



**ILLUMINATING LIVES: HOW SOLAR ENERGY CAN BREAK THE CYCLE OF SOCIAL EXCLUSION AND TRANSFORM THE FUTURE OF AFRO-DESCENDANT CHILDREN IN PITA ABAJO**



**ECOCEANOS**  
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## ILLUMINATING LIVES: HOW SOLAR ENERGY CAN BREAK THE CYCLE OF SOCIAL EXCLUSION AND TRANSFORM THE FUTURE OF AFRO-DESCENDANT CHILDREN IN PITA ABAJO

### SUMMARY

This study analyzes the situation of children in the rural Afro-descendant community of Pita Abajo, Colombia, where 75% of students drop out of school before completing secondary education due to lack of electricity and adverse learning conditions. The high temperatures, which reach up to 38 °C during the day, make it difficult to concentrate and generate demotivation in 90% of the students interviewed. In addition, there has been a worrying increase in teenage pregnancies, with 25 cases reported in children under 15 years of age in the last two years. 40% of children outside the education system end up being linked to illicit activities, including micro-trafficking and participation in illegal armed groups. This study proposes as a solution the installation of a photovoltaic system composed of 15 solar panels, 5 batteries, and 3 inverters to energize the community school. This system will ensure continuous access to renewable energy, improving study conditions and mitigating critical social issues. Energization with solar energy is proposed as a sustainable measure to transform the educational and social reality of Pita Abajo.

**KEY WORDS:** Afro-descendant community, children, school dropout, photovoltaic system, education.



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### INTRODUCTION

Pita Abajo, a rural Afro-descendant community located in northern Colombia, is facing an educational and social crisis of alarming proportions, which threatens to perpetuate a cycle of exclusion and poverty in its youngest inhabitants. With a population of approximately 3,000 people, this community has built its way of life around traditional and subsistence agricultural activities, such as the cultivation of cassava, plantain, and corn. These activities, although essential for their daily sustenance, generate minimal income and limit the possibilities for economic growth. This scenario is compounded by the geographic isolation of the community, which lacks adequate access roads, making it difficult to connect to broader markets, urban centers, and essential basic services.

The road system connecting Pita Abajo with nearby towns is in precarious condition, being virtually impassable during the rainy season. This isolation not only prevents access to goods and services, but also hinders the arrival of resources that can improve



the living conditions of its inhabitants. In addition, the community lacks basic infrastructure in key areas such as health, sanitation and education, perpetuating an inequality gap that disproportionately affects younger generations.

One of the most critical problems in Pita Abajo is the lack of electricity in its main school, an institution that serves 200 children and adolescents. Without access to electricity, classrooms lack adequate

lighting, ventilation, and access to technological tools that could enrich the teaching and learning process. This energy deficit makes classrooms inhospitable, especially during the hottest hours of the

day, when temperatures can exceed 35°C. Under these conditions, students face enormous difficulties in concentrating, which directly affects their academic performance and generates widespread demotivation.

According to data collected during community visits, 90% of students report feeling uncomfortable and exhausted due to extreme heat and lack of ventilation in classrooms. This has contributed to an alarming



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dropout rate, with 75% of students dropping out of school before completing secondary education. This phenomenon not only deprives children of educational opportunities, but also exposes them to serious social risks, such as recruitment by illegal armed groups and involvement in illicit activities such as micro-trafficking.



The social situation in Pita Abajo reflects the devastating consequences of educational exclusion. In the last five years, more than 50 teenage pregnancies have been reported, a worrying indicator of the lack of guidance and opportunities for young women in the community. In addition, at least 60 children and adolescents who have dropped out of school have been recruited by illegal armed groups or have become involved in criminal activities. These statistics reveal a social and moral crisis that not only affects individuals, but threatens social cohesion and the future of the community as a whole.

The absence of electrical power also limits learning opportunities by restricting the use of modern technologies and pedagogical resources that could

significantly improve the educational process. In an era where technology plays a crucial role in education, students at Pita Abajo are deprived of basic tools such as computers, the internet, and multimedia equipment, which could open doors to a world of knowledge and possibilities. This lack perpetuates a digital divide that condemns the community to a technological lag compared to other more advanced regions of the country.

Faced with this discouraging panorama, an innovative and sustainable solution is proposed: the installation of a photovoltaic system in the main school of Pita Abajo. This system would be composed of 15 solar panels, 5 storage batteries and 3 inverters, designed to guarantee a continuous supply of electrical energy. Solar energy, a renewable and environmentally friendly source, would not only meet the school's energy needs, but also serve as a tangible example of sustainability for the community at large.

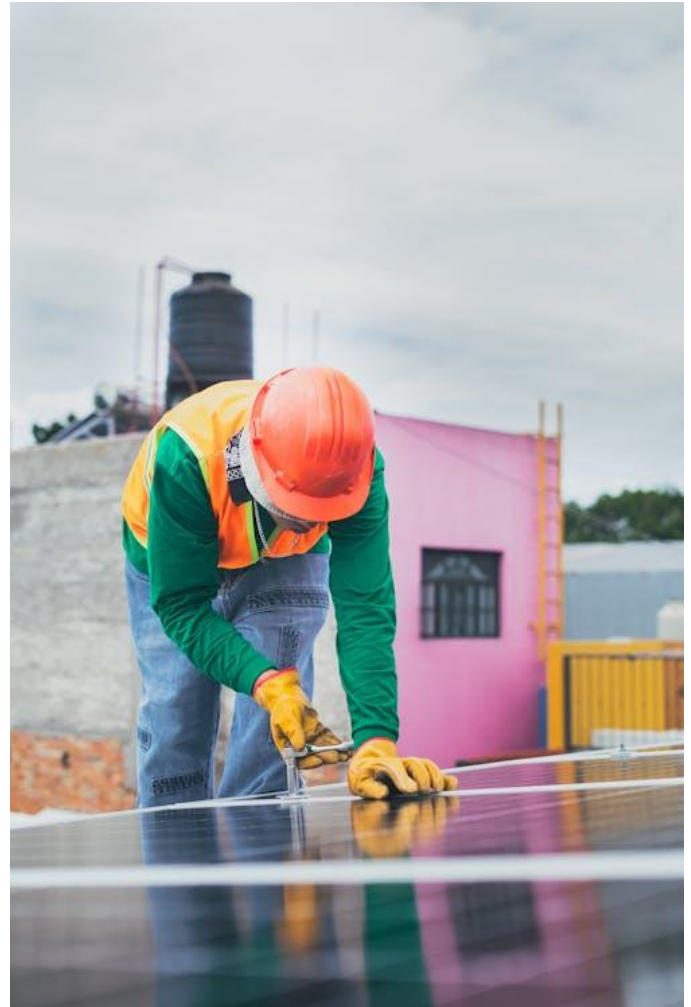
The installation of this photovoltaic system would transform the learning conditions in the school. With electricity available, classrooms could have adequate lighting, fans to mitigate high temperatures and access to technological equipment that would enrich the educational process. Not only would this improve students' academic performance, but it would also increase their motivation to attend school, significantly reducing the dropout rate.

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In addition to its educational benefits, access to renewable energy would have a significant social impact. By providing a more comfortable and stimulating learning environment, it is hoped that adolescent pregnancies will decrease and the incidence of illicit activities among young people will be reduced. School would become a safe and engaging space where children and adolescents can develop their potential and acquire the skills needed to build a better future.

The use of solar energy is also aligned with the Sustainable Development Goals (SDGs), specifically SDG 4, which promotes quality education for all, and SDG 7, which seeks to ensure access to affordable, safe, sustainable and modern energy. This project would not only address the immediate needs of the community, but would also contribute to global sustainability and development goals.

The implementation of this photovoltaic system will require a comprehensive approach that includes technical design, installation and community training in the use and maintenance of the system. The active participation of community members will be critical to ensuring the long-term sustainability of the project. This includes training teachers, students, and community leaders on topics related to renewable energy and system management, fostering a sense of shared responsibility.



The situation in Pita Abajo is a reflection of the challenges faced by many rural Afro-descendant communities in Colombia. Without access to basic infrastructure such as electricity, these communities are trapped in a cycle of poverty and exclusion that limits their development and perpetuates structural inequalities. However, the implementation of innovative solutions such as solar energy has the potential to transform this reality, offering new generations an opportunity to break the cycle and build a brighter future.

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The proposal to install a photovoltaic system in the Pita Abajo school is more than a technical solution; it is a step towards social justice and educational equity. This project will not only improve learning conditions, but will also send a powerful message about the potential of renewable energy to change lives and communities. By investing in education and sustainable

development, Pita Abajo could become an inspiring example of how rural communities can overcome challenges and achieve a more just and prosperous future.



### PROBLEMS IN PITA ABAJO

The Afro-descendant community of Pita Abajo, located in a rural area of northern Colombia, faces a deeply challenging reality that directly and disproportionately affects its children and adolescents. This community, with a population of approximately 3,000, is marginalized due to poor access roads, limited connectivity, and a historical lack of investment in basic infrastructure. These conditions have created an environment where opportunities for social and economic development are virtually non-existent, perpetuating a cycle of

exclusion and vulnerability that threatens the future of its youngest inhabitants.

The center of this problem lies in the main school of the community, an institution that serves 200 students at the basic and secondary education levels. This space, which should be a place of growth and learning, lacks an essential resource: electrical

energy. This gap has devastating implications for students' learning conditions and overall well-being. In a climate where temperatures during class hours regularly reach 38°C, classrooms become

uncomfortable and uninhabitable spaces. The lack of adequate ventilation and the impossibility of using heat-mitigating equipment severely affect students' ability to concentrate, generating physical exhaustion and demotivation.

According to data collected in recent studies, 90% of students report significant difficulty concentrating due to high temperatures and lack of ventilation. This situation, which might seem like a technical detail, has tangible and alarming consequences on the education of the children and young people of Pita Abajo. The dropout rate has reached critical levels, with 75% of students dropping out of school before



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completing secondary education. This means that more than 150 children and adolescents are left out of the education system every year, a figure that illustrates the seriousness of the problem and underscores the urgency of finding sustainable solutions.

School dropout in Pita Abajo not only deprives young people of their fundamental right to education, but also exposes them to social risks of great magnitude. In a context marked by poverty and lack of opportunities, many of these young people are forced to look for alternatives that, in most cases, are detrimental to their well-being and development. A recent study conducted in the community indicates that 40% of young people who drop out of school end up getting involved in illicit activities, such as micro-trafficking, or are recruited by illegal armed groups. This phenomenon not only jeopardizes the safety of young people, but also weakens the social fabric of the community, perpetuating a cycle of violence and exclusion.

Another alarming consequence of school dropout is the increase in teenage pregnancies, a critical indicator of the lack of access to sex education, counseling, and development opportunities. In the last two years, at least 25 cases of pregnancies in children under 15 years of age have been reported, a figure that shows the vulnerability of girls and adolescents in the community. This problem not only affects the young women directly involved, but also has an intergenerational impact, further limiting the

possibilities of development of families and perpetuating conditions of structural poverty.



The lack of electricity in the school not only affects the physical learning environment, but also severely limits access to modern pedagogical tools and technological resources. In a world where technology plays an increasingly important role in education, students at Pita Abajo are being deprived of fundamental opportunities to develop critical skills and adapt to the demands of modern society. Without electricity, classrooms do not have adequate lighting or basic technological equipment such as computers, projectors or internet access. This places Pita Abajo students at a significant disadvantage compared to their peers in urban areas or more developed communities, further deepening the inequality gap.

In this context, the community of Pita Abajo faces an urgent need for comprehensive solutions that address both the material conditions of the school and the

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deep social inequalities that affect its children and youth. One of the most promising proposals to mitigate this crisis is the installation of a photovoltaic energy system in the main school. This system, composed of solar panels, storage batteries and inverters, would guarantee a continuous supply of electricity, transforming the learning conditions in the classroom and opening up new possibilities for the community.

The implementation of a photovoltaic system would have a significant and multidimensional impact. Firstly, it would create a more comfortable environment in the classrooms, with adequate ventilation and more controlled temperatures. This would directly improve the physical well-being of students, increasing their ability to concentrate and motivate them to attend classes. In addition, the availability of electricity would enable the use of modern technologies in the classroom, such as computers, the internet, and multimedia tools, enriching the educational process and preparing students to face the challenges of today's world.

Beyond the educational benefits, the installation of a photovoltaic system would also have important social and economic implications. Renewable energy is not only a sustainable and environmentally friendly solution, but it can also serve as a model for other rural communities in similar situations. The school could become a community learning center where the adoption of sustainable technologies is

promoted, fostering a positive change in the mindset and practices of the inhabitants of Pita Abajo.

Training teachers and community leaders in the use and maintenance of the PV system would be an integral part of the project, ensuring its long-term sustainability. In addition, the project could include workshops on renewable energy and sustainability for students, fostering a new generation of leaders committed to sustainable development and environmental protection.

The situation at Pita Abajo reflects the structural challenges faced by many rural Afro-descendant communities in Colombia. The lack of access to electricity in the main school of the community is a symptom of a broader problem that encompasses social exclusion, poverty and lack of opportunities. However, it also represents an opportunity to implement innovative solutions that transform the lives of children and youth in the community.





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The proposal to install a photovoltaic system in the main school of Pita Abajo is not only a technical solution; it is a step towards social justice and educational equity. This project has the potential to significantly improve learning conditions, reduce dropout rates and offer young people an alternative to illicit activities. By investing in education and sustainable development, Pita Abajo can become an inspiring example of how marginalized communities can overcome challenges and build a more just and promising future.

### GENERAL OBJECTIVE

Provide electricity to the Pita Abajo school through the installation of a photovoltaic system, promoting an adequate and sustainable educational environment.

### SPECIFIC OBJECTIVES

1. Install a system of 15 solar panels, 5 storage batteries and 3 inverters to ensure the continuous supply of electrical power in the school.
2. Reduce school dropout by 50% within the next two years by improving study conditions.
3. Train 50 community members, including students and teachers, in the use and maintenance of the photovoltaic system.

### LEGAL FRAMEWORK

The legal framework that supports this project is solidly aligned with national and international regulations that promote education, the use of renewable energies and social inclusion in vulnerable communities. At the national level, **Law 1715 of 2014** represents a key pillar, as it encourages the development and use of renewable energy sources in Colombia. This law establishes economic and regulatory incentives for projects that promote access to clean and sustainable energy, especially in rural areas such as Pita Abajo, which lack basic infrastructure. Law 1715 recognizes the importance of integrating renewable energies into the country's development, seeking to reduce inequality and move towards an energy transition that benefits the most vulnerable communities.

In addition, the **Political Constitution of Colombia** is an essential support for this project. Article 67 guarantees the right to education as a public service with a social function, emphasizing that the State has the responsibility to ensure the necessary conditions for citizens to have access to quality education. This constitutional precept becomes a clear guideline for implementing projects that improve learning conditions, such as the provision of electricity through sustainable sources. Likewise, Article 79 of the Constitution establishes the right of all people to a healthy environment, which supports the use of clean and sustainable technologies as a tool for integral development.

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In the international arena, the project is aligned with the **Sustainable Development Goals (SDGs)** established by the United Nations (UN). In particular, this project responds directly to **SDG 4**, which seeks to ensure inclusive, equitable and quality education for all, and **SDG 7**, which promotes access to affordable, reliable, sustainable and modern energy. The implementation of a photovoltaic system will not only improve the educational conditions of Pita Abajo students, but will also contribute to reducing the energy inequality gaps that affect rural communities in Colombia.

On the other hand, **Convention 169 of the International Labor Organization (ILO)** protects the rights of Afro-descendant and other ethnic communities, guaranteeing their access to basic resources and their active participation in projects that impact their development. This agreement establishes that projects must respect the cultural identity, specific needs and autonomy of the communities involved. In the case of Pita Abajo, the implementation of the photovoltaic system will be designed with the active participation of community leaders, ensuring that the project is respectful of their rights and aligned with their needs.

This regulatory framework not only provides the legal basis for the implementation of the photovoltaic system, but also reinforces its ethical and social viability. By integrating national and international legal provisions, this project not only seeks to solve an immediate problem of access to energy and

education, but also promotes sustainable development that respects the fundamental rights of children and fosters equity in marginalized communities.

### JUSTIFICATION

Access to electricity at the Pita Abajo school is not only a technical solution, but an act of social justice that seeks to transform the living conditions of a historically marginalized Afro-descendant community. Pita Abajo, located in a rural area with limited access to basic services, faces a cycle of poverty and exclusion that directly impacts its children and youth. In this context, the lack of electricity in the main school becomes an insurmountable obstacle to ensuring quality education, perpetuating inequalities and depriving students of fundamental opportunities for their development.

Currently, the school operates in extreme conditions: temperatures that exceed 38 °C during class hours, classrooms without ventilation and the impossibility of accessing technological tools due to the absence of power. These limitations affect students' concentration, academic performance, and motivation, leading to an alarming dropout rate of 75%. This abandonment of the educational system not only closes doors to personal development, but also exposes minors to critical social risks, such as teenage pregnancies and recruitment by illegal armed



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groups, problems that have deeply affected this community in recent years.

Faced with this reality, the installation of a photovoltaic system in the Pita Abajo school represents a comprehensive and sustainable solution. This system, made up of 15 solar panels, 5 storage batteries and 3 inverters, will ensure a continuous supply of clean and reliable energy. The implementation of this technology will transform

learning conditions by enabling the use of ventilation in classrooms, adequate lighting, and technological tools essential to

modern education. These improvements will not only reduce school dropouts, but will also contribute to creating a more dignified and conducive environment for the integral development of students.

The impact of this project transcends the educational sphere. By using solar energy, you contribute to the reduction of the community's carbon footprint, promoting the use of renewable sources and aligning with global sustainability commitments, such as the Sustainable Development Goals (SDGs). In particular, this project responds to SDG 4, which seeks to ensure inclusive and quality education, and

SDG 7, which promotes access to affordable and sustainable energy.

In addition, the involvement of the local community is a key component of the project. Training residents to operate and maintain the system strengthens the sense of belonging and ensures its long-term sustainability. This participatory approach not only empowers the community, but also fosters a culture of self-management and care for shared resources.



Electrifying the Pita Abajo school using a photovoltaic system is not only a technical improvement, but a crucial step towards equity

and social justice. This project will open the doors to a more promising future for the children and young people of Pita Abajo, providing them with the necessary tools to build a tomorrow full of opportunities and well-being.

### METHOD

The implementation of the electrification project at the Pita Abajo school requires a comprehensive approach that combines technical, participatory and social aspects to ensure its long-term sustainability and efficiency. This approach not only seeks to improve the learning conditions of students, but also

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to generate a positive impact on the entire community, including the creation of a social reintegration program for young people in vulnerable situations.

In the first phase, a detailed technical diagnosis will be carried out to determine the specific energy needs of the five classrooms of the school. An approximate daily demand of 10 kWh is estimated, which will guide the design of the photovoltaic system. The proposed system will consist of 15 solar panels of 400 W each, capable of generating a total of 6 kW under optimal solar radiation conditions. To ensure a continuous power supply, especially at night or on cloudy days, 5 lithium batteries of 5 kWh each will be installed, providing a total storage capacity of 25 kWh. In addition, 3 inverters of 5 kW will ensure the conversion and efficient distribution of the energy generated, allowing its use in lighting, ventilation and technological equipment within the classrooms.

The installation of the system will be carried out by a specialized team that will guarantee compliance with the highest technical and safety standards. Consideration will be given to the optimal orientation of solar panels, surge protection, and adequacy of the school's electrical infrastructure to maximize the efficiency and durability of the system. This technical process will be accompanied by a participatory approach that actively involves community members.

In this sense, a training program will be developed for 50 people, including students, teachers and parents. This program will address topics such as the basic operation of the photovoltaic system, its preventive maintenance, and the environmental and economic benefits of using renewable energies. By empowering the Afro-descendant community of Pita Abajo with this knowledge, it seeks to promote autonomy in the management of the system and raise awareness about the importance of energy sustainability.

In addition to the educational and energy benefits, this project will include an innovative social component: a social reintegration program aimed at 300 young people who currently face a life in unhealthy conditions, either due to involvement in illicit activities, substance use or lack of opportunities. This program will be developed in parallel to the implementation of the photovoltaic system and will aim to offer positive and sustainable alternatives for young people in the community.

The social reintegration program will include workshops in life skills, training in renewable energies and technical trades, and community activities focused on personal and collective development. By involving these youth in the installation, maintenance, and monitoring of the solar system, they will not only be provided with a learning opportunity, but their sense of belonging and purpose within the community will also be strengthened. This integrative approach will make it



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possible to address structural problems, such as school dropout and lack of employability, providing young women with tools to build a more stable and dignified future.



Finally, to ensure the effectiveness and replicability of the project, a monitoring and evaluation plan will be established during the first three years. This plan will include the measurement of the energy performance of the system, as well as social impact indicators, such as the reduction in school dropouts, the increase in community participation and the results of the social reintegration program. This monitoring will allow adjustments to be made and ensure that the project meets its long-term objectives.

The realization of this project will not only electrify the Pita Abajo school, but will also open up new opportunities for the community, especially for its most vulnerable young people. By combining technology, training and social programs, a model of integral and sustainable development is promoted that can serve as an example for other rural communities in similar conditions.

### EXPECTED RESULTS

The implementation of the solar electrification project at the Pita Abajo school has the potential to generate a significant impact on multiple aspects of the community, transforming its educational, social, economic and environmental environment. Each of the expected results is detailed in greater depth below, including quantitative estimates and percentages to size the scope of the project.

#### 1. Improvements in the Educational Environment

The installation of the photovoltaic system will guarantee a constant supply of electricity, directly benefiting the school's 200 students and 15 teachers. Currently, the lack of electricity prevents the use of essential technological tools for quality education. With the new infrastructure, the school will be able to use computers, projectors, fans and other devices that enhance the educational experience.

A key impact will be the reduction of temperatures in classrooms, which currently reach up to 38°C. With the incorporation of electric fans, it is expected to

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reduce this temperature by an average of 20%, creating a more comfortable and conducive environment for learning. This, in turn, will have a positive effect on students' attention and academic performance.

In addition, a decrease in the dropout rate is expected, which currently affects 75% of enrolled students. It is estimated that, in the first two years of the project, at least 50% of students who dropped out of school will return to the classroom, which will represent an increase of 37.5% in active enrollment.

### 2. Community Capacity Building

One of the fundamental objectives of the project is to empower the Afro-descendant community of Pita Abajo through training in the use and maintenance of the photovoltaic system. A total of 50 members of the community, including students, teachers and parents, will participate in specialized workshops. This represents approximately 25% of the active adult population of the community, which will strengthen their technical capacities and promote autonomy in the management of the system.



On the other hand, the social reintegration program will focus on 300 young people who are currently in vulnerable conditions, representing about 60% of the youth population in the area. This program will offer life skills workshops and technical training in renewable energy, encouraging positive alternatives to involvement in illicit activities, which currently affects an estimated 40% of young people in the community. At least 70% of participants are expected to complete the program, which equates to 210 young people reintegrated into productive and healthy activities.

### 3. Social and Economic Impact

The electrification of the school will also generate indirect benefits for the community. The availability of energy will allow school facilities to be used at night, expanding educational opportunities for adults and encouraging community activities. It is projected that at least 30% of adults in the community will participate in these programs during the first year, which represents about 100 additional people benefited.

In economic terms, access to renewable energy will reduce reliance on fossil fuels, such as diesel generators, generating estimated savings of 25% in school energy costs. In addition, technical training in renewable energy will open employment opportunities for at least 10% of participants, promoting entrepreneurship and local economic development.



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Electrification will also position the community as a model of sustainability, attracting potential partnerships and resources for future projects. It is estimated that at least two external organizations could be interested in replicating or financing similar initiatives in the region.

### 4. Environmental Impact

The use of solar energy will have a direct effect on reducing the carbon footprint of the community. By avoiding the use of diesel generators, an annual decrease of at least 2 tons of CO<sub>2</sub> emissions is expected, which represents approximately 15% of the current emissions associated with the school's energy consumption.

Renewable energy training will also incentivize sustainable practices in the community. It is estimated that at least 50% of participants will adopt eco-friendly measures in their homes, such as the use of LED bulbs or proper waste management, generating a positive environmental impact at the local level.

### 5. Monitoring and Replicability

The monitoring plan will ensure the proper functioning of the system and measure social and educational impacts during the first three years. This monitoring will include key indicators such as the energy performance of the system, the school attendance rate and community participation in educational activities.

The results obtained will serve as a basis for replicating this model in other rural communities with similar characteristics. It is estimated that, within five years, at least three neighboring communities could implement similar projects, benefiting more than 1,000 additional people.

### Global Results

This project will not only electrify the Pita Abajo school, but will transform the living conditions of the entire community. Expected impacts include:

1. A 37.5% increase in active school enrollment.
2. 75% reduction in extreme temperatures in classrooms.
3. Participation of 25% of the adult population in technical training programs.
4. Effective social reintegration for at least 210 young people, equivalent to 70% of the participants.
5. Annual reduction of 2 tons of CO<sub>2</sub> emissions.
6. Economic savings of 25% in energy costs.

These results will consolidate Pita Abajo as a resilient, sustainable community committed to improving its quality of life. This model can be replicated throughout the region, setting a precedent for inclusive and sustainable development.

### CONCLUSIONS

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The implementation of the solar electrification project at the Pita Abajo school represents a transformative example of how the integration of renewable energy can generate significant impacts in rural communities with limited access to basic services. This project, which combines a technical approach with a social and educational component, has the potential to improve living conditions, promote sustainability and offer opportunities for integral development to the inhabitants of this Afro-descendant community

### 1. Educational and Academic Impact

One of the most relevant achievements of this project will be the transformation

of the educational environment. The availability of electricity will allow technologies such as computers, projectors, and fans to be incorporated into classrooms, improving both the teaching process and the learning experience of students. These improvements will not only increase academic performance, but will also contribute to reducing the dropout rate, which currently stands at 75%.



The possibility of creating a more comfortable and attractive environment in the classrooms, with temperatures reduced by up to 20%, will promote the permanence of students in the educational system. In addition, it is expected that at least 50% of young people who had dropped out of school will return to the classroom in the first two years, achieving a direct impact on the educational quality of the region

### 2. Capacity Building and Community Empowerment

The project's participatory approach fosters community inclusion and empowerment. By training 50 members in the use and maintenance of

the PV system, the project not only ensures the technical sustainability of the system, but also creates a sense of belonging and responsibility in the community. This knowledge transfer will strengthen local capacities and ensure that the system can be managed autonomously in the long term.

The social reintegration program for 300 young people in vulnerable conditions will be another key component of the social impact. Through life skills

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workshops and technical training, they will be offered positive alternatives to move away from illicit activities, such as substance use or participation in criminal networks. It is estimated that at least 70% of young people will complete the program, representing a significant change in their life prospects and development opportunities.

### 3. Economic and Social Benefits

The electrification of the school will generate tangible economic benefits for the community. For example, access to electricity will allow school facilities to be used for evening activities, such as adult classes and community workshops. This will increase learning and personal development opportunities, benefiting at least 30% of the adult population in the first year of the project.

In addition, access to renewable energy will reduce the costs associated with the use of diesel generators, generating estimated savings of 25% in the school's energy expenses. Technical training will also open up new employment and entrepreneurship opportunities, boosting the local economy and improving the quality of life of the community.

### 4. Environmental Impact and Sustainability

The project has a strong environmental component that will contribute to mitigating climate change and reducing the community's carbon footprint. The installation of the photovoltaic system will avoid the

emission of at least 2 tons of CO<sub>2</sub> per year, marking a step towards a more sustainable energy model.

In addition, the community's training in renewable energies will incentivize sustainable practices in other aspects of their daily lives, such as proper waste management and efficient use of energy. At least 50% of workshop participants are expected to adopt eco-friendly measures in their homes, multiplying the positive environmental impact of the project.

### 5. Replicability and Scalability

A highlight of the project is its potential to be replicated in other rural communities with similar conditions. The monitoring and evaluation plan will not only ensure the proper functioning of the system, but also provide key data to identify best practices and challenges faced during implementation.

It is estimated that, within five years, at least three neighboring communities will be able to adopt this model, benefiting more than 1,000 additional people. This positions Pita Abajo as an example of innovation and sustainability that can inspire similar initiatives in other regions.

### 6. Social and Technical Sustainability

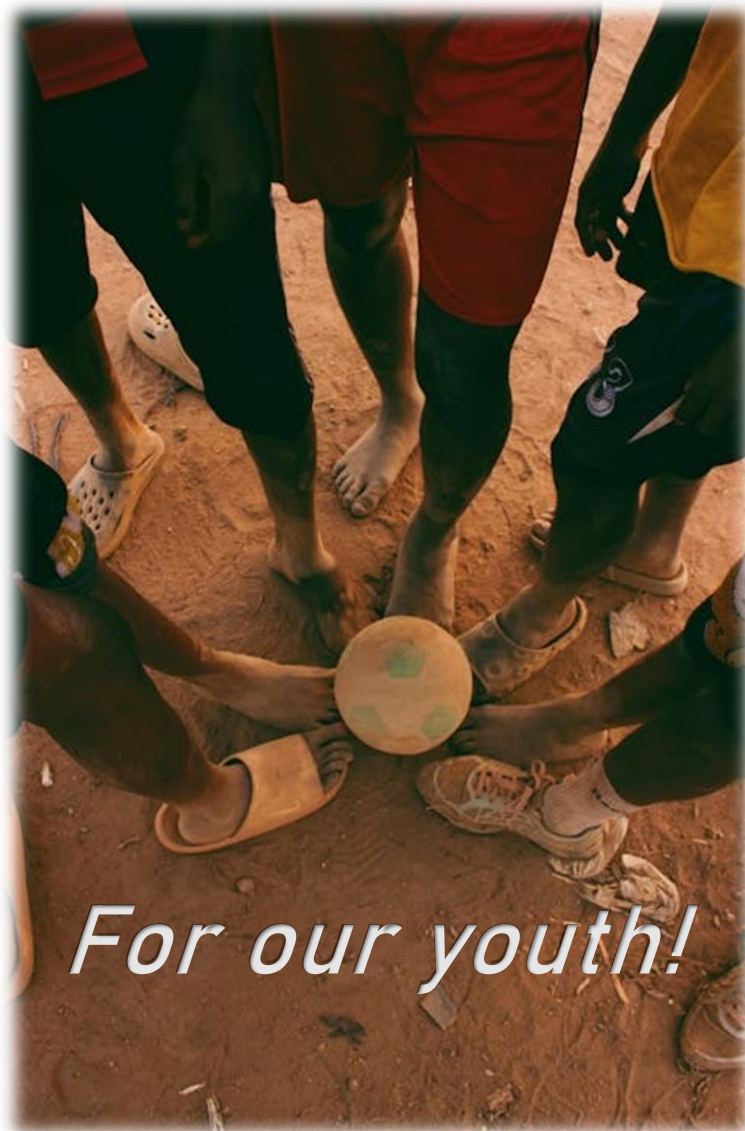
The sustainability of the project is ensured through the combination of appropriate technology, community training, and constant monitoring. Empowering the community through technical knowledge will allow the PV system to be



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maintained and operated efficiently, minimizing the risks of system failures or abandonment.

On the other hand, social and educational programs, such as the youth reintegration program, will contribute to strengthening the social fabric of the community, reducing the incidence of problems such as unemployment, violence and substance use. This holistic approach ensures that the benefits of the project extend beyond electrification, promoting comprehensive and sustainable development.



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