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PLANNING TO IMPROVE THE QUALITY OF ENERGY IN THE RURAL COMMUNITY QUEBRADA DE GUILLEN

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Abstract
The province of Manabí is rich in natural resources, agriculture, cattle, fishing; being one of those with the most coastal areas. Its rural population lives mainly in mountainous areas, very difficult to access. Despite the efforts of the electric company to provide quality energy service, it has not been satisfactorily fulfilled because many of them are in territories where conditions are not favorable so that through the extension of the network to provide quality in the service. The research aims to identify the difficulties presented by an isolated community, to provide an adequate electrical service and evaluate alternatives taking advantage of the local endogenous potential to satisfy the generation and improve the quality of energy. For the development of the research, quantitative and qualitative methods were applied, obtaining as a result that it is possible to use endogenous.

Keywords: Local development; energy efficiency; renewable sources of energy.

Introduction

Science and technology are social processes in its broadest sense, revaluing the social not as a scenario but as a decisive element, is to start walking in the right direction for sustainable local development, improving the quality of life from local development (Rodriguez, Vázquez, Sarmiento, & Millet, 2017).

The quality of life in rural areas can depend on many factors, such as the level of economic development, access to basic services, education and health. In general, the quality of life in rural areas is lower than in urban areas due to the lower level of economic development. Although many people live in difficult conditions, this does not mean that they cannot enjoy a full and satisfying life. (Brito &Pacají, 2022).

Improving the quality of life in rural areas would require economic development to improve access to basic services and generate jobs for the young generation. This would imply government investments to improve basic infrastructure such as roads, electricity, potable water, and telecommunications. In addition, educational programs would be needed to improve educational levels and medical programs to ensure good health for all the inhabitants. Finally, social policies would be required to reduce poverty and promote greater equality between men and women in this type of environment (Merino, Mora., & Pamela, 2022).

There is agreement in considering that quality of life is not something that one has or receives, but something that one must actively create oneself if the context allows it, based on one's own interests, desires, and needs. When talking about quality of life, it is necessary to talk about health, people's living conditions, as well as institutional mechanisms that allow it to be restored, with the vision of well-being for all Ecuadorian citizens (Seraquive& Ávila, 2020).

The population that lives in developing countries and that are, in most cases, the agricultural sustenance of the urban populations; It makes it isolated from the cities and many of them today do not meet the basic conditions, such as energy, water to stay in their cultivation areas, favoring in many cases their migration to urban areas, abandoning the cultivation areas, causing a decrease in production agricultural and livestock(Pan American Health Organization (PAHO), 2020).

The social situation experienced by many populations in developing countries puts into context the social concern for the energy development of isolated communities in different regions and cultures as a responsible way to approach future development where the efficient availability of resources and the climate change mitigation are priority tasks(News, 2014).

Scientific and technological knowledge is one of the main assets of contemporary societies and an essential element to promote economic and social development. Science, technology and innovation have become necessary tools for the transformation of productive structures, the rational exploitation of natural resources, health care, food, education and other social requirements(Murillo, 2012).

Energy is one of the fundamental pillars of human progress. Electricity constitutes a basic part of the needs of modern man, as do the supply of clean water, medical care,

education(Rodríguez, Castillo, Vázquez, &Saltos, 2016).

The quality of life in rural Ecuador is generally low due to a variety of factors, including lack of access to basic services, level of education, and scarcity of resources. People living in these rural areas often have less access to clean water, electricity, medical services and education, which contributes to greater poverty. In addition, many rural communities lack adequate transportation infrastructure, and rural roads are difficult to navigate. This makes it difficult for people to move around and trade with other places(Perugachi&Cachipuendo, 2020).

The educational level is also low in many rural areas due to limited access to formal education. This means that many children do not have the opportunity to get a good education and may end up working in low-paying jobs or even without a job. The scarcity of resources is another important factor that contributes to poverty in rural areas of Ecuador. Many areas lack fertile land to grow the food needed to keep their inhabitants healthy and satisfied. This means that many families depend on trade with other places to obtain the food they need to survive. Taken together, these factors contribute to a lower level of quality of life in rural areas of Ecuador.

In Ecuador, the endowment of electrical energy is made up of 46% thermoelectric energy: 40% by hydroelectric, 12% by international interconnection and 2% by biomass. The combustion of fossil fuels such as oil, have generated pollution by carbon dioxide, sulfur, nitrous oxide contributing to the greenhouse effect, which has caused droughts, floods, deterioration of ecosystems and a decrease in air quality. In addition, the poor conditions of accessibility to rural communities mean that the electricity supply received is of low quality, which causes the destruction of electrical appliances, preventing the socio-economic development of the inhabitants of the area(ARCONEL, 2017).

The quality of life in the province of Manabí has improved significantly in recent years. This is mainly due to investment in infrastructure, economic development, and education. However, it is important to note that rural areas still have a long way to go to achieve a quality of life comparable to that of urban areas, everything will depend on the government's plans.

First, access to basic services such as potable water, electricity, and health care remains limited in many rural areas of Manabí. In addition, many inhabitants have difficulties accessing nutritious food due to the high cost of transportation and the low educational level of farmers.

On the other hand, the educational level is an important limitation to improve the quality of life in these rural areas since there are no nearby schools or adequate educational programs. This means that children cannot receive an adequate education, which limits their future job opportunities.

Economic development is a key factor to improve the quality of life in these rural areas, since it allows them to generate enough income to meet their basic needs and reduce their economic vulnerability; however, economic development has not been properly implemented due to lack of investment from central and local government.

The quality of life in rural Manabí still needs significant improvements if this province is to be

a more prosperous and secure place for all its inhabitants. The adequate implementation of projects related to infrastructure, basic services, education, and economic development are essential to achieve this objective, including energy as a high priority (ONU, 2022).

In the province of Manabí, 4.5% of the population does not have energy (CONELEC, 2011) and 1.5%, located in the rural community of Quebrada de Guillén, receives a deficient energy service that is supplied by the local distribution company, generating different inconveniences that make the service not continuous and causing damage to the electrical appliances of the residents. settlers.

The inconveniences in the service are caused by the difficulty of the communication and transmission routes, the variability of the climate given by the geography of the place; Because it is a mountainous area, the problem becomes more acute in winter, the vegetation interrupts the service of the only single-phase medium voltage line, which is extremely long; and due to its caliber, it presents many energy losses; in addition to an imbalance in the networks caused by the poor adaptation of the load centers, aspects that generate a poor quality of life for its inhabitants and make them migrate to areas with better conditions. Situation that motivates the study problem addressed in this work.

The quality of the energy results in an element that requires continuous attention(Rodríguez, Vázquez, Veléz, &Saltos, 2018); in recent years this attention has been of greater importance due to the increase in the number of sensitive loads in the distribution systems, which by themselves constitute a cause of the degradation of these systems(Culman, Morales, Acevedo, & Rey, 2013).

In the National Plan for Good Living 2017-2021(Senplades, 2017), it is stated that small energy generation projects with renewable sources may be implemented, such as: photovoltaic, wind, biomass, and hydroelectricity in areas close to consumers; with participatory management schemes of decentralized autonomous governments, community organizations and the private sector. These projects make renewable energy sources available for local productive uses and interconnected systems, which makes it possible to generate local employment, optimize the use of natural resources, diversify territories in the generation of electricity and reduce technical losses in the transmission of electricity. electricity. Hence, the objective of this work is: to identify the difficulties presented by the isolated community of Quebrada de Guillén, in the quality of the electricity supply and to evaluate alternatives taking advantage of the endogenous local potential to satisfy the generation and improve the quality of energy.

Materials and methods

For the development of the research, quantitative and qualitative methods were used, combining table and field work, the techniques of analysis of documentation and previous data, structured survey, interviews, direct observation, and the inductive method were used. deductive method to carry out the critical analysis and determine the types of generation that can be implemented.

Analysis and discussion of results

The quality of energy in the rural sector plays an important role in the social, economic, and environmental fields(Vélez, Rodríguez, Cervantes, &Mieles, 2016). Access to quality electricity services represents a decisive element in the fight against poverty, marginalization, unsanitary conditions, illiteracy, and the well-being of people. Therefore, it is necessary, to promote efficiency in production processes and effectiveness in public service, to create the conditions to have developed communities that avoid migration in traditional environments and that develop from the local level(Vázquez, Rodríguez, Villacreses, &Vélez, 2019).

The community of Quebrada de Guillén is a rural community in the Abdón Calderón parish of the Portoviejo canton. The map with its location is shown in figure 1. It is a purely agricultural-livestock community, where its inhabitants live from this activity. From its mountainous and broken characteristics that are born from the highest hills, where the water flows from its peaks crossing fields, it takes the name that identifies it.

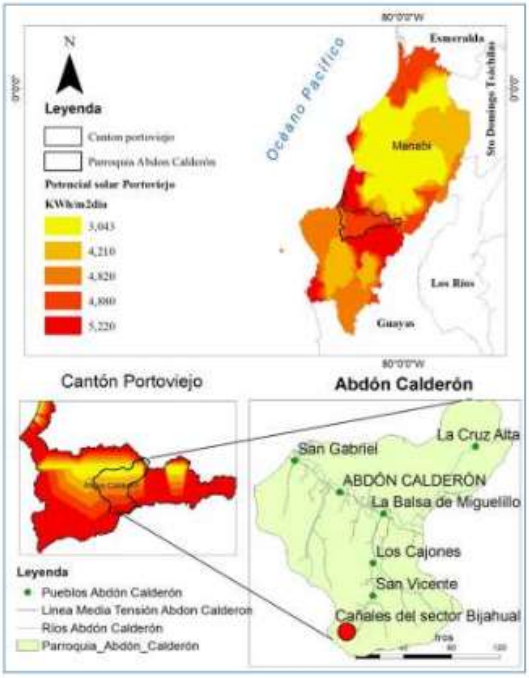

Figure 1. Guillén ravine

Fountain:(Sanchez & Rodríguez, 2021)

The electric company has drawn up a policy towards awareness to achieve a relevant social impact by offering energy to populations living in rural areas far from the grid, making an effort to improve the service causing long distance transmission lines of the network(Vélez, Rodríguez, Cervantes, &Mieles, 2016), aimed at guaranteeing a quality service; but this is not enough, so the inconvenience to users persist, as what was established in the policy is not fulfilled in practice. Figure 2 shows the damage caused to users.

As can be seen, the damages have an impact on the poor quality of life with a negative social and economic impact. Unforeseen cuts affect electrical equipment, all of which causes

abandonment of the countryside due to lack of opportunities to improve and the thickening of the cordons of misery in the largest cities, factors that commit governments to devise strategies that help improve these aspects. , in order to increase the levels and living conditions of the population in the countryside, with this you can increase agricultural production, better income, from agro-productive activities and with it the appearance of new marketing activities, but under improved conditions in relation to access to electrical energy and where a stable and safe electrical supply is guaranteed, which allows them to maintain their continuity without affecting their performance or causing failure of their components.

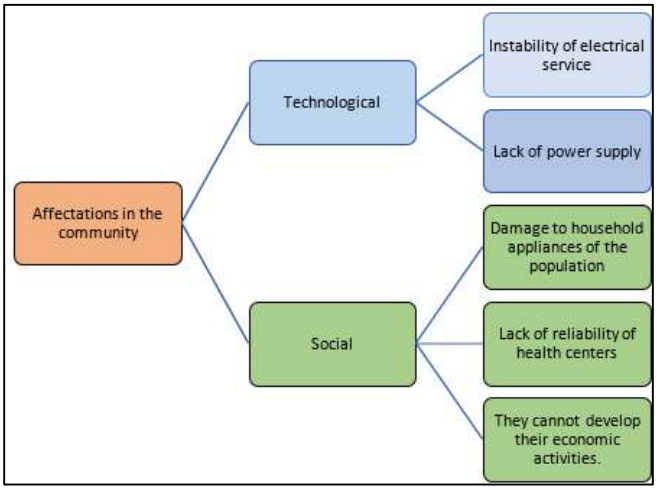

Figure 2. Some technological and social conditions

Source: Surveys and interviews conducted.

In rural areas, the inhabitants tend to have a lower quality of life, among other aspects, due to the differences in the provision of all kinds of services, compared to that of the urban population. This scenario has historically favored migratory processes from the countryside to the city (and even international migration processes), and the consequent creation of poverty gaps between urban and rural areas, a difficulty that can be improved by taking advantage of the resource. local autochthonous that in the province and in the community can be used for their service(Rodriguez, Vazquez, Sarmiento, &Milet, 2017).

There are studies related to the use of energy from the use of the potential in existing renewable sources in the territories; that with a comprehensive assessment can be used to provide local solutions to problems individually. Many countries, at present, have promoted the introduction of these technologies through energy transition strategies; for example some developed countries like Japan(Casado, 2016), where they have carried out a change based on a new approach for the energy sector, and thus achieving the transition with a process, through which it is possible to reduce greenhouse gas emissions, mitigate the environmental impact of the sector and contribute to combat the effects of climate change(Gamboa, 2022).

This is also observed in Latin American countries such as Chile, Costa Rica, Mexico, in the case of Mexico, the diversity in the typology of cities in relation to resources, demands,

architectural conditions, infrastructure or density is being studied. This conditions the need to carry out a specific analysis, and they identify factors for the planning process that would allow evaluating and selecting the most appropriate technology according to different conditions (Barragán, Zalamea, Terrados, & Vanegas, 2019).

In Chile, researchers project themselves in social studies and their roles, with a flexible methodology, through a series of collection techniques and records of ethnographic-based information - observation, participant observation, oral history, interviews, focus groups, documentary review. and archives - they allow to reconstruct and illustrate some aspect of social life for evaluations of territories of the energy transition(White, 1019). This aspect is important in the case of rural electrification, where the interests of the community must be based on, who are affected and need the use of endogenous resources that exist in their territories. The researchers themselves suggest that with social support existing difficulties can be resolved, in addition to government support or strategy.

Table 1 shows some problems that have been detected in the community, which offer elements of why work should be done to achieve improvements in the community's energy conditions.
Table 1. Problems that have been detected in the community.

Incident factors	**Indicators**	**Conditions**
Factor social	Abandonment of the rural area	10 families
Economic factor	Low income	30 families in a state of poverty
electrical power interruptions	Disconnection times per month	18 times in winters and 10 times in summer
Bad voltage in the networks	Low voltage at consumption points	105V grid tail voltages

Source: Community Inventory

As can be seen, there are adverse conditions that cause different problems such as abandonment by the population of rural areas, which in turn translates into other situations in the city such as unemployment, food shortages or higher prices, among others.

From a social point of view, rural electrification has a direct positive impact on all economic activities, generating, for example, favorable synergies around agricultural-based industrial activities. With which, rural electrification contributes to the reduction of poverty, since, for example, from a greater power and quality of electrical energy it is possible to improve, modernize and diversify production (agricultural and livestock), and favor the generation of rural employment in non-traditional activities(Cook, 2011), (Vanden & Wren, 2023).

The Quebrada de Guillén community has serious difficulties with the stability of the continuity and quality of the electricity supply. This town is fed by a single-phase medium voltage line that runs long distances for its distribution along the ravine, where the houses are in a mountainous area with thick vegetation, which does not guarantee the continuity of the service due to falling trees. on poles and nets, landslides, stream, and ravine outlets, in winter times

and in many cases the access road is closed. In the images of figure 3, the state of the power lines can be seen.

Figure 3. Images of the power lines in the Guillén ravine.

The proposal to guarantee a community in the energy supply is to develop a rural electrification strategy, based on the potential in local renewable energy sources; and in this way ensure electrification with endogenous resources, from the residuals of agricultural and livestock production, improving the quality of energy and contributing to the change of the energy matrix, within the community. As it is a livestock community with a high forest potential, the use of biogas can be one of the alternatives, as well as solar energy, with the use of photovoltaic generation. Figure 4 shows the annual average of solar radiation in the Quebrada de Guillén.

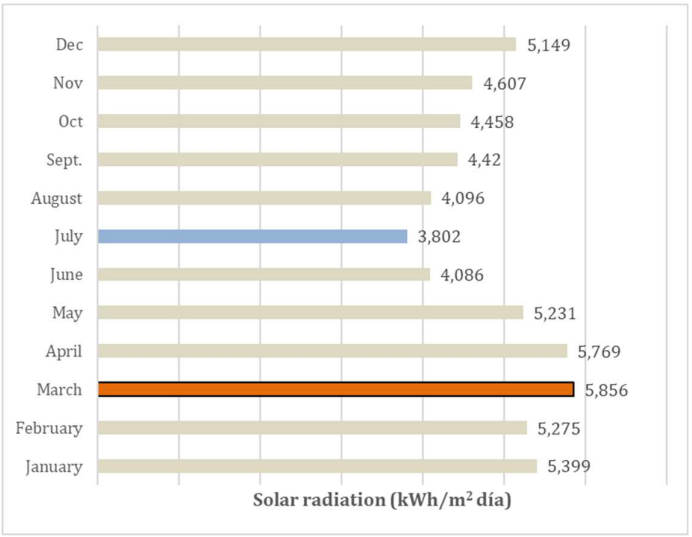

Figure 4. Monthly average of solar radiation in the Quebrada de Guillén
Source: (Rodriguez & Vázquez, 2018).

As can be seen, the months with the highest and lowest solar radiation are the months of March and July, in addition, the annual average was calculated, arriving to behave with4,845 kWh/m^{2}day.

A project to improve the quality of the electrical service, will allow its residents to increase the quality of life and comply with what is proposed in the strategy of the rights of good living of each Ecuadorian citizen(National Constituent Assembly (NC), 2008), contributing to the life model that guarantees sustainability, by reducing the levels of environmental contamination, a continuous supply of electrical energy and with strict compliance with the parameters. By using

an alternative energy that solves the poor-quality problems that currently exist with conventional energy, it will allow a different and better way of living where production is the regular activity of its inhabitants.

Taking this context into account, sustainable development, and the fulfillment of the objectives for sustainable development in 2030 would be promoted, which is to ensure access under equal conditions for all where the population has access to energy and water (Ecuador, 2023).

Conclusions

The use of endogenous resources, fundamentally solar radiation, is proposed because it is one of the most abundant, which through its application will allow its inhabitants to improve their energy quality with new forms of generation that are friendly to the environment, in addition to the introduction of energy systems, new opportunities are achieved for the economic development and stability of the inhabitants in the territory.

The Quebrada de Guillén community, in the Portoviejo canton, presents difficulties in receiving quality electrical service because it is in an isolated, mountainous area with very difficult access, which causes the inhabitants to migrate to urban areas.

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