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# Integrating Geothermal Operations with Targeted Social Investment to Advance the SDGs: Evidence from the San Jacinto-Tizate Geothermal Project, Nicaragua

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## ABSTRACT

Polaris Renewable Energy integrates sustainability as a core element of its business model, recognizing that investment in renewable energy offers an opportunity to deliver meaningful social and environmental benefits. The company contributes to the well-being of neighbouring communities by prioritizing sustainable development and social investment initiatives that generate measurable improvements in quality of life. Beginning with the San Jacinto-Tizate Geothermal Power Plant in Nicaragua, Polaris has implemented a long-term community development program centered on five pillars: education, community infrastructure, agriculture, health, and sports. The program currently benefits five communities and approximately 5,000 residents. Its design principle is community empowerment - beneficiaries organize and co-implement - ensuring outcomes are locally owned. More than a decade of experience demonstrates that geothermal development, when integrated with targeted social programs and effective stakeholder engagement, can directly advance several United Nations Sustainable Development Goals (SDGs) while reinforcing social licence, community resilience, and long-term project performance.

## 1 INTRODUCTION

Polaris Renewable Energy Inc. (Polaris) is a Canadian publicly traded company engaged in the acquisition, development, and operation of renewable energy projects across Latin America. Its diversified portfolio includes geothermal, solar, wind, and run-of-river hydro technologies in six countries. Among these, the San Jacinto-Tizate Geothermal Power Plant in north-western Nicaragua is Polaris's largest and longest-operating facility, since 2013 serving as a benchmark for sustainable development in the region. With an installed capacity of 82 MW, comprising two Fuji turbines and an Ormat binary unit, the plant contributes significantly to Nicaragua's renewable energy matrix and national energy security.

Beyond energy generation, Polaris embeds sustainability as a core corporate principle, maintaining that long-term business success depends on shared value creation for all stakeholders - employees, investors, customers, the environment, and local communities. The San Jacinto-Tizate project exemplifies this philosophy through a structured social investment program aligned with international frameworks and directly linked to the United Nations Sustainable Development Goals (SDGs)[1].

The social outcomes achieved through these programs have strengthened the resilience of neighbouring communities. Local residents now enjoy continuous access to potable water, improved educational opportunities, modernized agricultural practices, and enhanced public infrastructure that supports health and social cohesion.

Through these sustained efforts, Polaris demonstrates that constructive, long-term engagement with local communities fosters trust, reinforces partnerships, and strengthens the company's social licence to operate.

This paper focuses on the San Jacinto-Tizate Geothermal Power Plant, Polaris's only geothermal asset. Although this paper highlights San Jacinto-Tizate, the same sustainability framework and methodology are applied consistently across all Polaris operations in Latin America.

[1] United Nations, Sustainable Development Goals. https://sdgs.un.org/goals



Figure 1. San Jacinto-Tizate 82 Mwe Geothermal Power Plant.

## 2 APPROACH AND MANAGEMENT SYSTEM

Polaris applies international sustainability frameworks to guide its environmental and social management systems, including the IFC Performance Standards (2012) and the Equator Principles (EP4, 2020). Corporate sustainability reporting also aligns with the Global Reporting Initiative (GRI), SASB, and ISO 26000 on Social Responsibility, ensuring consistency and transparency across all operations.

At the San Jacinto-Tizate Geothermal Power Plant, these principles are operationalized through an Environmental and Social Management System (ESMS) and a comprehensive Stakeholder Engagement Plan (SEP). The SEP establishes structured processes for identifying, consulting, and engaging stakeholders throughout the project lifecycle. It includes a grievance mechanism that enables community members to raise concerns or suggestions in a timely and culturally appropriate manner.

This system serves both as a risk management tool - allowing early detection and mitigation of potential issues - and as a platform for dialogue and trust-building. Responsibilities for engagement and grievance resolution are clearly defined, with periodic training provided to both company staff and community representatives.

To ensure effectiveness and adaptability, Polaris regularly reviews and updates its procedures based on participatory evaluations and lessons learned. This process promotes continuous improvement, strengthens accountability, and reinforces the company's social licence to operate within its geothermal communities.

## 3 MATERIALITY AND SUSTAINABILITY STRATEGY

Polaris conducted a materiality analysis to identify and prioritize sustainability topics most relevant to its operations and stakeholders, following the GRI, SASB, and ISO 26000 frameworks. Fifteen material topics were identified and grouped into four key pillars:

- Our Planet (Environmental Management)
- Our Partners (Social Development)
- Our Practice (Governance and Ethics)
- Our People (Labour Practices)




Figure 2. Polaris's Sustainability Strategy.

Among these, Stakeholder Engagement and Community Development ranked high in the materiality process, highlighting their significance to both business performance and social impact.

The sustainability strategy establishes specific objectives, indicators, and performance targets under each pillar. Progress is tracked annually through key performance indicators (KPIs) reviewed by senior management and the Board of Directors. For the San Jacinto-Tizate project, KPIs such as number of beneficiaries, access to services, educational attainment, and agricultural productivity serve as measurable indicators of community impact.

| Program Area | Primary SDGs / Targets | Outcomes / KPIs |
|---|---|---|
| Education | SDG 4.1, 4.4; SDG 13. | 51 teachers trained; 1,000+ students served; robotics curriculum established; annual environmental fairs; over 41,000 fruit trees donated since 2013. |
| Water & Infrastructure | SDG 6.1, 6.b; SDG 11.7 | 900+ homes connected to potable water; 5 schools and 1 clinic served; trained community water committees; new bridges and recreation spaces. |
| Agriculture & Biodigesters | SDG 2.3; SDG 8.3; SDG 13.2; SDG 15.1. | 50 farmers trained; revolving fund operational; 69% reduction in firewood use; biodigesters installed; sustainable beekeeping introduced. |
| Health | SDG 3.8, 3.d | Ultrasound and dental stations donated; strengthened local health system; COVID-19 prevention support. |
| Sports | SDG 3.4; SDG 11.3 | Sports facilities constructed; youth leagues supported; community integration enhanced. |

Table 1. Alignment of Community Development Programmes with SDGs.

Each program line includes annual targets and KPIs linked to budget, schedule, and responsible units. Data is reviewed and validated through Polaris's corporate ESG processes to ensure accuracy and transparency.

## 4 PROGRAMME LINES OF ACTION AND SDG LINKAGES

Polaris integrates sustainable development principles into its operational framework to ensure that the benefits of geothermal energy extend beyond power generation to address local social and environmental priorities. This approach directly supports multiple United Nations Sustainable Development Goals (SDGs) by advancing education, health, clean water access, sustainable livelihoods, and inclusive growth in nearby communities.

At San Jacinto-Tizate, the company's social investment model is guided by ongoing stakeholder engagement, social assessments, and the Environmental and Social Impact Assessment (ESIA). From these, five program lines have been defined - Education, Water and Infrastructure, Agriculture, Health, and Sports - each mapped to specific SDGs and measurable outcomes. Collectively, these initiatives contribute to community resilience, social equity, and environmental sustainability, demonstrating the broader role of geothermal development in achieving national and global sustainability goals.

### 4.1 Education - Advancing SDG 4: Quality Education and SDG 13: Climate Action

Education serves as a cornerstone for community empowerment and long-term resilience. Through partnerships with the Ministry of Education and NGOs, Polaris established the first computer and robotics laboratory at the Sara María Parrales School (currently renamed as Farabundo Martí School). This initiative transformed the facility into a local resource and training hub for teachers and students, directly advancing SDG Target 4.4 on technical and vocational skills.

Complementary programs - Learning Today, Shining Tomorrow and Learning Roots - benefit 51 teachers and over 1,000 students, fostering digital literacy and early childhood learning. Annual environmental fairs, training program and tree-planting campaigns (over 41,000 fruit trees donated since 2013) promote climate awareness and environmental stewardship, supporting SDG Target 13.3 on awareness-raising on climate change mitigation, adaptation, impact reduction and early warning.

In alignment with the SDGs, since 2023 a Vocational Engagement Program has fostered interaction between high school students and personnel from the geothermal power plant, aiming to broaden participants' perspectives on professional opportunities and to promote the development of practical competencies that facilitate their access to decent employment.

Together, these education programmes not only enhance academic outcomes but also cultivate the next generation of skilled professionals, linking quality education with sustainable local development.



Figure 3. Senior secondary students visiting the San Jacinto-Tizate Geothermal Power Plant during the annual vocational orientation fair. 2025.

### 4.2 Water and Community Infrastructure – Advancing SDG 6: Clean Water and Sanitation and SDG 11: Sustainable Cities and Communities

Access to clean water was identified as a top community priority. Polaris, with partners including the Inter-American Development Bank (IDB), Development Bank of Austria (OeEB), and Catholic Relief Services, co-financed a US$1.2 million potable water system benefiting over 900 households, five schools, and a local health clinic. The project, operational since 2015, continues to function sustainably under trained community water committees, addressing SDG Targets 6.1 and 6.b on universal water access and participatory management.

Beyond this, as part of ESIA compliance, the company carries out systematic water quality monitoring across fifteen community sources to promptly detect any deviations that could compromise the safety of the water supply. This practice enables the identification of needs and environmental risks, reinforcing preventive measures and promoting the responsible management of water resources in surrounding communities.

In addition to the water system, Polaris has also invested in rural infrastructure, including bridge construction, school rehabilitations, drainage improvements, and public recreation areas, strengthening SDG Target 11.7 by improving safety, accessibility, and social cohesion in rural settlements.



Figure 4. Inauguration of the community water and sanitation project – ribbon-cutting ceremony, 2015.

### 4.3 Agriculture – Advancing SDG 2: Zero Hunger, SDG 8: Decent Work and Economic Growth, and SDG 13: Climate Action

Agriculture is the main livelihood in the San Jacinto area. Polaris supports sustainable agricultural practices to increase productivity, diversify income, and enhance climate resilience. Approximately 50 smallholder farmers have received training, equipment and inputs. A revolving fund supports replanting cycles, contributing to SDG Target 2.3 on smallholder productivity.

Installation of biodigesters has reduced firewood consumption by 69% with beneficiary families, improving air quality and reducing emissions - advancing SDG 13.2 on climate adaptation and SDG 7.2 on renewable energy. A beekeeping project promotes biodiversity and sustainable income generation, aligned with SDG 15.1 on ecosystem conservation.



Figure 5. Beneficiary of the watermelon cultivation project posing with her harvest, 2021.

### 4.4 Health – Advancing SDG 3: Good Health and Well-Being

Polaris contributes to SDG 3 by reinforcing local health services and preventive care. In collaboration with the Ministry of Health, the company equipped the community clinic with ultrasound and dental stations, provided essential medical supplies, and supported public health campaigns.

During the COVID-19 pandemic, Polaris supplied protective and hygiene materials to rural clinics, helping mitigate virus transmission and strengthen local response capacity. These actions directly address SDG Targets 3.8 by strengthening local access to essential health services and equipment; and 3.d through improved preparedness and response capacity at rural health clinics.

### 4.5 Sports and Social Cohesion – Advancing SDG 3: Good Health and Well-Being and SDG 11: Sustainable Communities

Sports and recreation play a vital role in strengthening community well-being, inclusion, and youth engagement. Recognizing this, Polaris has constructed and equipped sports fields, donated uniforms and equipment, and continues to sponsor local leagues in baseball, football, and volleyball.

These initiatives provide safe and structured spaces for recreation, encouraging teamwork, discipline, and positive social interaction. By offering accessible alternatives for leisure, they also contribute to reducing the risks associated with negative behaviors among youth, fostering a culture of healthy living and community collaboration.

The promotion of sports extends beyond recreation, it acts as a preventive social tool that supports SDG Target 3.5, which seeks to strengthen the prevention and treatment of substance abuse, while also advancing SDG 3.4 on mental and physical well-being and SDG 11.3 on inclusive, participatory communities.

Together, these efforts help to cultivate healthier, safer, and more cohesive communities around the San Jacinto-Tizate Geothermal Power Plant, reinforcing the broader social value of geothermal development.

## 5 RESULTS AND DISCUSSION

The program has delivered quantifiable results: over 900 families now have continuous access to potable water; educational outcomes and school attendance have improved; agricultural yields have increased; and firewood dependency has decreased. Qualitative results include strengthened local governance, enhanced community trust, and greater social stability - factors essential for maintaining a durable social licence to operate.

These outcomes illustrate how geothermal projects can deliver shared value when sustainability principles are integrated into core operations.



Figure 6. Girls participating in the National Robotics Olympiad, 2024.

## 6 LESSONS LEARNED AND REPLICABILITY

Key success factors include community empowerment, long-term partnerships, and KPI-based management. The model can be replicated in other contexts, with adaptation to local socioeconomic conditions. Some of the main aspects include:

- Embed stakeholder engagement and grievance mechanisms from project inception.
- Apply participatory materiality analysis to focus on high-impact themes.
- Align each intervention with specific SDG targets and track 2–5 clear KPIs.
- Combine company, donor, and beneficiary contributions to maximize ownership.
- Communicate results and lessons learned annually to reinforce transparency and learning.

## 7 CONCLUSIONS

Integrating targeted social investment with geothermal operations can substantially advance the SDGs while strengthening both social licence and operational performance. At San Jacinto, community-driven initiatives in education, infrastructure, agriculture, health, and sports demonstrate a scalable pathway to lasting impact.

For developers, aligning social performance with core business objectives is not only a responsibility - it is a strategic advantage that enhances project sustainability and stakeholder value.



Figure 7. Community members with Polaris' Board of Directors, CEO, and management team during a community engagement visit. 2024.

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