerable consumers. Integrating social housing renters and first-time property ownership underscores this objective. However, managing the neighbourhood on a daily basis is a challenge given the diverse community with differing levels of education and varied habits and expectations among residents. This complexity often results in issues with organizing communal maintenance payments and maintaining common spaces. Low attendance at community meetings is common and some residents sometimes misunderstand their responsibilities, for instance, by not realizing that they need to contribute to elevator maintenance. Despite initial awareness raising efforts, there appears to be a lack of long-term support and education among participants. High operating charges related to the services offered by the community further complicate the issue. Finally, traditional engagement and cooperative behaviour are necessary to maintain existing infrastructure, but not all neighbours contribute equally.

Sewage system warning about sea pollution caused by improper littering. "Here begins the sea, do not litter" (7.3).

- **Slow adaptation to infrastructural shortcomings revealed over time.** Other aspects of the initiative that appeared well planned on paper have underdelivered in reality. Two instances are the watering filter system and the building orientation. Regarding the watering filter, CityDev decided to install systems for water recovery and processing of grey water. However, as the system has never functioned properly, the grey waters remain stored underground, requiring regular visits from pump trucks to suction these waters. Sometimes, these trucks arrive too late, leading to leakages. To solve this, the current plan is to redirect greywater to the city sewer system and repurpose the system for rainwater collection instead. As for the second issue, the building's orientation to maximize thermal mass gains during winter may not have considered the risk of increased summer heat exposure, sometimes resulting in overheated buildings. An unfortunate example of this is the greenhouse on the rooftop of one of the blocks, which heats up so much in summer that it becomes unsuitable for planting. And finally, there has been delays in installing some of the promised elements, such as the electric charging points.

In a nutshell:

TIVOLI GreenCity is a major effort to create a forward-thinking neighbourhood in Brussels, focused on sustainable and responsible urban development. The project is a leading example and has inspired similar initiatives elsewhere. However, despite its successes, issues in implementation holds key lessons for improving the sustainability and impact for future initiatives. The project's initial plans included elements and infrastructure that has functioned poorly or were not installed at all. Moreover, the project missed an opportunity in implementing a community ownership model for the solar panels, which would have been crucial for empowering the community energy initiative. Ownership not only encourages responsibility but also simplifies installation and encourages energy-efficient consumption (Lennon & Dunphy, 2024).

The neighbourhood is interconnected with common spaces that promote community interaction and foster a sense of belonging among residents (7.4).

Integrating ownership with educational programmes could have further improved energy literacy, especially among vulnerable residents. This contrasts with the initial phase, where co-creation programs were successfully introduced with local neighbours. However, they were not sufficiently sustained once the community was established and operational. The gaps illustrate the value of a holistic governance system, which could have prevented several of these issues that diminish the project's impact and place an undue burden on the local community administration, potentially leading to friction among neighbours.

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(7.1; 7.2; 7.3; 7.4) Guillermo Borragán

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Energy Cooperatives Forum in São Paulo in 2022 (8.1).

Pathways to Cooperation: Building Collective Knowledge in Energy Cooperatives in Brazil and Latin America

Building knowledge infrastructures and sharing lessons across geographic boundaries is helping the energy cooperatives movement gain momentum.

Overview

Brazil has a long tradition of cooperativism. In 2016, new ways of approaching and considering renewable energy projects became possible with the regulation of shared distributed generation, which enabled the emergence of energy cooperatives in the country. Since then, the Organization of Brazilian Cooperatives (OCB), with the support of its project with the German Confederation of Cooperatives (DGRV), has been promoting the construction of collective knowledge on cooperative energy through seminars, workshops, information guides and digital platforms. These actions have boosted the creation of several energy cooperatives in Brazil and strengthened the exchange of experiences with other Latin American countries, contributing to a fair and sustainable energy transition in the region.

Background – energy cooperatives in Brazil

Brazil has a significant history of cooperativism, with more than 4,600 registered cooperatives, covering various branches and regions of the country. Brazilian cooperativism is particularly strong in the areas of agriculture, credit and health. Starting in 2016, energy cooperatives started to gain prominence as a new area of interest. The regulation of distributed generation by REN 687/2015 made it possible to create shared generation cooperatives, a model that had not previously existed in the country. This narrative explores how the Organization of Brazilian Cooperatives (OCB) and the German Confederation of Cooperatives (DGRV) have supported the construction of collective knowledge in energy cooperatives in Brazil and Latin America over the last eight years.

One of the first initiatives promoted by OCB and DGRV was a series of seminars and workshops held between 2017 and 2019, which travelled to 16 cities in all five regions of Brazil. These events were attended by more than 1600 people and disseminated information about the opportunities for generating community-owned renewable energy to the gen-

Workshop and webinar with energy cooperatives at Fotovoltaica-UFSC in 2019 (8.2; 8.3).

eral population and existing cooperatives. A 'Guide to Starting a Photovoltaic Distributed Generation Cooperative' was launched in 2018 and shared with workshop participants at that time. This document became a key reference on the subject, detailing steps for setting up renewable energy cooperatives, including regulatory, technical and financial aspects.

At one of these workshops held in Brasilia in 2017, Eduardo Braz was first introduced to the concept of shared generation through cooperatives. Inspired by what he learnt, he founded Coopsolar in 2019, the first distributed generation cooperative in the state of Paraíba. Eduardo began the groundwork to create the cooperative after attending the event and managed to gather the necessary number of people to officially establish it in January 2019. Another important milestone was the webinar and workshop held at the Solar Energy Research and Training Centre of the Federal University of Santa Catarina (Fotovoltaica-UFSC) in 2019. At that time, only six energy cooperatives could be identified and they were invited to share their experiences. This event, which has more than 4,000 views on YouTube, served as a reference for the creation of new cooperatives, such as the Percília and Lúcio cooperative in Rio de Janeiro[1] - the first energy cooperative in a favela in Brazil.

In 2020, the DGRV interviewed several energy cooperatives and identified the lack of information on the subject as a critical challenge. To address this issue, the platform Energia Cooperativa (energia.coop) was created. The web-based platform offers a centralized source of information on cooperativism and the energy sector, offering articles and publications on the topic and a map with energy cooperative initiatives in the country. In addition to the platform, explanatory videos about renewable energy cooperatives were launched and widely publicized by the DGRV and its partners. During the pandemic, DGRV and OCB started a Working Group (WG) with distributed generation cooperatives, holding bimonthly online meetings to exchange experiences and identify collective solutions to common challenges.

First virtual meeting of the Energy Cooperatives Working Group (WG) (8.4).

In 2022, with the return of face-to-face events, the cooperatives participating in the WG were able to meet face-to-face at the Energy Cooperatives Forum in São Paulo, promoting inter-cooperation and the exchange of knowledge. That same year, 16 representatives from Brazilian energy cooperatives took part in a technical visit to Germany, where they learnt about the German cooperative energy sector and its innovations. In 2023, the online course 'Distributed generation of renewable energy: Opportunities for cooperatives' was launched on the CapacitaCoop platform, with the aim of teaching practical know-

[1] The story of the Percília and Lúcio cooperative was also reported in the LCL Report 2021

Brazilian energy co-operatives on a technical visit to Germany in 2022 (8.5; 8.6)

how about the distributed generation of renewable energy model and making cooperatives more competitive and environmentally sustainable.

Sharing knowledge beyond borders

While the cooperative energy movement already had deep roots in countries in Europe, the United States and Australia, Latin America has begun to emerge as an important player in this area and adapting practices to local realities. Although much of the literature and knowledge on the subject originated in the global north, the peculiarities and challenges of the Latin American context have made the exchange of experiences and the building of collective knowledge at a regional level increasingly essential.

Brazil has thus stood out as a leader in this movement, attracting the attention of other countries in the region. In 2022, researchers and practitioners involved with energy communities in Colombia visited Brazil to learn about regulation and practical experiences in community models. This visit provided Colombian researchers with necessary knowledge to improve their policies for energy communities. In 2023, these researchers organized a Latin American symposium on energy communities in Medellín, Colombia, bringing together OCB representatives and other actors from Brazil, Argentina, Chile and Mexico. This event facilitated a valuable exchange of knowledge and resulted in the drafting of a declaration in Colombia, published in December 2023, which officially defined the concept of energy communities in the country.

In addition to these face-to-face meetings, the energia.coop platform was expanded in 2023 to include content specific to Chile, Colombia and Mexico. The platform now features a map of initiatives that compiles projects from these four countries, promoting visibility and the exchange of information between the various energy cooperative initiatives in the region. These actions demonstrate the growing importance of regional cooperation in building robust collective knowledge adapted to local needs.

Building a collective knowledge in energy cooperatives is proving to be a powerful tool for driving forward the energy transition in Brazil and Latin America. The continued support of OCB and DGRV

Visit by Colombian researchers to Brazil in 2022 (8.7; 8.8).

Latin American Energy Communities Symposium in Medellin, Colombia, 2023 (8.9; 8.10).

has been essential in empowering local cooperatives, promoting the exchange of experiences and tackling common challenges. The growing number of energy cooperatives, from six in 2019 to 49 in 2024, reflects the success of these initiatives. In addition, the movement has enabled a significant movement of cooperatives from other sectors to also generate their own renewable energy. Today there are more than 800 cooperatives, including agricultural, health, credit and others, generating their own energy and ensuring more sustainable operations. This collective journey has not only strengthened individual cooperatives but has also created a collaborative network that crosses borders and varied contexts, demonstrating effectiveness of local and regional collaborations in producing innovative and sustainable solutions. The development of digital platforms, training courses and technical meetings are examples of how shared knowledge can generate significant impacts.

The cooperative energy movement in Latin America continues to evolve, learning from challenges and celebrating achievements, while always aiming for a fair and inclusive energy transition. The accumulated experience and lessons learnt in this process serve as a valuable guide for future initiatives, demonstrating that the power of cooperation and shared knowledge is fundamental to tackling global energy challenges.

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Photo credit: (8.1; 8.2; 8.3; 8.4; 8.5; 8.6; 8.7; 8.8; 8.9; 8.10) DGRV

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Fórum de cooperativas de energia em São Paulo in 2022 (8.1).

Caminhos para a Cooperação: Construindo Conhecimento Coletivo em Energia Cooperativa no Brasil e na América Latina

Construir redes de conhecimento e compartilhar lições além das fronteiras geográficas está ajudando o movimento das cooperativas de energia a ganhar força.

Resumo

O Brasil possui uma longa tradição de cooperativismo. Em 2016, novas formas de fazer e pensar as energias renováveis se tornaram possíveis com a regulação da geração distribuída compartilhada, permitindo a formação de cooperativas de energia. Desde então, a Organização das Cooperativas Brasileiras (OCB), com o apoio do projeto que desenvolve junto à Confederação Alemã das Cooperativas (DGRV), vem promovendo a construção de conhecimento coletivo em energia cooperativa através de seminários, workshops, guias informativos e plataformas digitais. Essas ações impulsionaram a criação de diversas cooperativas no Brasil e fortaleceram a troca de experiências com outros países da América Latina, contribuindo para uma transição energética justa e sustentável na região.

Contextualização - energia cooperativa no Brasil

O Brasil tem um histórico significativo no cooperativismo, com mais de 4.600 cooperativas registradas, abrangendo diversos ramos e regiões do país. O cooperativismo brasileiro é particularmente forte nas áreas de agricultura, crédito e saúde, mas em 2016, uma nova vertente começou a ganhar destaque: a geração de energia cooperativa. A regulamentação da geração distribuída pela REN 687/2015 possibilitou a criação de cooperativas de geração compartilhada, um modelo até então inexistente no país. Esta narrativa explora como a Organização das Cooperativas Brasileiras (OCB) e a Confederação Alemã das Cooperativas (DGRV) têm apoiado, nos últimos oito anos, a construção do conhecimento coletivo em energia cooperativa no Brasil e na América Latina.

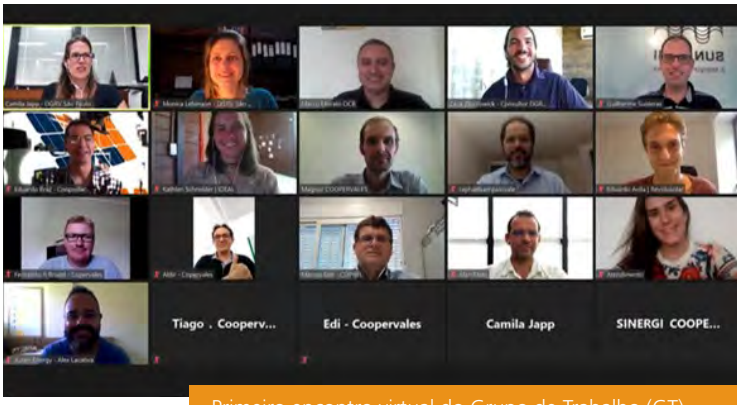
Uma das primeiras ações promovidas pela OCB e pela DGRV foi uma série de seminários e workshops realizados entre 2017 e 2019, que percorreram 16 cidades em todas as cinco regiões do Brasil. Esses eventos, que contaram com a participação de mais de 1600 pessoas, visavam informar a população e cooperativas de outros ramos sobre as oportuni-

Workshop e Webinar com cooperativas de energia no Fotovoltaica-UFSC em 2019 (8.2, 8.3)

dades de geração de energia renovável de forma comunitária. Durante os workshops, os participantes receberam o "Guia de Constituição de Cooperativa de Geração Distribuída Fotovoltaica", lançado em 2018, que se tornou uma referência fundamental no assunto à época. Esse documento detalha os passos para a formação de cooperativas de energia renovável, incluindo aspectos regulamentares, técnicos e financeiros.

Em um desses workshops, realizado em Brasília em 2017, Eduardo Braz descobriu o conceito de geração compartilhada por meio de cooperativas. Inspirado pelo que aprendeu, ele fundou a Coopsolar em 2019, a primeira cooperativa de geração distribuída do estado da Paraíba. Eduardo começou a articular a criação da cooperativa em 2018, após participar do evento, e conseguiu reunir o número necessário de pessoas para fundá-la oficialmente em janeiro de 2019. Outro marco importante foi o webinar e workshop realizado no Centro de Pesquisa e Capacitação em Energia Solar da Universidade Federal de Santa Catarina (Fotovoltaica-UFSC) em 2019. Naquela época, apenas seis cooperativas de energia haviam sido mapeadas e foram convidadas para compartilhar suas experiências. Esse evento, que tem mais de 4 mil visualizações no YouTube, serviu como referência para a criação de novas cooperativas, como cooperativa Percília e Lúcio no Rio de Janeiro[1] – a primeira cooperativa de energia em uma favela no Brasil.

Em 2020, a DGRV, após entrevistar diversas cooperativas de energia, identificou a falta de informação sobre o tema como um desafio crítico. Para abordar essa questão, foi criada a plataforma Energia Cooperativa (energia.coop), que centraliza informações sobre cooperativismo e o setor de energia, oferecendo artigos e publicações sobre o tema e um mapa com as iniciativas de energia cooperativa no país. Além da plataforma, foram lançados vídeos explicativos sobre cooperativas de energia renovável, amplamente divulgados pela DGRV e seus parceiros. Durante a pandemia, a DGRV e a OCB iniciaram um Grupo de Trabalho (GT) com cooperativas de geração distribuída, promovendo encontros online bimestrais para trocar experiências e identificar soluções coletivas para desafios comuns.



Primeiro encontro virtual do Grupo de Trabalho (GT) das cooperativas de energia (8.4).

Com o retorno das atividades presenciais, em 2022, as cooperativas que participavam do GT puderam se encontrar presencialmente no Fórum de Cooperativas em São Paulo, promovendo a intercooperação e a troca de conhecimentos . Nesse mesmo ano, 16 representantes de cooperativas brasileiras participaram de uma visita técnica à Alemanha, onde aprenderam sobre o setor energético cooperativo alemão e suas inovações. Em 2023, foi lançado o curso online

[1] A história sobre a cooperativa Percília e Lúcio também foi apresentada no Let Communities Lead Report publicado em 2021.

Cooperativas de energia brasileiras em visita técnica à Alemanha em 2022 (8.5, 8.6)

"Geração distribuída de energia renovável - oportunidades para o cooperativismo" na plataforma CapacitaCoop, com o objetivo de ensinar na prática a utilização do modelo de geração distribuída de energia renovável para tornar as cooperativas mais competitivas e ambientalmente sustentáveis.

Compartilhando o conhecimento para além das frontreiras

Enquanto o movimento de energia cooperativa já tinha raízes profundas em países da Europa, Estados Unidos e Austrália, a América Latina começou a emergir como um importante ator nessa área, adaptando as práticas às suas realidades locais. Embora muito da literatura e conhecimento sobre o tema tenha se originado no norte global, as peculiaridades e desafios do contexto latino-americano tornaram a troca de experiências e a construção de conhecimento coletivo a nível regional cada vez mais essenciais.

Dessa forma, o Brasil se destacou como um líder nesse movimento, atraindo a atenção de outros países da região. Em 2022, pesquisadores e atores envolvidos com comunidades energéticas da Colômbia visitaram o Brasil para conhecer a regulação e experiências práticas em modelos comunitários. Essa visita teve como objetivo apoiar os pesquisadores colombianos a apoiar a melhoria de suas políticas para comunidades de energia. Em 2023, esses pesquisadores promoveram um simpósio latino-americano de comunidades energéticas em Medellín, na Colômbia, reunindo representantes da OCB e outros atores do Brasil, Argentina, Chile e México. Esse evento facilitou uma troca de conhecimento valiosa e resultou na elaboração de um decreto na Colômbia, publicado em dezembro de 2023, que definiu oficialmente o conceito de comunidades energéticas no país.

Além desses encontros presenciais, a plataforma energia.coop foi expandida em 2023 para incluir conteúdos específicos sobre o Chile, Colômbia e México. A plataforma agora apresenta um mapa de iniciativas que compila projetos desses quatro países, promovendo a visibilidade e o intercâmbio de informações entre as diversas iniciativas de energia cooperativa na região. Essas ações demonstram a importância crescente da cooperação regional na construção de um conhecimento coletivo robusto e adaptado às necessidades locais.

Visita de pesquisadores colombianos ao Brasil, em 2022 (8.7; 8.8).

Simpósio Latino-americano de Comunidades Energéticas em Medellin, na Colombia, em 2023 (8.9; 8.10)

A construção coletiva de conhecimento em energia cooperativa demonstra ser uma ferramenta poderosa para impulsionar a transição energética no Brasil e na América Latina. O apoio contínuo da OCB e da DGRV tem sido essencial para capacitar cooperativas locais, promover a troca de experiências e enfrentar desafios comuns. O número crescente de cooperativas de energia, que passou de seis em 2019 para 49 em 2024, reflete o sucesso dessas iniciativas. Além disso, o movimento possibilitou um relevante movimento das cooperativas de outros setores a também gerarem sua própria energia renovável. Hoje existem mais de 800 cooperativas entre agropecuárias, de saúde, crédito e outros, gerando sua própria energia e assim garantindo uma produção e atuação mais sustentável. Essa jornada coletiva não apenas fortaleceu as cooperativas individuais, mas também criou uma rede de colaboração que abrange fronteiras e contextos variados, mostrando que a união de esforços locais e regionais pode levar a soluções inovadoras e sustentáveis. O desenvolvimento de plataformas digitais, cursos de capacitação e encontros técnicos são exemplos de como o conhecimento compartilhado pode gerar impactos significativos.

O movimento de energia cooperativa na América Latina continua a evoluir, aprendendo com os desafios e celebrando os sucessos, sempre com o objetivo de uma transição energética justa e inclusiva. A experiência acumulada e as lições aprendidas neste processo servem como um guia valioso para futuras iniciativas, mostrando que o poder da cooperação e do conhecimento compartilhado é fundamental para enfrentar os desafios globais da energia.

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Meeting of the network "Energy & Communities" in May 2023 in the city of Belém, Pará, Brazil (9.1)

Energy & Communities Network: an alliance for full access to energy in the Brazilian Amazon

Mainstreaming traditional and place-based knowledge, through a broad societal coalition, is making inroads in the policy sphere for enacting just energy access for Indigenous and traditional communities.

Overview

The Energy & Communities Network (in Portuguese, Rede Energia & Comunidades) is a coalition of representatives from civil society organizations, social movements, and volunteers who advocate for full access to renewable electricity for isolated and remote communities in the Brazilian Amazon. Our primary objective is to propose, articulate, monitor, evaluate, and accelerate the implementation of public policies aimed at improving access to clean energy as a tool for sustainable development. Our work is grounded in the principles of social, environmental, and climate justice, to ensure that policies meet the needs of forest peoples - Indigenous, quilombola, extrativistas, and other traditional communities[1].

Building the Energy & Communities Network

The Energy & Communities Network is a collaborative Network between Brazilian organizations working on energy-related issues (listed in Table 1). The Network started in 2018 through the mobilization of civil society organizations and communities aiming to expand public dialogues about access to renewable electricity in Brazil. In 2019, with support from the Charles Stewart Mott Foundation, founding organizations of the Network organized the first "Energy and Communities Meeting" to explore technological possibilities, share experiences and discuss policies for energy

[1] Traditional peoples and communities are culturally differentiated groups with their own forms of social organization, recognized by the Brazilian State (Decree 6.040/07). Indigenous peoples have ancestry that predates European colonization (Law 6.001/73). Quilombola communities are rural, Black communities with African ancestry and a history of resistance to slavery and other oppressions (Decree 4.887/03). Extrativistas communities are traditional populations whose subsistence is based on the collection and extraction of natural resources (Law 9.985/00). In Portuguese, the term „extractivism" refers to sustainable use.

access in the Brazilian Amazon[2]. From the discussions, participants identified a set of actions to overcome the electrical exclusion of communities in remote areas of the Amazon through their work. Building on the success of this first meeting in bridging actors and raising awareness about energy-related issues, regular meetings continued under the formal umbrella of the "Energy & Communities Network."

The Network is governed by the executive secretariat, consisting of representatives from member organizations and a rotating leadership. A council of representatives from social movements advises the secretariat on the Network's operations. In bi-weekly meetings, members discuss strategic plans, assess outcomes and evaluate emerging national and international opportunities. While most meetings are online, in-person meetings are occasionally organized. Recent in-person meetings took place in July 2023 at the WWF headquarters in Brasilia resulting in the Network's strategic plan, and a follow-up meeting in July 2024 at the same location. The decisions in the network are co-produced by the members in a non-hierarchical and consensus-based manner, guided by values of respecting differences, and no tolerance for discrimination or prejudices.

Objectives of the Energy & Communities Network

The primary objective of the Network is to advocate for and accelerate the implementation of public policies and sustainable development programs for the Brazilian Amazon, ensuring they meet the needs of Indigenous, quilombola, extrativistas, and other traditional communities. Our primary agenda is to create full access to energy in the Brazilian Amazon, understood as access to "energy services that are adequate, reliable, high-quality, safe, environmentally benign, and economically accessible to support human and economic development" (IEI Brazil, 2022, p. 7). We emphasize that access to clean energy should enable necessary services for the well-being of forest peoples, covering both domestic use demands and local demands for energy to power economic uses.

The Brazilian Amazon represents a panorama of environmental, economic, cultural, and energy injustices that disproportionately impact those living in this region. Despite the large hydroelectric plants that makes the Northern region of Brazil an exporter of electricity, parts of the population still lack access to electricity services, especially in remote areas (Campos, 2023). Nearly one million people do not have access to clean energy in the Amazon, particularly communities in isolated regions located in Indigenous lands and protected areas (IEMA, 2020). Communities often rely on diesel generators to generate electricity, which operate for only a few hours at night and come with high costs due to fuel prices, in addition to environmental and noise pollution (WWF Brazil, 2020). Due to a scarcity of electricity, communities face various limitations including food preservation, access to education and communication, health services, agricultural production, forest products collection, and pumped water (Moran et al., 2022; WWF Brazil, 2020). Although the Amazonian states produce 25.7% of Brazil's electricity, they consume only 8.4% (Schutze et al., 2022). It is also important to note that hydroelectric plants have caused and continue to cause extensive socio-environmental impacts in the region (for examples of impacts, see: Athayde et al., 2019; Campos, 2023; Castro-Diaz et al., 2018; Moran, 2016).

What we do as Energy & Communities Network

The activities of the Network can be grouped in three main areas of action: communication and training, political advocacy, and knowledge production (detailed in Table 2).

We view communication and training as strategic areas for empowering communities by disseminating information about policies and rights of electrical energy consumers. The Network produces a radio

[2] For more details about the event and its outcomes, visit: https://feira.energiaecomunidades.com.br/

and podcast program for this purpose, sharing the latest information of programs such as "Luz para Todos" (Light For All) and how it may bring benefits to communities. We believe that communication is both a means and an end goal in pursuit of the objectives of the Network.

Regarding advocacy, we understand that every action is political. Therefore, our advocacy activities are organized by facilitating meetings that bring together civil society, social movements, and policymakers with the aim to give voice to the needs of communities and villages living without access to electricity. Moreover, we aim to influence federal government decision-making processes through direct participation in public hearings, public consultations, and the formulation of public policies to accelerate universal access to electricity in Amazonian territories. Our practices are grounded in the values of social, environmental, and climate justice.

Finally, our work in the field of knowledge production integrates traditional and local knowledge with technical-scientific research produced by organizations within the Network. We incorporate traditional and Indigenous knowledge in creating energy solutions that are appropriate for the local context and adjusted to the Amazonian reality. The co-production of knowledge supports the other two areas of action-by providing qualified information for the communication sphere and informing dialogues in the advocacy sphere.

2nd Energy & Communities Meeting and Belém Charter

Between May 9 and 11, 2023, the Network organized the 2nd "Energy & Communities Meeting" in the city of Belém, state of Pará, Brazil. The event brought together approximately 300 people, including 250 leaders from Amazonian communities and social movements, public managers from the region, third-sector organizations, researchers, members of ministries, and other federal government agencies. The meeting aimed to identify and advance the agendas and demands related to energy, as expressed and presented directly by community leaders. Additionally, the event explored initiatives, innovations, and practical solutions to meet the needs and demands of communities.

Mainstreaming the voices of Amazonian peoples and communities, the meeting highlighted the multi-dimensional nature of the energy access problems by bringing out its links to poverty, health, education, communication, water supply, and sanitation, among others. The main outcome of this meeting was the collaborative letter expressing the differentiated

Planning meeting of the network Energy & Communities in 2023 (left) and 2024 (right) (9.2; 9.3)

II ENCONTRO ENERGIA & COMUNIDADES
Parque dos Igarapés
9 a 11 de Maio de 2023
Belém - PA - Brasil

DOCUMENTO FINAL

Nós, povos indígenas, quilombolas, extrativistas de todos os estados da Amazônia brasileira, presentes no II Encontro Energia e Comunidades, realizado em Belém-Pará, de 9 a 11 de maio de 2023, vindos dos Territórios Indígenas, Quilombolas, Reservas Extrativistas marinhas e florestais, Florestas Nacionais, Reservas de Desenvolvimento Sustentável, Projetos de Assentamento Agroextrativistas Estaduais e Federais, solicitamos que Estado brasileiro atenda as demandas listadas abaixo.

Estas demandas, construídas durante o evento, trazem as principais reivindicações dos povos indígenas, quilombolas e extrativistas (PIQCTs), no que se refere a questão energética e a todos os serviços e projetos que dela dependem, e que estão detalhados neste documento.

Excerpt from the Belém Chater produced at the 2nd Energy & Communities Meeting in May 2023, Belém, Pará, Brazil. Full letter can be accessed at: https://www.energiaecomunidades.com.br/2023/05/16/conheca-o-documento-com-as-reivindicacoes-das-comunidades-que-resultou-do-ii-encontro-energia-comunidades/ (Available in Portuguese) (9.3)

energy needs and aspirations of the communities. Titled "Belém Charter," the document was written and endorsed by the communities participants (Figure 9.3) and highlights the specific energy situation and solutions needed by Indigenous peoples, quilombolas, and extrativistas communities. It describes the challenges faced by communities living without full access to electricity in isolated regions and with limited essential services such as communication and sanitation. The letter discusses injustices associated with the unequal distribution of benefits and impacts related to Brazil's energy production, rejects the energy production model based on large-scale hydroelectric dams, and emphasizes the need for public policies that prioritize community participation in all stages of creating energy sufficiency in isolated areas.

It is important to note that these problems and demands are not new to the public authorities, but lack sustained action. The Energy & Communities Network works to bridge this gap by gaining legitimacy as an important actor and intermediary between the government and organized civil society. A sign of our increasing effectiveness is indicated by the follow-on engagements post the 2nd Energy & Communities Meeting, where some ministries, the Brazilian Development Bank (BNDES), and the national electricity regulation agency have discussed possibilities of incorporating recommendations in policy actions.

Conclusion

The Energy & Communities Network demonstrates the relevance of alliances across multiple sectors to advance energy and human development agendas within the Brazilian Amazon. The creation of self-organized networks that bring together multiple stakeholders, guided by the experiences of communities and social movements, is an effective model for influencing policy. Our work emphasizes the importance of shaping agendas, actions, and strategies based on listening to and involving the communities experiencing issues related to lack of full access to electricity.

Table 1 – Organizations that are part of the Energy & Communities Network*

Organization	Mission, description and aims	Website
350.org Brazil	An international movement of ordinary people working to end the era of fossil fuels and build a world of renewable energy for all, led by communities	https://350.org/pt/
National Council of Extrativistas Populations (CNS)	Mobilize, organize, and represent extrativistas communities and organizations within the Brazilian Amazon and Brazil. Propose, demand, and monitor the implementation of public policies that ensure economic, environmental, and cultural sustainability	https://cnsbrasil.org/
Coordination of Indigenous Organizations of the Brazilian Amazon (COIAB)	Promote political mobilization and strengthen Indigenous organizations throughout the Brazilian Amazon and advocate for the demarcation of traditional Indigenous lands	https://coiab.org.br/
National Coordination for Articulation of Rural Black Quilombola Communities (CONAQ)	Fight for the guarantee of collective use of territories for the implementation of sustainable development projects, and for the implementation of public policies that take into account the organization of quilombola communities	https://conaq.org.br/
Front For A New Energy Policy	A national initiative aimed at raising awareness and mobilizing citizens to transform current energy models in Brazil, seeking alternatives that ensure energy efficiency and the use of more sustainable sources	https://energiaparavida.org.br/
Forum on Renewable Energies of Roraima	Raise awareness, educate, and qualify the public opinion regarding energy issues in the state of Roraima	https://energiasroraima.com.br/
Charles Stewart Mott Foundation	Support projects worldwide that promote a fair, inclusive, and sustainable society	https://www.mott.org/
Institute of Consumer Defense (IDEC)	Guide, raise awareness, uphold ethics in consumer relations, and above all, advocate for the rights of consumer-citizens	https://idec.org.br/
Institute of Energy and Environment (IEMA)	Qualify decision-making processes to ensure that transportation and energy systems in Brazil guarantee the sustainable use of natural resources alongside social and economic development	https://energiaeambiente.org.br/
Socio-environmental Institute (ISA)	Work alongside Indigenous, quilombola, and extrativistas communities to develop solutions that protect their territories, strengthen their culture and traditional knowledge, elevate their political profile, and foster sustainable economies	https://www.socioambiental.org/
International Energy Initiative (IEI Brazil)	Initiate, strengthen, and advance energy for a sustainable development that balances economic efficiency with social equity and environmental sustainability	https://iei-brasil.org/
Liter of Light	Improve people's quality of life through sustainable lighting solutions and empower agents of transformation	https://www.litrodeluz.com/

Project Health and Happiness (PSA)	Promote and support participatory processes for integrated and sustainable community development that empirically contribute to improving public policies, quality of life, and exercise of citizenship	https://saudeealegria.org.br/
Revolusolar	National action through the use of social solar energy, promoting sustainable, reliable, modern, and affordable energy for low-income communities in slums, peripheral urban areas, Indigenous communities, and rural areas. Revolusolar promotes local job creation and income generation, professional training, and improved quality of life for the population, contributing to mitigation and adaptation of climate change impacts	https://revolusolar.org.br/
WWF Brazil	Contribute to conservation of nature in Brazil by harmonizing human activities with biodiversity conservation and the rational use of natural resources, for the benefit of today's citizens and future generations	https://www.wwf.org.br/
Global Rights Institute (ID Global)	Contribute to debates on a just energy transition by acting as a focal point between multidisciplinary research, innovative teaching, and diligent legal practice, aiming to strengthen the next generation of interlocutors that can respond creatively and impactfully to the social, economic, and legal challenges faced by Brazil, Latin America, and the Global South	https://www.idglobal.org.br/

*In addition to the organizations mentioned above, the Network also includes the participation of volunteers, academic researchers, and other collaborators.

Table 2 – Focal areas of action, goals and definitions, and examples of activities led by Energy & Communities Network

Focal areas of action	Goals and activities	Examples
Communication and training	Empowerment of communities through access to information on rights and policies regarding access to electricity Raising awareness on energy issues within the Amazon Amplifying the voices of Indigenous, quilombola, extrativistas, and other traditional communities	Management of website (https://www.energiaecomunidades.com.br/) Radio/podcast program titled "Programa Energia e Comunidades," available on Spotify (under the profile of "Rede de Notícias da Amazônia") and YouTube (@RedeEnergiaComunidades). Currently, the podcast has 24 episodes of approximately 15 minutes each, covering topics such as energy poverty, energy consumer councils, and the social tariff for electricity Management of Instagram account (@energiaecomunidades)
Political advocacy	Monitoring the national (Executive and Legislative) and international political agenda on energy issues Coordination with local governments and decision-making bodies in the energy field Advocacy for the rights of isolated communities to access energy Advocacy for the importance of energy in enabling the well-being (bem-viver) of Forest Peoples	Participation in meetings with the National Secretariat of Electrical Energy of the Ministry of Mines and Energy and its Department of Universalization and Social Policies of Electrical Energy Submission of technical notes in public consultation processes (e.g., contributions to Public Consultation MME 161/2024 on the Proposal for a new Operational Manual for the National Program for Universalization of Access to and Use of Electrical Energy - Luz para Todos; Technical Note analyzing resources that are available and necessary for ensuring universal access to electricity in the Legal Amazon (IEMA, 2023b); Public Consultation MME 154/2023 on resources allocated to the Luz Para Todos Program; Contributions to Bill 4248.2020 concerning goals for universal access to electricity in the Legal Amazon Region). Organization of webinars with stakeholders to discuss programs for universal access to energy in remote regions (e.g., webinars titled "Technological Alternatives: Perspectives on Energy Storage in the context of the Mais Luz para a Amazônia Program"; "Electrification in remote regions of the Legal Amazon: Sustainability of installations and the role of communities in the context of the "Mais Luz para a Amazônia" Program") Preparation of technical reports to support propositions for bills and executive decrees (e.g., Technical Report "Photovoltaic Systems in the Legal Amazon: Evaluation and proposition of public policies for universalization of electrical energy and reverse logistics" (IEMA, 2023a) resulting in an article in Decree 11638/ 2023 regarding the National Program for Universalization of Access to and Use of Electrical Energy - Luz para Todos). Participation in public hearings (e.g., participation in hearings titled "Just Energy Transition: Social Role of Solar Energy" and "Energy Monocultures")

Knowledge co-production, innovation and development	Production of knowledge aimed at influencing and qualifying decision-making regarding energy issues Identification of relevant knowledge gaps Integration of technical-scientific knowledge with local and traditional knowledges	Acquisition of data from the federal government via Access to Information Act (IEMA, 2024) Reports and publications produced jointly by member organizations (e.g., publication produced by IEI Brazil and Revolusolar on distributed generation of energy that is socially beneficial; Ribeiro et al., 2024) Virtual library on the Network's website, including publications on the productive potential of remote communities in the Amazon (WWF Brasil, 2021); technical reports for implementation of isolated photovoltaic system (Saúde e Alegria, 2019); case studies reporting on processes and results of solar energy project implementation (IEMA, 2019; WWF Brasil, 2022); public policy evaluation reports (IEMA, 2023a; IDEC, 2021; IEI Brasil, 2022; IEMA, 2018)

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ENERGIA & COMUNIDADES

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Encontro da rede "Energia & Comunidades" em maio de 2023 na cidade de Belém, Pará, Brasil (9.1)

Rede Energia & Comunidades: uma aliança para o pleno acesso à energia na Amazônia brasileira

Uma ampla coalizão social está abrindo caminhos na esfera política para garantir pleno acesso à energia para comunidades indígenas e tradicionais, através da inclusão do conhecimento tradicional e local nas políticas públicas.

Resumo

A Rede Energia & Comunidades é uma rede composta por representantes de organizações da sociedade civil, movimentos sociais e voluntários que pautam o pleno acesso à energia elétrica renovável para povos e comunidades em regiões isoladas da Amazônia brasileira. Atuamos propondo, articulando, monitorando, avaliando e acelerando a implementação das políticas públicas de acesso à energia limpa como instrumento para o desenvolvimento sustentável, sempre embasados em princípios de justiça social, ambiental e climática, para que se efetivem de acordo com as necessidades dos povos da floresta - indígenas, quilombolas, extrativistas e demais comunidades tradicionais[1].

Construindo a Rede Energia & Comunidades

A Rede Energia & Comunidades é uma rede colaborativa entre organizações que trabalham com questões relacionadas à energia no Brasil (listadas na Tabela 1). A Rede começou a se formar em 2018, através da mobilização de organizações da sociedade civil e comunidades que objetivavam expandir diálogos sobre o acesso à energia elétrica renovável. Em 2019, com o apoio da Fundação Charles Stewart Mott, as primeiras organizações integrantes da Rede organizaram o "I Encontro Energia e Comunidades", explorando possibilidades tecnológicas, comparti-

[1] Os povos e comunidades tradicionais são grupos culturalmente diferenciados com suas próprias formas próprias de organização social, reconhecidos pelo Estado brasileiro (Decreto 6.040/07). Povos indígenas possuem ancestralidade que antecede à colonização europeia (Lei 6.001/73). Comunidades quilombolas possuem ancestralidade negra relacionada com histórico de resistência à opressão histórica (Decreto 4.887/03). Comunidades extrativistas são populações tradicionais cuja subsistência baseia-se na coleta e extração de recursos naturais (Lei 9.985/00). Em português, extrativismo se refere ao uso sustentável

lhando experiências e debatendo políticas de acesso à energia na Amazônia[2]. Através das discussões, participantes identificaram ações e recomendações visando superar a exclusão elétrica das comunidades em áreas remotas da Amazônia. Devido ao sucesso do primeiro encontro em conectar e conscientizar atores sobre temas relacionados à energia, reuniões regulares continuarem a acontecer sob a atual denominação "Rede Energia & Comunidades".

A governança da Rede é constituída por uma Secretaria Executiva, composta por representantes das organizações membros, em colaboração com um Conselho Político, liderado pelas organizações representantes dos movimentos sociais. Em reuniões quinzenais que ocorrem virtualmente, são discutidos planos e estratégias para a efetivação dos objetivos da Rede, trocas de experiências entre organizações e avaliação de janelas de oportunidades para atuação em nível nacional e internacional. As decisões da Rede são tomadas de maneira não hierárquica, baseadas no consenso entre membros e guiadas por valores de respeito às diferenças e tolerância zero em relação à discriminação ou preconceitos. Embora a maioria das reuniões seja online, reuniões presenciais são organizadas ocasionalmente. Em julho de 2023, membros se reuniram na sede do WWF Brasil em Brasília para elaborar o planejamento estratégico da Rede. Em julho de 2024, outra reunião presencial ocorreu no mesmo local.

Objetivos da Rede Energia & Comunidades

O principal objetivo da Rede é propor, articular, monitorar, avaliar e acelerar a implementação das políticas públicas e programas de energia e desenvolvimento sustentável destinados à Amazônia brasileira, para que se efetivem de acordo com as necessidades dos povos indígenas, quilombolas, extrativistas e demais comunidades tradicionais. A nossa principal pauta é assegurar o pleno acesso à energia na Amazônia brasileira, entendido como o acesso a "serviços energéticos que sejam adequados, confiáveis, de qualidade, seguros, ambientalmente benignos e economicamente acessíveis para auxiliar o desenvolvimento humano e econômico" (IEI Brasil, 2022, p. 7). Enfatizamos que o acesso à energia limpa deve viabilizar os serviços necessários para o bem-viver dos Povos da Floresta, abrangendo tanto demandas para uso doméstico, como também demandas locais para uso de energia para fins produtivos e econômicos.

O foco de atuação da Rede é a Amazônia brasileira, haja vista o panorama de injustiças ambientais, econômicas, culturais e energéticas que impactam a região de maneira desproporcional. Apesar da existência de grandes hidrelétricas que fazem a região Norte do Brasil ser exportadora de eletricidade, partes da população seguem sem acesso ao serviço de energia elétrica, sobretudo em comunidades do interior (Campos, 2023). De fato, quase um milhão de pessoas não possuem acesso à energia na Amazônia, principalmente comunidades em regiões isoladas localizadas em terras indígenas e unidades de conservação (IEMA, 2020). As comunidades frequentemente dependem de geradores a diesel para produção de eletricidade, os quais funcionam por apenas algumas horas durante à noite e com um alto custo devido ao preço do combustível, além de emitir poluentes e ruídos (WWF Brasil, 2020). Devido à escassez de eletricidade, as comunidades vivem com diversas limitações, incluindo preservação de alimentos, acesso à educação e comunicação, serviços de saúde, produção agroextrativista, bombas para abastecimento de água (Moran et al., 2022; WWF Brasil, 2020). Apesar dos estados amazônicos produzirem 25.7% da eletricidade no Brasil, estes consomem apenas 8.4% (Schutze et al., 2022). É importante notar que as hidrelétricas na região produziram e continuam a produzir extensos impactos socioambientais na região (para exemplos de impactos, veja: Athayde et al., 2019; Campos, 2023; Castro-Diaz et al., 2018; Moran, 2016).

O que faz a Rede Energia & Comunidades

As atividades da Rede envolvem três eixos de atuação: comunicação e formação; incidência política; produção de conhecimento (detalhados na Tabela 2).

[2] Para mais detalhes sobre o evento e seus resultados, acesse: https://feira.energiaecomunidades.com.br/

Entendemos a comunicação e a formação como campos estratégicos para o empoderamento comunitário, através da disseminação de informações sobre políticas e direitos dos consumidores de energia elétrica. A Rede produz um programa de rádio e podcast que visa comunicar informações com os ouvintes sobre as políticas públicas do setor elétrico e como elas podem beneficiar as comunidades, como o programa Luz para Todos e a tarifa social de energia elétrica. Entendemos a comunicação não somente como meio, mas também como atividade fim da Rede.

No que se refere à incidência política, entendemos que toda ação é política. Por isso, nossas práticas e ações se fundamentam nos valores de justiça social, ambiental e climática. Articulamos e facilitamos reuniões que reúnem sociedade civil, movimentos sociais, e formuladores de políticas públicas, com o objetivo de dar visibilidade às vozes e demandas das comunidades e aldeias que vivem sem acesso à energia. Também visamos influenciar processos decisórios do governo federal através da participação direta em audiências públicas, processos de consulta pública e elaboração de políticas públicas. Deste modo, o trabalho na área de incidência política contribui para aceleração e melhoramento do processo de universalização do acesso à energia elétrica na Amazônia.

Finalmente, o trabalho no campo de produção de conhecimento busca integrar o conhecimento tradicional e local, combinados às pesquisas técnico-científicas produzidas por organizações da Rede. Enfatizamos a relevância do conhecimento tradicional e indígena na criação de soluções energéticas que sejam devidamente apropriadas para o contexto local e para a realidade amazônica. A produção de conhecimento ampara os outros dois eixos de atuação, fornecendo informação qualificada para o eixo de comunicação e para as propostas, debates e diálogos realizados no eixo de incidência política.

II Encontro Energia & Comunidades e Carta de Belém

Entre os dias 9 e 11 de maio de 2023, membros da Rede organizaram o "II Encontro Energia & Comunidades" na cidade de Belém, estado do Pará, Brasil. O evento reuniu cerca de 300 pessoas e contou com a presença de 250 lideranças das comunidades e movimentos sociais amazônicos, gestores públicos da região, organizações do terceiro setor, pesquisadores, membros de ministérios e outros órgãos do governo federal. O encontro objetivou identificar e avançar pautas e demandas relacionadas à energia, conforme expressadas e apresentadas diretamente pelas lideranças comunitárias para as autoridades presentes no evento. Ainda, o encontro também enfatizou as conexões entre acesso à energia e questões como pobreza, saúde, educação, comunicação, água e saneamento. Por fim, também explorou iniciativas, inovações e soluções práticas que possam atender às necessidades das comunidades.

Reunião de planejamento da rede Energia & Comunidades em 2023 (esquerda) e 2024 (direita) (9.2; 9.3)

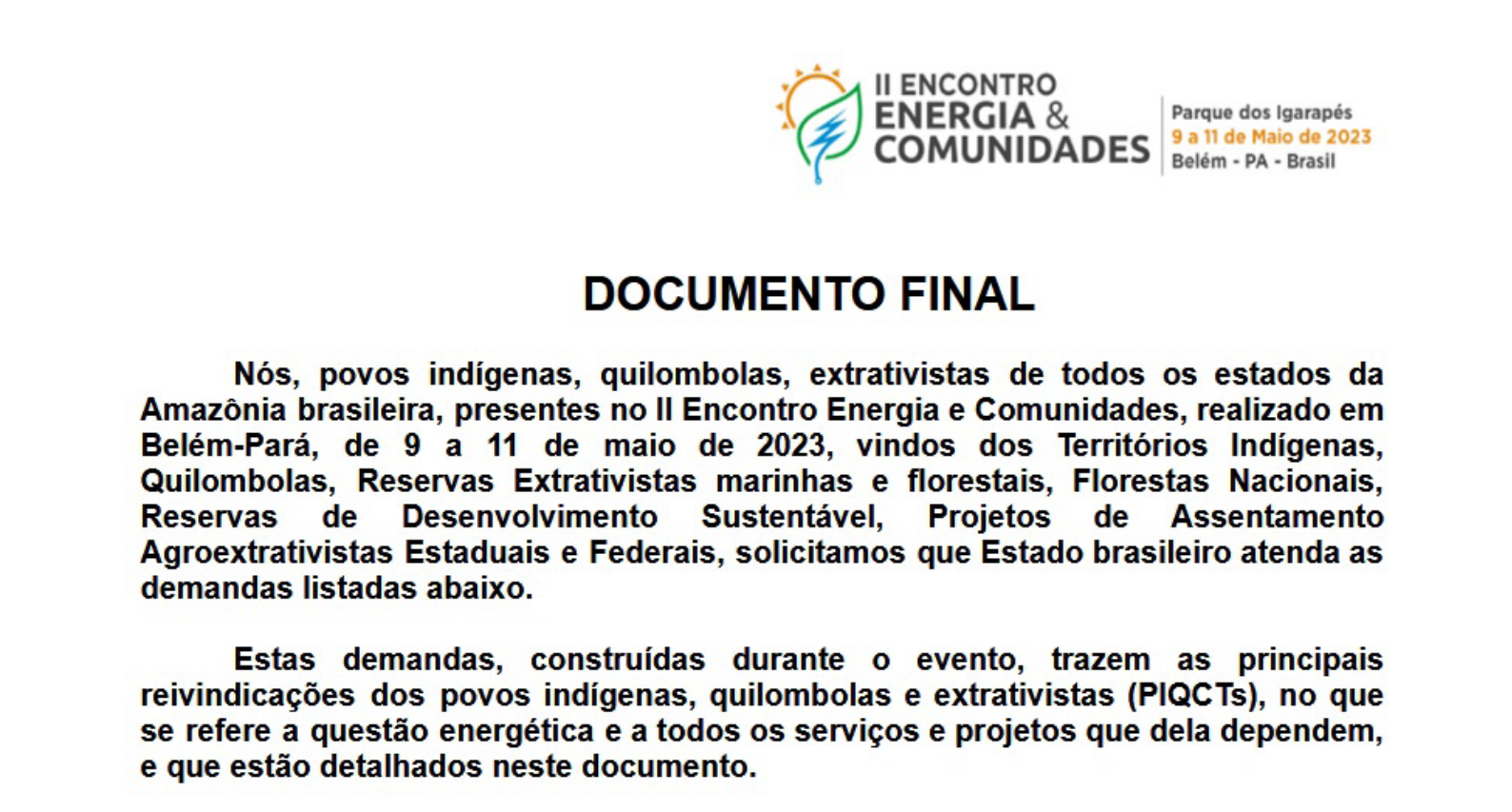

Figura 1 – Trecho inicial da Carta de Belém que foi produzida no II Encontro Energia & Comunidades em maio de 2023, Belém, Pará, Brasil. A carta pode ser acessada na íntegra em: https://www.energiaecomunidades.com.br/2023/05/16/conheca-o-documento-com-as-reivindicacoes-das-comunidades-que-resultou-do-ii-encontro-energia-comunidades/

O evento teve como principal foco as vozes dos povos e comunidades amazônicas e o principal produto foi a redação colaborativa de uma carta que expressa as demandas e desejos das comunidades. Denominada "Carta de Belém", o documento foi escrito e endossado pelos participantes e representantes de comunidades e aldeias (Figura 1; Energia e Comunidades, 2023). A carta descreve as dificuldades enfrentadas pelas comunidades que vivem sem acesso pleno à energia elétrica e outros serviços essenciais em regiões isoladas; versa sobre injustiças associadas com a distribuição desigual de benefícios e impactos referentes à produção de energia do Brasil; recusa o modelo de produção energética pautado pela construção de hidrelétricas de grande escala; enfatiza a necessidade de políticas públicas que priorizem participação comunitária na criação de soluções energéticas em locais isolados.

É importante destacar que esses problemas e demandas não são novidade para as autoridades, refletindo a falta de ação do poder público. Visando sanar tais lacunas, a Rede Energia & Comunidades atua como intermediária entre governos e sociedade civil organizada. Por exemplo, como desdobramento do II Encontro, alguns ministérios, o Banco Nacional de Desenvolvimento Econômico e Social (BNDES) e a agência nacional de regulação de eletricidade discutiram possibilidades de incorporar as recomendações da carta em políticas públicas. Deste modo, a Rede conquista legitimidade como um ator importante no campo energético.

Conclusão

A Rede Energia & Comunidades demonstra a relevância de alianças entre múltiplos setores para avançar pautas relacionadas à energia e desenvolvimento na Amazônia brasileira. A criação de redes horizontais e auto-organizadas que reúnem múltiplas partes interessadas, orientadas pela experiência de comunidades e movimentos sociais, se mostra como um modelo efetivo para influenciar a esfera política. O nosso trabalho enfatiza a relevância de se pautar agendas, ações e estratégias a partir da escuta e participação das comunidades que experienciam os problemas relacionados à ausência de acesso pleno à energia elétrica.

Tabela 1 – Organizações que fazem parte da Rede Energia & Comunidades*

Organização	Descrição	Site
350.org Brasil	Movimento internacional de pessoas comuns que trabalham para acabar com a era dos combustíveis fósseis e construir um mundo de energias renováveis para todos, lideradas pelas comunidades	https://350.org/pt/
Conselho Nacional das Populações Extrativistas (CNS)	Mobilizar, organizar e representar as comunidades e organizações extrativistas da Amazônia brasileira e do Brasil para articular, propor, reivindicar e acompanhar a execução de políticas públicas que garantam a sustentabilidade econômica, ambiental e cultural de nossas gerações presentes e futuras.	https://cnsbrasil.org/
Coordenação das Organizações Indígenas da Amazônia Brasileira (COIAB)	Promover articulação política e o fortalecimento das organizações indígenas por toda a Amazônia brasileira e atuar pela demarcação das Terras tradicionais indígenas	https://coiab.org.br/
Coordenação Nacional de Articulação das Comunidades Negras Rurais Quilombolas (CONAQ)	Lutar pela garantia de uso coletivo do território, pela implantação de projetos de desenvolvimento sustentável, pela implementação de políticas públicas levando em consideração a organização das comunidades de quilombo	https://conaq.org.br/
Frente Por Uma Nova Política Energética	Articulação nacional que visa conscientizar e mobilizar cidadãos e cidadãs para transformar o atual modelo energético brasileiro, buscando alternativas que garantam eficiência energética e o uso de fontes mais sustentáveis	https://energiaparavida.org.br/
Fórum de Energias Renováveis de Roraima	Sensibilizar, conscientizar e qualificar a opinião pública em relação aos desafios da questão energética no Estado, com ações efetivas e soluções sustentáveis para a sociedade	https://energiasroraima.com.br/
Fundação Charles Stewart Mott	Apoiar projetos em todo o mundo que promovam uma sociedade justa, inclusiva e sustentável	https://www.mott.org/
Instituto de Defesa de Consumidores (IDEC)	Orientar, conscientizar, defender a ética na relação de consumo e, sobretudo, lutar pelos direitos de consumidores-cidadãos	https://idec.org.br/
Instituto de Energia e Meio Ambiente (IEMA)	Qualificar os processos decisórios para que os sistemas de transporte e de energia no Brasil assegurem o uso sustentável de recursos naturais com desenvolvimento social e econômico	https://energiaeambiente.org.br/
Instituto Socioambiental (ISA)	Atuação ao lado de comunidades indígenas, quilombolas e extrativistas como parceiros históricos para desenvolver soluções que protejam seus territórios, fortaleçam sua cultura e saberes tradicionais, elevem seu perfil político e desenvolvam economias sustentáveis	https://www.socioambiental.org/
International Energy Initiative (IEI Brasil)	Iniciar, fortalecer e avançar a energia para o desenvolvimento sustentável que equilibre eficiência econômica com equidade social e sustentabilidade ambiental	https://iei-brasil.org/

Litro de Luz	Melhorar a qualidade de vida das pessoas por meio de soluções sustentáveis de iluminação e empoderar agentes de transformação	https://www.litrodeluz.com/
Projeto Saúde e Alegria	Promover e apoiar processos participativos de desenvolvimento comunitário integrado e sustentável que contribuam de maneira demonstrativa no aprimoramento das políticas públicas, na qualidade de vida e no exercício da cidadania das populações atendidas	https://saudeealegria.org.br/
Revolusolar	Atuação nacional por meio do uso da energia solar social, promovendo energia sustentável, confiável, moderna e a preços acessíveis para comunidades de baixa renda de favelas, periferias, comunidades indígenas e rurais, promovendo geração de emprego e renda locais, formação profissional e uma melhor qualidade de vida à população,contribuindo para a mitigação e adaptação dos efeitos das alterações climáticas	https://revolusolar.org.br/
WWF Brasil	Contribuir para que a sociedade brasileira conserve a natureza, harmonizando a atividade humana com a conservação da biodiversidade e com o uso racional dos recursos naturais, para o benefício dos cidadãos de hoje e das futuras gerações	https://www.wwf.org.br/
Instituto de Direito Global - ID Global	Contribuir no debate sobre Transição Energética Justa, atuando como ponto de articulação entre pesquisa multidisciplinar, ensino inovador e a prática diligente do direito, visando fortalecer a próxima geração de interlocutores para responder de maneira criativa e impactante os desafios sociais, econômicos e jurídicos enfrentados pelo Brasil, América Latina e Sul Global.	https://www.idglobal.org.br/

*Além das organizações citadas acima, a Rede também conta com atuação de voluntários e outros colaboradores

Tabela 2 – Eixos de atuação, definição e exemplos de atividades pela Rede Energia & Comunidades

Eixo de atuação	Objetivos e atividades	Exemplos de atividades
Comunicação e formação	Empoderamento comunitário através do acesso à informação sobre direitos e políticas do setor elétrico Conscientização sobre questões relacionadas à energia na Amazônia Amplificar as vozes de povos indígenas, quilombolas, extrativistas e demais comunidades tradicionais	Gerenciamento do site: https://www.energiaecomunidades.com.br/publicacoes/ Programa de rádio/podcast intitulado "Programa Energia e Comunidades", disponível no Spotify (página "Rede de Notícias da Amazônia") e YouTube (canal @RedeEnergiaComunidades). Atualmente, conta com 24 episódios de aproximadamente 15 minutos cada, versando sobre assuntos como pobreza energética, conselhos de consumidores de energia, tarifa social de energia elétrica Gerenciamento do Instagram da Rede: @energiaecomunidades
Incidência política	Acompanhamento da agenda política nacional (Executivo e Legislativo) e internacional sobre a questão energética Articulação com governos e órgãos locais de tomada de decisão no campo energético Defesa dos direitos das comunidades isoladas à energia Defesa da importância da energia para viabilizar o bem viver dos Povos da Floresta	Participação em reuniões com a Secretaria Nacional de Energia Elétrica do Ministério de Minas e Energia e com seu Departamento de Universalização e Políticas Sociais de Energia Elétrica Submissão de notas técnicas em processos de consulta pública (p. ex., contribuições para a Consulta Pública MME n° 161/2024 sobre a Proposta de novo Manual de Operacionalização do Programa Nacional de Universalização do Acesso e Uso da Energia Elétrica - Luz para Todos; Nota Técnica que analisa os recursos disponíveis e necessários para universalizar o acesso à energia elétrica na Amazônia Legal (IEMA, 2023b); Consulta Pública MME n° 154/2023 sobre recursos destinados ao Programa Luz Para Todos; contribuições para Projeto de Lei Nº 4.248 de 2020 que versa sobre metas para universalização do acesso à energia elétrica na Região da Amazônia Legal) Realização de webinars com as partes interessadas para discutir caminhos de aprimoramentos dos programas de universalização do acesso à energia em regiões remotas (p. ex., "Alternativas tecnológicas: perspectivas do armazenamento de energia no contexto do programa Mais Luz para a Amazônia"; "Eletrificação em regiões remotas da Amazônia Legal: sustentabilidade das instalações e papel das comunidades no contexto do Programa Mais Luz para a Amazônia") Elaboração de relatório técnico para fundamentação técnica de proposições para projetos de lei e decretos executivos (p. Ex., Relatório técnico "Sistemas Fotovoltaicos na Amazônia Legal: avaliação e proposição de políticas públicas de universalização de energia elétrica e logística reversa" (IEMA, 2023a) resultando em artigo no Decreto n° 11.638 de 2023 que dispõe sobre o Programa Nacional de Universalização do Acesso e Uso da Energia Elétrica - Luz para Todos) Participação em audiências públicas (p. ex., participação em audiência sobre o tema "Transição energética justa: papel social da energia solar" e "Monocultura da Energia")

		Obtenção de dados junto ao governo federal via mecanismos da Lei de Acesso à Informação (IEMA, 2024)
Produção de conhecimento, desenvolvimento e inovação	Produção de conhecimento que vise influenciar e qualificar a tomada de decisão sobre questões energéticas	Relatórios e publicações produzidas em conjunto entre organizações membros (p. ex., publicação realizada em conjunto entre IEI Brasil e Revolusolar sobre geração distribuída de interesse social; Ribeiro et al., 2024)
	Identificação de lacunas de conhecimento relevantes	Biblioteca virtual no site da Rede, incluindo publicações sobre o potencial produtivo de comunidades remotas na Amazônia (WWF Brasil, 2021); cadernos de especificação técnica para projetos de sistemas fotovoltaicos isolados (Saúde e Alegria, 2019); estudos de caso relatando processos e resultados de implementação de projetos de energia solar (IEMA, 2019; WWF Brasil, 2022); relatórios de avaliação de políticas públicas (IEMA, 2023a; IDEC, 2021; IEI Brasil, 2022; IEMA, 2018)
	Articulação do conhecimento técnico-científico com conhecimentos locais e tradicionais	

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ENERGIA & COMUNIDADES

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