Scaling *Circular Innovation*

How ZhanaSolutions Integrates Industrial Kitchen Waste into Biodiesel Production

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List of Acronyms

ACODRES: Colombian Association of the Gastronomy Industry
ANGAT: National Association of Gastronomy and Tourism (Colombia)
ARR: Annual Recurring Revenue
ASIRI: *Local impact investment fund in Colombia*
BDR: Business Development Representative
BOD_5: Five-day biochemical oxygen demand
CAC: Customer Acquisition Cost
CGAR: *Compound Annual Growth Rate*
CO_2: *Carbon Dioxide*
COD: *Chemical Oxygen Demand*
CRM: Customer Relationship Management
EBITDA: Earnings Before Interest, Taxes, Depreciation, and Amortization
ESG: *Environmental, Social, and Governance*
ESP: Utilities Company
FAO: Food and Agriculture Organization of the United Nations
FENALCO: National Federation of Merchants (Colombia)
FIMI: *Mission Impact Investment Fund (Colombia)*
FONTUR: National Tourism Fund (Colombia)
HORECA: Hotels, Restaurants, and Cafeterias
IEA: International Energy Agency
IoT: Internet of Things
LTV: Lifetime Value (Customer Lifetime Value)
MADS: Ministry of Environment and Sustainable Development (Colombia)
MRR: *Monthly Recurring Revenue*
pH: potential of hydrogen
PQRS: Requests, Complaints, Claims, and Suggestions
SAFE: *Simple Agreement for Future Equity*
SD: *Secure Digital (SD card)*
SDA: District Secretariat of Environment (Bogotá D.C.)
SDR: *Sales Development Representative*
USD: United States Dollars

Executive Summary

ZHANASOLUTIONS GREEN ENGINEERING S.A.S. (ZhanaSolutions) is a Colombian company that transforms an environmental problem, discharges of brown fats from industrial kitchens, into a circular business opportunity and clean energy. Its solution combines the G-Trap technology, capable of removing up to 99% of fats from wastewater from industrial kitchens, with comprehensive support services including technical assistance, training, and logistics. This approach helps reduce water pollution, prevent greenhouse gas emissions, and create a new productive chain for biodiesel production.

In 2022, the world produced more than 478 million liters of fats (1.38 million liters daily), according to data from Our World in Data (2024), of which a significant proportion ends up in rivers and oceans. This waste contrasts with the need for sustainable inputs for the energy transition: it is projected that the demand for biofuels will grow by 23% by 2028 (IEA), driven by commitments such as the European aviation sector's goal to replace up to 70% of its fuel with sustainable fuels.

ZhanaSolutions anticipated this challenge in 2019, developing the G-Trap, a technology capable of removing up to 99% of grease from wastewater and converting it into an energy input. One of its early investors was Fondo Acción, through its Impact Mission Investment Fund. Fondo Acción is a non-governmental organization that encourages and supports the effective participation of civil society in the implementation of public policies for early childhood, as well as the conservation and sustainable development of biodiversity and natural resources in Colombia.

Fondo Acción, in addition to investing financial resources in high-impact companies, aims

to strengthen not only the administrative and economic capacities of its partners but also to contribute to learning through the generation of knowledge and the systematization of experiences through comprehensive support. That is why, in 2023, it partnered with ZhanaSolutions to apply to the P4G call for proposals, with the intention of advancing a project to establish a circular economy model in which waste from the food preparation and production industry is transformed into suitable inputs for the production of advanced biofuels.

Since 2021 and up to June 2025 (unless otherwise indicated), with the support of investors, donation resources such as those channeled through the P4G program in 2024, and non-financial support provided by the Impact Mission Investment Fund of Fondo Acción, the company has achieved the following results:

Operational and market achievements

- 30 machines with IoT for real-time monitoring.
- 257G-Trap units installed (as of September 2025).
- Expansion to 13 departments, including cities such as Bogotá, Cartagena, Medellín, and Cali.
- 56 active clients in June 2025, including major restaurant chains like Frisby and Burger King, and 67 agreements signed.
- Sales +230% in one year, a closing rate of 50%, CAC reduced by 70%, churn rate <1%.

Financial results

- USD 1.41 million mobilized (equity, debt, other sources).
- Positive EBITDA: USD 11,555 (June 2025)
- Total contract value: USD 966,101 (June 2025).
- Gross income (January-June 2025): USD 164,574

Environmental and social impact (June 2025)

- 11,025 m^3 of treated water per month.
- 7,350 liters of recovered fat with potential for biodiesel per month.
- 95 tons of CO equivalent avoided per month.

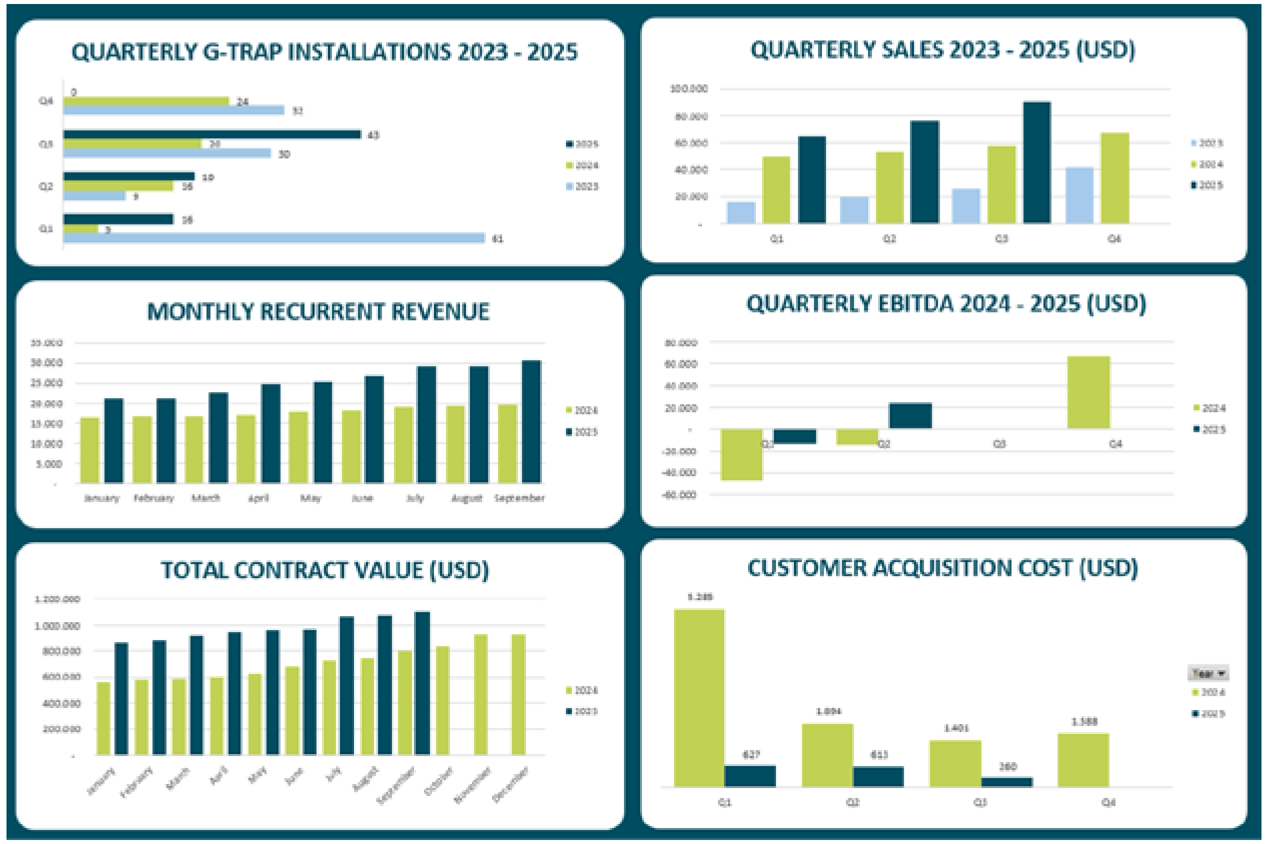

Figure 1. Key performance indicators ZhanaSolutions. Source: ZhanaSolutions.

- 33% of the workforce is women, with a projection of 35%.
- 420 people benefited directly at their workplaces.

Impact on policy and management

- Collaborations and alliances with the District Secretariat of Environment of Bogotá D.C., the Cartagena Mayor's Office, Aguas de Cartagena, the Bogotá Water and Sewerage Company ESP, and sector guilds for the promotion of circular management of wastewater.
- Organization of local and national technical committees to promote the circular management of discharges.
- Preparation of a policy recommendation document validated by national and local stakeholders.
- Progress is being made in incorporating regulatory incentives for the HORECA sector into Bogotá's legislative agenda.
- Collaborations to develop the Fat Free Zones[1] program and an environmental certification for restaurants.

Similarly, as a technology impact startup, ZhanaSolutions has encountered challenges that have hindered its growth but have not stopped it.

Challenges faced

- Difficulties in mobilizing investment due to the contraction of the impact investment sector.
- Limitations to expanding the internal team, compensated with external contractors.
- Sales below the target, although with sustained growth.
- Positive EBITDA, but lower than projected.
- Limited access to national political figures, supported by high-level connections.
- Challenges in involving women in operations, prioritizing administrative and strategic roles.

Lessons learned

1. Building alliances and utilizing evidence-based segmentation enhanced the process of generating and converting prospects.
2. Providing technical support, including maintenance, is crucial for ensuring operational continuity and fostering customer loyalty.
3. Policy advocacy requires customized assistance and prompt role clarification to build vital national and local partnerships.
4. Attracting new investors depends on effectively handling their rules and requirements.
5. Monitoring and reporting environmental indicators enhances credibility with external stakeholders, but it is essential to develop further the ability to measure social indicators.

1 The 'Fat-Free Zones' pilot program targets key areas of Bogotá D.C. to address sewer blockages resulting from improper fat and oil disposal. It aims to coordinate large companies, public agencies, authorized managers, and eco-friendly businesses to promote good practices, adopt technology, and strengthen institutional commitment. Additionally, the program facilitates better engagement of waste generators with authorized managers.

Recommendations

In summary, based on the lessons learned since the business's inception and focusing on the process developed with Fondo Acción and P4G, here are the main recommendations:

For donors:

- Build strong, diverse, and inclusive teams across multiple disciplines.
- Provide adaptable financing options.
- Help forge unconventional partnerships with public entities and private associations.

For entrepreneurs:

- Establish transparent technical evidence and financial metrics.
- Positioning themselves as a tech company that delivers double impact.
- Leverage strategic partnerships and multi-stakeholder networks.
- Connect social inclusion and gender considerations to the business model.
- Conduct a social impact assessment to communicate the impact clearly.

ZhanaSolutions demonstrates that converting environmental liabilities into economic and energy opportunities can benefit water, climate, and communities. Its growth, tangible impact, and political influence demonstrate its potential as a model of circular entrepreneurship that can scale in Colombia and beyond.

Introduction

Every day, cities like Bogotá and Cartagena discharge thousands of liters of fat into their sewers, misusing a valuable resource. While restaurants see fat as waste, ZhanaSolutions views it as an opportunity for clean energy and a circular business model. In 2022, global fat production exceeded 478 million liters annually, averaging approximately 1.38 million liters per day. (Our World in Data, 2024). Much of this fat ends up in rivers and oceans, despite its potential for biofuel production.

This challenge aligns with the global aim of reaching net zero emissions by 2050 and the urgent search for alternative energy sources, creating a rapidly expanding market. By 2028, biofuel demand is projected to increase by 23% (IEA, 2024), fueled by commitments in sectors like aviation, which in Europe must replace 70% of its fuel with sustainable options(European Council of the European Union, 2023). To achieve this goal, shifting away from edible oils, such as palm oil, and focusing on second-generation feedstocks[2] will be essential.

In 2019, ZhanaSolutions' innovation team, led by co-founder Javier De Castro, along with co-founders Francisco Vivas and Andrés Galindo, anticipated this challenge by developing the G-Trap. This technology can remove up to 99% of grease from wastewater and transform it into energy. The G-Trap originated from a research and development effort that began in 2007, aimed at addressing corporate environmental issues.

The entrepreneurs launched their venture with an initial investment of thirty million Colombian pesos, roughly USD 7,500, to prototype ten machines for producing and installing five hundred units. These initial machines were placed in the Frisby restaurant chain and ARA supermarkets, providing results that laid the groundwork for ZhanaSolutions' scaling

2 Second-generation biofuels can be produced from different biotic resources other than food crops. They include various raw biological materials such as energy crops, agricultural and forestry residues, construction waste, and municipal waste (Kumar et al., 2022).

and growth. The company is currently progressing toward this vision, thanks to a cohesive team, dedicated leadership, and the support of investors and donors who share a commitment to sustainable development.

Fondo Acción, an NGO that promotes civil society's involvement in public policies related to early childhood and biodiversity conservation in Colombia, was among the early investors via its Impact Mission Investment Fund. The organization aims to enhance its partners' administrative and financial skills while fostering knowledge creation and experience systematization through comprehensive support.

Fondo Acción provides Non-Financial Support to companies in its FIMI portfolio by helping them apply for funding opportunities and managing those resources throughout project implementation. In 2023, ZhanaSolutions partnered with Fondo Acción to apply for the P4G call, aiming to develop a circular economy model that converts waste from food preparation and production into inputs for advanced biofuel production.

Since then, ZhanaSolutions has both protected water resources and advanced the creation of a circular value chain for biodiesel derived from brown fats, turning an operational and environmental challenge into a future energy source.

Figure 2. ZhanaSolutions' entrepreneurial team. From left to right: Andrés Galindo, Francisco Vivas, and Javier De Castro.

Context and Problem Statement

- Restaurant fats entering water sources pose significant operational and environmental challenges. They can clog pipes locally and within city sewer systems, while also contaminating water with organic matter and fats that harm aquatic ecosystems and human health. Additionally, their decomposition releases greenhouse gases. Wastewater from restaurants can contain fats and oils at levels up to 380 times higher than the limits set by Resolution 0631 of 2015 from the Ministry of Environment and Sustainable Development (ZhanaSolutions, 2025).
- At the same time, the opportunity to utilize these leftover fats and oils as an energy source that could support the country's transition to a low-emission economy is missed. Various national policies see residual biomass as a vital resource for moving toward a sustainable energy future [3]. Currently, between 66% and 78% of brown fats from industrial kitchens could be reused (Biotrade, 2025).
- This double issue—poor management of discharges from industrial kitchens and underutilization of brown fats for energy—presents a clear opportunity to transform an environmental liability into an asset for the circular economy, benefiting the environment, communities, and the economy.

3 At the national level, Colombia has established several policies including Resolution 0631 of 2015 and Resolution 0316 of 2018 from the Ministry of Environment and Sustainable Development, the National Circular Economy Strategy (Minambiente, 2019), CONPES 4004 of 2020 on circular economy for water and sanitation (DNP, 2020), and the Energy Transition Policy (CONPES, 2022). Locally, the Bogotá D.C. District Circular Economy Policy is also in place(Alcaldía Mayor de Bogotá, 2023), among others.

Solution

ZhanaSolutions was developed to address the urgent challenge of industrial kitchen wastewater contamination by combining a disruptive clean-tech innovation with a comprehensive service model and a circular business approach. The company's solution integrates the G-Trap pretreatment system, a patented technology for recovering organic fats, with a specialized waste management service that transforms an environmental liability into economic and social value. By recovering and valorizing brown grease, ZhanaSolutions not only addresses a waste management challenge but also creates a new residual feedstock for bioenergy production, directly contributing to climate change mitigation.

The G-Trap system captures up to 99% of fats in the water through mechanical and thermal separation, far surpassing traditional passive traps that remove only 30–35%. This innovation reduces the carbon footprint by 270% and the gray water footprint by 300% compared to conventional systems (CarbonBox, 2025) . The treatment byproduct, brown fat, is collected and repurposed by Biotrade, which processes it into biodiesel and other industrial products such as esters, alcohols, and gels, closing the loop within the circular economy. Remote sensors installed in the G-Trap allow for real-time monitoring of water flow, grease volume, and machine performance, ensuring operational efficiency and traceability throughout the process. This data also feeds client sustainability dashboards that quantify savings in water, emissions, and energy.

Figure 3. G-Trap technology

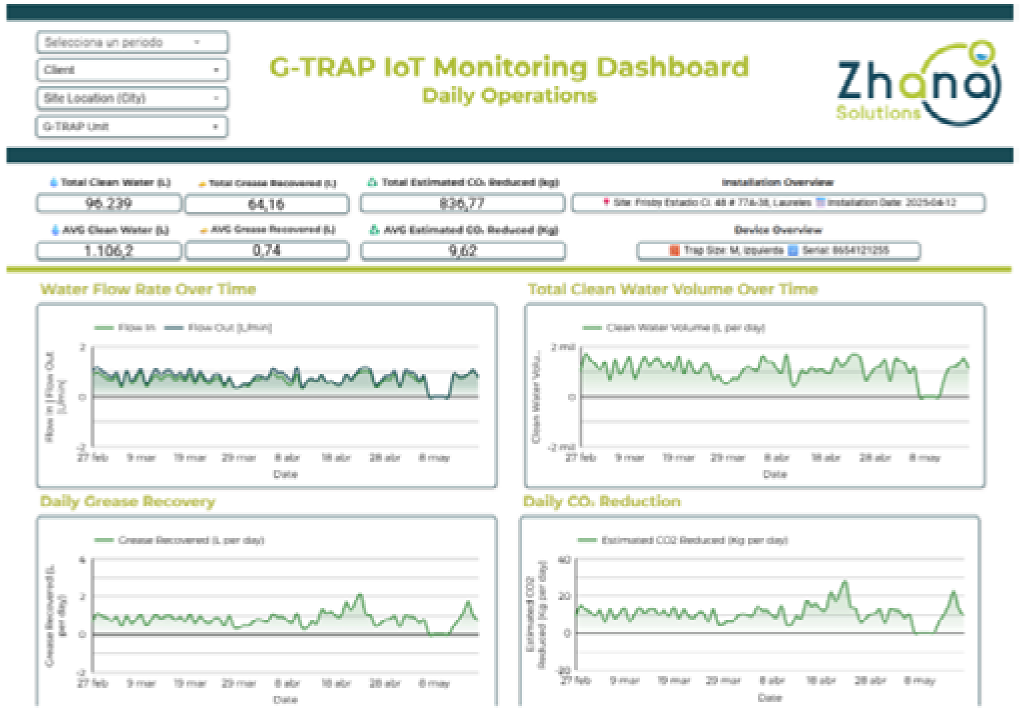

Figure 4. G-Trap Remote Monitoring Dashboard

ZhanaSolutions offers a package of incentives designed to motivate restaurateurs and hoteliers to adopt better grease management practices, addressing problems they currently face while providing new value. It differentiates itself through a subscription-based full-service model designed to eliminate clients' operational burdens and build long-term loyalty.

1. **Monthly Subscription:** Clients in the HORECA sector (hotels, restaurants, cafés) pay a fixed monthly fee (USD 100–150) that covers installation, waste collection, technical assistance, and maintenance, improving the customer's sense of value for the price charged, moving the perspective of the service from a cost to an investment.
2. **Integrated Technical Support:** The company guarantees a 48-hour response time for repairs, offers preventive maintenance, and provides staff training in sustainable practices, ensuring smooth operation and regulatory compliance.
3. **Data-Driven Value:** Monthly performance reports provide KPIs such as CO reductions, water savings, and recovered grease-to-energy conversion. These reports help clients enhance their ESG performance, secure sustainability certifications, and establish reputational value.
4. **Customer Care and Retention:** Dedicated PQRS teams handle client requests, while account managers maintain relationships through continuous engagement, differential pricing, and recognition events. This approach has built loyalty among large gastronomic clients, particularly within Acodres Cartagena, where restaurants view the service as a long-term investment rather than an expense.
5. **Waste-to-energy solution:** ZhanaSolutions generates income by selling the collected brown grease (brown grease) to Biotrade. Biotrade pays ZhanaSolutions 70% of the price of brown grease based on the mass of grease collected, minus logistics and humidity costs. This relationship transforms what would typically be a cost (grease disposal and logistics, which generally require payment to a manager) into an income, saving the company money and supporting the circular economy model. Bio Trade utilizes this material not only for biodiesel but also for other products, such as esters, alcohols, and gels.

"Restaurants in the historic center of Cartagena are interested in this solution because they are tired of traditional grease traps. They don't work well because they produce a lot of grease, often clog, cost $350.000 COP (USD 90) to unclog, and require monthly cleaning, which adds up financially."- Katherine Ballestas, Executive Director ACODRES Cartagena.

Figure 5. ZhanaSolutions provides complete installation, training, and technical support services.

Strategic partnerships for systemic change

ZhanaSolutions' success goes beyond its technology, relying also on strategic partnerships that boost operational efficiency, market reach, and influence policy. By demonstrating that their technology has a better environmental performance, such as a smaller carbon footprint and improved water management, they are motivating stakeholders to advocate for regulatory changes that would ultimately benefit their solution at the national level.

1. **Circular Value Chain Partnership:** Collaborating with Biotrade transforms waste disposal expenses into revenue through brown grease valorization, effectively subsidizing ZhanaSolutions' operations.
2. **Institutional Partnerships:** Engagement with industry associations (Acodres, Cotelco, Fenalco) and environmental authorities (e.g., Bogotá's Secretary of Environment) strengthens visibility and regulatory alignment.
3. **Public-Private Collaboration:** Through partnerships with Fondo Acción and alignment with national environmental policies, the company supports the development of new circular production chains that advance Colombia's energy transition.

4. **Technological Partnership:** The collaboration with Sense ensures IoT integration for continuous data monitoring and predictive maintenance—turning client feedback loops into operational intelligence.

These partnerships create a strong ecosystem advantage, embedding ZhanaSolutions within both the private innovation and public policy landscapes.

Disruptive business model

ZhanaSolutions' business model focuses on recurring revenue, measurable impact, and scalability, providing a comprehensive waste management service rather than just selling technology.

1. **Value proposition:** Reduces maintenance costs, minimizes compliance risks, and enhances corporate sustainability credentials.
2. **Revenue streams:**
   - Monthly service subscriptions.
   - Component repair and sales.
   - Sale of recovered brown grease for biodiesel production.
3. **Operational Efficiency:** Income from grease sales offsets waste management costs, while IoT data improves logistics, maintenance scheduling, and machine performance.
4. **Market Creation:** By framing its solution as responsible residual water treatment, ZhanaSolutions created an entirely new category in digital and regulatory ecosystems, one that links sanitation, energy recovery, and sustainability.
5. **Differentiation factors:** The new IoT sensor system is a competitive edge, automatically collecting and analyzing data in real-time on key metrics like water flow, grease volume recovered, and machine operational status.

ZhanaSolutions specializes in turning grease management into a sustainable, data-driven service that benefits the environment, economy, and operations across the entire value chain. Its subscription model offers consistent revenue and reduces clients' compliance and maintenance responsibilities. Through partnerships with technology developers, the company emphasizes IoT-enabled traceability, strong customer support, and circular value creation. This approach distinguishes ZhanaSolutions from traditional wastewater treatment providers and positions its solutions as drivers of sustainable growth, bioenergy innovation, and climate change mitigation.

Market Analysis

The market for technological solutions in the restaurant and hospitality industry is growing quickly, especially around innovations that improve operational efficiency and meet environmental regulations. Although a complete market size has not been officially measured, several signs indicate strong and increasing demand for automation in grease management and wastewater treatment.

Automated grease traps, like those offered by ZhanaSolutions, are a relatively new part of the broader industrial kitchen technology market. Their popularity is growing because they are more efficient, need less maintenance, and can save money over time. Traditional grease traps in Colombia cost between COP 258,900 and 1,500,000 (about USD 65–375), while imported models can reach up to USD 1,200 before installation and upkeep. Automated bacteria dispensers are roughly COP 380,000 per month. Meanwhile, ZhanaSolutions' all-in-one service starts at COP 490,000 per month, which includes installation, maintenance, spare parts, waste collection, training, and certification, placing it in the middle-to-high market segment.

The demand for automated systems has increased by approximately 35%, driven primarily by hotel chains and large restaurant franchises in major cities. ZhanaSolutions' recent performance reflects this momentum: in April 2025, the company generated 139 new leads, issued proposals worth COP 611 million, and closed six new clients with contracts totaling COP 285 million—achieving 130% of its monthly sales target and a 31.5% conversion rate.

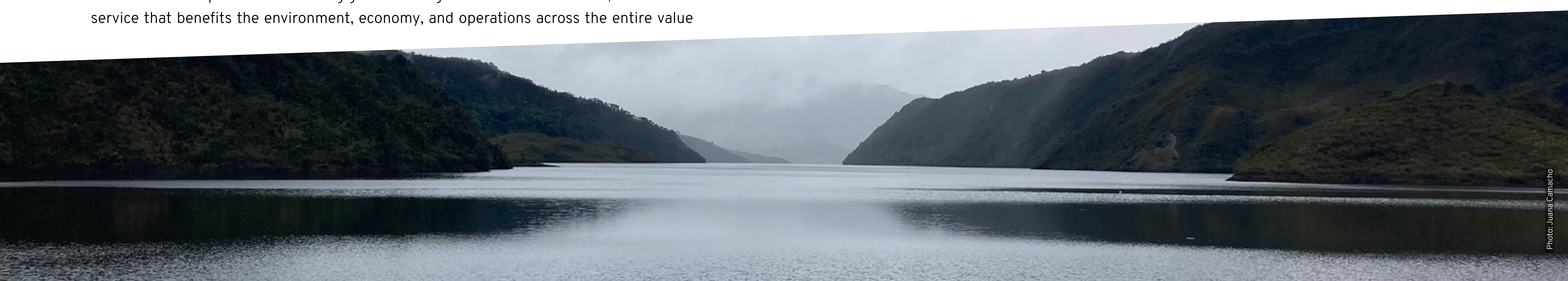

Photo: Juana Camacho

1. Growth Drivers

Several reinforcing factors support the market growth for ZhanaSolutions:

1. **Regulatory pressure and compliance:**

   Stricter environmental regulations on wastewater management and grease disposal have created a compliance-driven market. Authorities are increasing inspections and sanctions for non-compliance, prompting restaurants and hotels to invest in technologies that ensure adherence to norms. Publicized closures of major chains due to grease management failures have further accelerated the adoption of sustainable practices.

2. **Operational efficiency and cost savings:**

   Automated grease traps reduce labor costs, minimize downtime, and eliminate recurring expenses linked to manual cleaning and unscheduled maintenance. This efficiency translates into a superior cost-benefit ratio, particularly for clients managing multiple locations.

3. **Limited availability of automated solutions:**

   Few providers currently offer automated grease management technologies. ZhanaSolutions is one of the only companies in the region to deliver automation with 90% efficiency, combined with waste collection and certification, creating a first-mover advantage.

4. **High-demand segments:**

   The strongest demand comes from four, five, and six-star hotels, large restaurant chains, international franchises, and industrial facilities. Emerging opportunities exist in shopping centers, which are responsible for collective wastewater treatment, and in small to medium-sized food production companies seeking compliance solutions.

5. **Strategic alliances and public incentives:**

   Institutional partnerships, such as proposed agreements with the Mayor's Office of Cartagena to subsidize 50% of the first-year service cost, can accelerate market penetration. Collaboration with utilities like the Barranquilla water company (TripleA) could provide immediate access to over 200 potential customers.

2. Competitive Landscape

ZhanaSolutions operates in a market with both direct and indirect competitors. Direct competitors primarily manufacture traditional grease traps, while indirect competitors offer chemical or biological treatment services.

1. **Direct competitors (traditional trap manufacturers):**

   Colempaques and Rotoplast dominate the national market for general water-treatment and storage systems, offering basic grease traps through hardware stores and large retail chains. Their focus on low-cost modular products limits differentiation.

   Local stainless-steel fabricators provide custom traps to industrial kitchens, competing mainly through proximity and price.

   Imported devices from Asia are available through wholesale platforms but often suffer from poor after-sales support and inconsistent quality, which limits their adoption.

2. **Indirect competitors (service-based solutions):**

   Automated biological treatments such as bacteria dispensers (e.g., BioOne) offer monthly maintenance and certification at approximately COP 380,000, targeting hotels and restaurants seeking low-cost compliance.

   Comprehensive environmental service providers, such as Ambbio and PSA, deliver broader wastewater treatment solutions, often for large industrial clients. Ambbio currently poses the most significant competition in the hospitality segment, though its systems are less efficient than ZhanaSolutions' automated technology.

   Temporary cleaning and chemical services provide short-term compliance solutions for smaller restaurants; however, they often lack certification and sustainability credentials, rendering them an unreliable long-term option.

3. **Competitive Advantage**

   ZhanaSolutions maintains a unique position in the market as the only company offering automated grease traps with 90% efficiency, integrated with waste collection, certification, and digital performance reporting. Its service model supports clients in meeting regulatory obligations under their Comprehensive Waste Management Plans (PGIR) while providing quantifiable environmental indicators. Competitors either lack advanced automation or fail to address the full cycle of brown grease management.

This combination of technological innovation, regulatory alignment, and measurable sustainability outcomes positions ZhanaSolutions as a leading actor in a rapidly growing niche market that bridges industrial efficiency and environmental compliance.

Business and Operational Risks and Mitigation Strategies

ZhanaSolutions operates in a rapidly changing regulatory and financial environment, where both external and internal factors can impact business continuity and growth. Three primary risk areas have been identified, along with targeted mitigation strategies that have proven effective.

1. **Financial Pressure on Clients**

   Recent labor regulations have increased operational costs for many clients, reducing their profit margins and potentially limiting their ability to invest in environmental services. To mitigate this risk, ZhanaSolutions has bolstered its value proposition through technological upgrades and strategic alliances that improve the efficiency and cost-effectiveness of its circular model. These enhancements enable clients to cut operational costs, strengthen their financial resilience, and help protect ZhanaSolutions' revenue streams.

2. **Regulatory Delays**

   The company's growth depends on the speed of regulatory reforms, especially related to industrial wastewater management (Resolution 0631 of 2015 of the Ministry of Environment and Sustainable Development). Delays in updating these rules create a risk for timing, as market growth relies on more straightforward compliance guidelines. To tackle this, ZhanaSolutions has actively worked with local environmental agencies, advocating for the enforcement of current regulations and providing technical support based on the principle of subsidiarity. These efforts have not only reduced uncertainty but also led to direct sales and improved institutional relationships.

3. **Foreign Exchange Exposure**

   ZhanaSolutions faces a currency mismatch risk due to its debt obligations in USD and limited access to financial hedging tools. To address this risk, the company has diversified its funding sources by obtaining new credit lines in COP, which helps offset foreign currency liabilities and reduce exposure to exchange rate changes.

   Through these measures, ZhanaSolutions continues to enhance its operational stability, build stronger client relationships, and position itself for sustainable growth in a shifting regulatory and economic environment.

Policy advocacy and partnership efforts

A key challenge ZhanaSolutions encounters in expanding is the absence of incentives for HORECA sector companies to adopt its solution. Currently, discharge regulations do not mandate actions from these establishments because their discharges are considered domestic water. Moreover, brown fat lacks a regulatory framework for its use as an energy source, unlike used cooking oil. This regulatory gap limits the country's ability to capitalize on this strategic resource for the energy transition.

To address the regulatory gap, ZhanaSolutions has collaborated with key national authorities, including the Ministry of Environment and Sustainable Development and the National Planning Department. This effort is supported by resources donated through the P4G program. ZhanaSolutions also created a series of technical studies to explain why wastewater from industrial kitchens should be reclassified as non-domestic. These studies form the foundation for a policy recommendation document directed at these stakeholders.

ZhanaSolutions has actively championed local issues, such as water management and the circular economy, advocating for regulatory incentives to facilitate the transition through technical discussions, meetings with various stakeholders, and strategic partnerships:

Strategic Government and Policy Engagement

During the P4G grant period, ZhanaSolutions strategically strengthened its relationships with public institutions and industry associations to unlock market access and pave the way for regulatory support. With the hiring of the Engagement Manager, the company successfully established high-level relations with the Mayor's Office of Cartagena and Bogotá's environmental secretariats, marking its first formal entry into the public sector. Collaborations with these stakeholders and Aguas de Cartagena, for example, enabled over 50 site visits, resulting in the conversion of approximately 12 new clients, demonstrating the business model's scalability through institutional engagement.

Additionally, entry into Bogotá's Green Businesses Program[4] provided official government endorsement, increasing market credibility and visibility. Partnerships with Acodres, Cotelco, and Fenalco, key associations in the restaurant and hospitality sectors, helped build trust with industry leaders and opened direct channels to clients like Frisby, while positioning ZhanaSolutions as a recognized solution to the region's grease management challenges.

Technical, Financial, and Legal Consulting

P4G funding enabled ZhanaSolutions to contract expert consultants across sustainability, finance, legal compliance, and marketing, significantly enhancing its internal capacity and investment readiness. CarbonBox quantified the company's carbon and water footprints, generating verified data that strengthened the environmental credibility of the G-Trap technology and gave clients measurable sustainability KPIs.

Sense developed and installed IoT sensors in the equipment, enabling real-time monitoring, predictive maintenance, and automated impact reporting, thus improving client satisfaction and operational efficiency. Quarta Legal addressed governance and compliance gaps, closing about 90% of legal breaches and establishing a framework for future growth. The financial advisor's work led to a robust valuation of nearly USD 8 million, improved investor relations, and informed the strategic decision to consolidate operations in Colombia before undertaking international expansion. Finally, Transforma Publicidad refined the marketing and communications strategy, generating high-quality leads and positioning ZhanaSolutions as a market innovator under the concept of "responsible residual water treatment."

Value Chain and Circular Economy Validation

Through collaboration with Biotrade, ZhanaSolutions validated a new circular value chain that converts brown grease from industrial kitchens into a viable feedstock for biofuel and biochemical production. Biotrade's technical consultation defined the processes required to refine and dry the recovered residue, confirming its suitability for biodiesel transformation and establishing a sustainable revenue stream for ZhanaSolutions. Under this model, the company now receives approximately 70% of the market value of brown grease, effectively turning a traditional disposal cost into an income-generating activity. This partnership not only solidified the company's position within the circular economy but also demonstrated how its technology and business model contribute directly to bioenergy development, climate change mitigation, and national energy transition goals.

4 The Green Business Program supports companies offering environmental products and services, helping them access a wider market. This initiative is part of Colombia's National Green Business Policy.

Figure 6. Technical roundtables and multi-stakeholder dialogues facilitate building consensus and the development of proposals.

These three actions have resulted in the following accomplishments:

1. **The Public Policy Recommendations Document**, created through a partnership with environmental authorities and the private sector, outlines regulatory gaps and suggests mechanisms for adopting fat management technologies. Developed from thorough technical studies, it supports decision-making by public and private stakeholders funded by the P4G program.
2. **Strong partnerships with local authorities:** In Bogotá and Cartagena, ZhanaSolutions collaborated with environmental agencies (District Secretariat of Environment, Aguas de Cartagena ESP) to promote awareness about grease discharges and develop circular management strategies. These initiatives have helped integrate the company's solutions into green business programs and local regulatory agendas. In Bogotá, the environmental authority plans to propose a regulatory change to include incentives for restaurants in the legislative agenda of Bogotá D.C.

3. **Partnerships with utility companies:** Collaborating with both public and private entities have enabled ZhanaSolutions to target utility companies as strategic clients. These companies offer a significant market opportunity and can also serve as key partners in encouraging the adoption of the G-Trap among their users, incorporating it into waste management initiatives to enhance the solution's credibility and broad usage.
4. **Collaborating with trade associations and companies,** such as ACODRES and ANGAT, helped the company broaden its visibility among potential clients. This was particularly effective in Cartagena D.C. and T., where ACODRES's local chapter created multiple opportunities with local hospitality businesses. Moreover, ZhanaSolutions is a strategic partner of BioD, the nation's leading biodiesel producer, which is spearheading technological advancements in sustainable aviation fuel production.

ZhanaSolutions' engagement in debates about the circular economy at both national and local levels has helped show that brown fat is a strategic resource for energy transition and water conservation. Currently, authorities and restaurant associations at both regional and national levels not only acknowledge the potential of these solutions but also actively support them. They participate in dialogue forums, promote shifts in fat management and disposal practices, and develop policies that encourage a more circular and sustainable approach.

Results

ZhanaSolutions has successfully secured impact investors who believe in their solution and recognize its growth potential. They have obtained pre-seed and seed funding from four impact investment funds, including Fondo Acción's Impact Mission Investment Fund and ASIRI, both of which are local Colombian funds.

According to their reports, from 2021 through June 2025, ZhanaSolutions has achieved:

- Develop a technological solution to control brown fats in wastewater from industrial kitchens, aiming to prevent water pollution and create feedstock for bioenergy production.
- Develop a comprehensive service that adopts a circular economy model to utilize treatment byproducts within the biodiesel production process.
- Establish its presence across 13 departments nationwide, reaching a total contract value of USD 966,101 by June 2025, showing the company's substantial client base.
- Process 11 million liters of water each month, prevent the discharge of almost 5,000 liters of fats into the sewer system, and curb the emission of 95 tons of CO2eq (June 2025).

As part of its growth strategy and supported by FIMI's non-financial assistance, ZhanaSolutions applied for funding through the P4G platform's donation program, managed by the World Resources Institute. They received USD 355,963 to drive growth by enhancing financial, legal, commercial, and operational readiness to attract Series A investment. The funding also promotes multi-stakeholder dialogue to create a better environment for using brown fat and helps systematize their experience. Moreover, these resources aid in documenting and sharing lessons learned, improving support for impact ventures through dissemination.

This contribution helped ZhanaSolutions establish itself as a company and enhance its operational, commercial, legal, and administrative functions. It also supported the development of its corporate governance, ESG strategy, environmental and social impact, and involvement in systemic changes crucial for the energy transition. Here are the achievements realized through these efforts:

Operational Performance

The recent operational successes highlight ZhanaSolutions' technological innovation and market solidification. Below, key milestones in equipment installation, new technology adoption, and territorial expansion are outlined.

- Since April 2024, 122 units have been installed, increasing the total amount to 257 by September 2025, while training staff at each establishment in sound environmental practices, which demonstrates its capacity to expand and accommodate rising demand.
- IoT technology has been integrated into 30 machines to enable real-time data collection on water treatment and grease collection. This data allows for the calculation of the solution's impact indicators and is displayed to the client through a control dashboard.
- Expansion of the local sales and operations team (installation and maintenance), boosting sales growth in existing cities and entering new markets across the country.
- Installed 50 additional machines for one of their key clients.

Capacity Building

Besides enhancing its operations, ZhanaSolutions bolstered its internal capabilities and unified key tools to support sustainable growth. These successes span financial, commercial, legal, and strategic areas, enabling the company to professionalize management, innovate processes, and build a strong foundation for corporate governance and scalability.

- In response to the due diligence analysis conducted in 2024 and with support from P4G, the company now has a valuation, a shareholders' agreement, and a corporate governance policy aligned with good practices.
- A dashboard utilizing FIMI indicators was developed, including key metrics such as MRR, ARR, and LTV/CAC to monitor the company's financial stability. It also displays data on social, environmental, commercial, and operational impacts. Additionally, economic models were revised, and improvements were made to variance analysis to facilitate informed decision-making.
- Commercial tools automate sales processes, customer follow-up, and generate information for decision-making, thereby enhancing information traceability.
- Capacity building involves training the financial team to improve internal skills and decrease reliance on external consultants, thereby strengthening the commercial and operational teams.
- Legal preparation involved drafting a comprehensive shareholders' agreement and standardized contracts for sales and human resources. This approach aimed to protect the company against legal risks by adopting corporate governance best practices, which were formalized through a corporate governance policy based on recognized good practices.
- Creating functional prototypes for remote sensing systems enables real-time monitoring of G-Trap's performance, which is essential for automation and scalable operations.
- Marketing and sales activities were structured within strategic frameworks that clearly defined the company's goals and milestones. This included redesigning the corporate identity, establishing strategic indicators, and adopting a social marketing approach. Additionally, the company's website was updated to improve its organic ranking on social media platforms.

Photo: Juana Camacho

As Sebastián Guerrero, a financial consultant, illustrated when highlighting the impact of the initiative:

"Analyzing the numbers allowed them to understand the logic behind the indicators and to reconsider hypotheses regarding the operational plans."

Market and business growth

ZhanaSolutions' recent growth is evident not only in its expanding footprint and diversifying client base but also in its solid commercial and financial metrics. The results from Q1 2023 to Q2 2025 demonstrate how the company has increased its market presence, enhanced sales efficiency, and reached financial milestones that validate the viability and scalability of its circular business model.

ZhanaSolutions has positioned itself as a rapidly expanding national contender, broadened its market reach, and is attracting key strategic clients.

- Decentralization spans four cities: Bogotá, Cartagena, Medellín, and Cali, with additional opportunities in the Coffee Triangle, Santander region, Neiva, Barranquilla, Santa Marta, Villavicencio, and La Guajira.
- 30 new clients, increasing the total to 56 by June 2025.
- Tripled the number of clients each quarter.
- Improve profiling to target high-potential clients more effectively.

From a commercial standpoint, it has been verified that the business model is highly efficient, experiences rapid growth, acquires customers affordably, and maintains their loyalty over time.

- Sales increased by 230% in one year (June 2024 – June 2025).
- Closing rate of 50%.
- Faster conversion: 30% reduction in sales closing time.
- Reduced CAC by 70%.
- LTV/CAC ratio: 20–30x (vs. standard of 3x).
- Customer dropout rate < 1%.

The company balances rapid growth with financial discipline, recording positive EBITDA and securing over USD 1.3 million in resources from 2024 to June 2025. Other economic indicators for this period, from the first half of 2024 to June 2025, also reflect these achievements.

- Funds raised: USD 1,329,250 (equity, debt, other sources).
- Non-commercial financing: USD 81,750.
- Gross income: USD 164,574.
- Positive EBITDA: USD 11,555.
- Total contract value: USD 966,101.
- Monthly recurring income in June 2025 (MRR): USD 26,631 (91% of the target).

These figures illustrate ZhanaSolutions' growth throughout the project, showing rises in revenue, clients, and other financial metrics. While there is still progress to be made in attracting investment, the organization has become a stable and appealing option for investors. Currently, ZhanaSolutions is pursuing a bridge funding round to prepare for Series A. This round aims to raise USD 400,000 to strengthen its operations in Colombia, particularly the sales team, and to support a controlled expansion into Mexico with 20 to 50 teams.


Photo: Juana Camacho

BOX 1.

Key victories

- Frisby, one of the top fast-food chains in the country, successfully installed G-Trap technology across all its franchisees in Colombia, adding 50 machines in Bogotá and Medellín.
- ZhanaSolutions finalized a deal with Burger King, the country's third-largest burger chain, following a cost-benefit analysis. They anticipate covering 35% of Colombian outlets by the second half of 2026.
- During the design phase, some restaurants reference ZhanaSolutions and aim to include it in their projects. This is often due to the brand's robust social media presence, which is fueled by its marketing strategy.
- The company showed its fast response skills when a client facing a crisis asked for a machine installation, and their issue was resolved within 72 hours.
- Besides assisting the client in meeting regulations, they also facilitated their connection to the biodiesel supply chain. An operational team, now strengthened and in ongoing communication with the sales team, enables the company to provide these services and solutions.

Financial forecast and scalability

The post–Series A financial forecast predicts ten years of rapid growth fueled by expanding markets and operational efficiency. Revenue is projected to rise from USD 0.29 million in 2024 to USD 100.1 million in 2034, with a CAGR of 79.6%. The company plans to achieve EBITDA profitability by 2026 and net profitability by 2028, marking a shift to a self-sustaining growth stage.

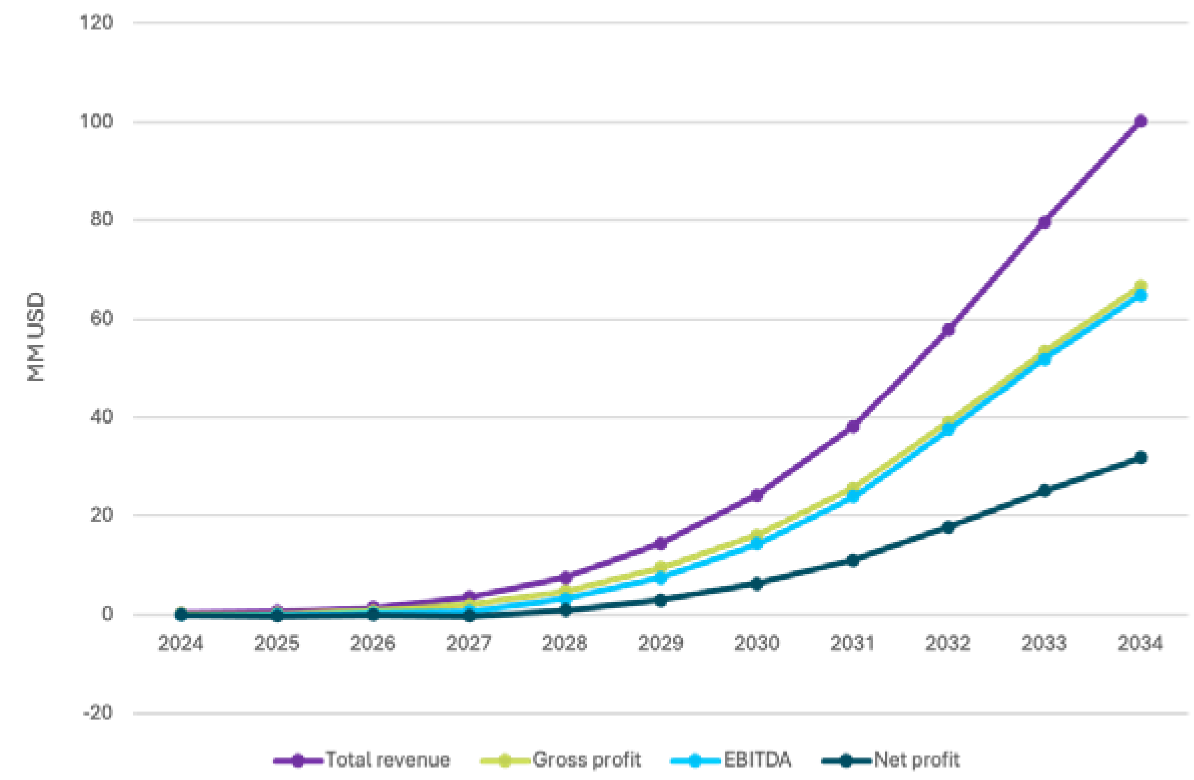

Figure 7. Financial forecast ZhanaSolutions 2024-2034 (MM USD). Source: ZhanaSolutions

Supuestos clave de crecimiento

Market adoption in Colombia:

The target market includes 175,000 industrial kitchens. By 2034, the company aims to serve 40,000 clients annually, establishing a robust local customer base and fostering steady, organic growth.

Geographic expansion into Mexico:

Entry into the Mexican market is planned for 2027, targeting approximately 600,000 industrial kitchens, which is 3.4 times the size of the Colombian market. By 2034, the company forecasts 12,500 services per year, making Mexico the main driver of growth from 2027 onward.

Pricing and value strategy:

The anticipated implementation of tiered pricing and bundled services aims to boost the average revenue per client and improve margins as customer loyalty develops.

Cost structure and operational leverage:

Variable costs increase proportionally with sales, while fixed costs level off after Series A funding. This structure enables profitability to accelerate with revenue growth.

Scalability of the Business Model

The model is built for replication and efficiency.

Operational leverage:

Once fixed costs are covered, every additional dollar of revenue significantly increases profit, as shown by the gross-profit CAGR of 81%, which exceeds the total revenue CAGR of 79.6%.

Geographic expansion:

A standardized, technology-enabled service model enables low-cost entry into new markets, with Mexico serving as a notable initial example.

Digital infrastructure:

Client management tools based on data enhance scheduling, maintenance, and upselling, while lowering service delivery costs.

Projected Impact

The projections show how Series A funding drives both financial and social benefits:

Transformation and value creation:

Revenue is projected to grow from USD 0.29 million to USD 100.1 million over ten years, with net profit reaching USD 31.7 million by 2034.

Market leadership:

Serving over 50,000 kitchens in Colombia and Mexico by 2034 will establish the company as a regional leader in industrial kitchen services.

Sustainability and ESG:

Operational efficiencies and resource recovery initiatives will lead to measurable reductions in waste and emissions, supporting the company's goals in circular economy practices.

Impact indicators

ZhanaSolutions' achievements extend beyond business and financial gains, offering tangible environmental benefits and promoting social development in the communities they serve. The company reduces water pollution and carbon emissions, repurposes brown fats as a valuable resource for the energy transition, and promotes employment inclusion alongside improved working conditions at its facilities. Here are the key highlights of 2025:

- 11,025 m^3 of water treated during June 2025 (compared to 7,271 m^3 in June 2024).
- 7,350 liters of fat recovered in June 2025, with energy potential for biodiesel.
- 95 tons of CO_2 equivalent avoided in June 2025.
- 33% of the workforce at ZhanaSolutions is women, and this participation is expected to increase to 35%.
- 276 women and 144 men have benefited at their workplace from the installation of the solution.

Success stories

McDonald's Colombia

When McDonald's Colombia set out to enhance its sustainability efforts, it faced a crucial question: how to effectively manage the large amounts of grease and wastewater generated daily in its busiest kitchens. In collaboration with ZhanaSolutions, the company proudly installed G-Trap automated grease separation systems in three of its flagship restaurants in Bogotá (Calle 125, Parque La 93, and Galerías). What started as a technical upgrade quickly turned into an inspiring story of positive change. Over the course of three months, McDonald's successfully recovered more than 290 kilograms of grease, treated the equivalent of 4,000 gallons of wastewater, and prevented over three tons of CO_2 emissions from entering the atmosphere, making a real difference for the environment.

However, the true achievement of the initiative extended beyond mere figures. ZhanaSolutions collaborated closely with McDonald's kitchen personnel, providing training and assisting in the adoption of new routines that eventually became ingrained. Both technicians and culinary staff began to take pride in their role in advancing the company's environmental objectives. The previously unnoticed process of grease management was transformed into a paradigm of efficiency and accountability. This partnership not only enhanced operational performance but also fostered a culture of environmental consciousness, which now serves as a benchmark for integrating technology and teamwork in redefining sustainability within the foodservice sector.

Almirante Hotel

In November 2024, the Almirante Hotel in Cartagena faced a crisis that threatened its operations. Following an inspection by EPA Cartagena, the environmental authority found non-compliance with discharge regulations and gave the hotel just five days to correct the issues or face temporary closure. With its reputation and daily operations on the line, the hotel turned to ZhanaSolutions for an urgent solution. Within a week, a specialized technical team designed and executed a rapid action plan, installing five G-Trap systems across the kitchen, production, and washing areas. The advanced grease and solids separation technology, combined with hands-on support from ZhanaSolutions engineers, allowed the hotel to meet environmental standards within the deadline, avoiding sanctions and ensuring business continuity.

What started as a moment of urgency became a turning point. The Almirante Hotel not only achieved full regulatory compliance but also became a leader in environmental management within Cartagena's hospitality industry. Since implementing the system, it now recovers between 15 and 20 kilograms of grease each month, which is reused for biofuel production, and has reduced maintenance costs by halving the frequency of cleaning. By mid-2025, the hotel had converted 206 kilograms of waste into valuable raw material, demonstrating that innovation and collaboration can turn an environmental liability into a model of circular economy success for the Colombian hotel industry.

Burger King Colombia

In 2025, Burger King Colombia took its first major step toward sustainability and operational efficiency. Without a formal sustainability department in place, the company faced rising maintenance costs and frequent grease-related blockages that disrupted operations and increased corrective expenses. Looking for a practical and scalable solution, Burger King partnered with ZhanaSolutions to launch a pilot project that would transform its kitchens' waste management systems.

Three G-Trap automated grease separation units were installed in Bogotá and Pereira, marking the start of a new operational standard. Within weeks, the maintenance team saw a significant reduction in corrective costs related to grease management (between 60% and 70%). Obstructions that previously required frequent suction and emergency interventions were nearly eliminated. In just five months, the system had recovered about 50 kilograms of grease, now repurposed for energy recovery. Encouraged by these results, Burger King began planning to expand the program to its restaurants in Cartagena and Medellín. In these two cities, inefficient wastewater handling had historically increased operational costs.

The Burger King experience demonstrates how ZhanaSolutions' G-Trap technology and specialized technical support not only provide measurable cost savings but also build the foundation for a broader corporate sustainability strategy in Colombia's fast-food sector.

Public policy and management

ZhanaSolutions' impact extends beyond its ground-based technologies. The company promotes systemic change by shaping public policies, forging strategic alliances, and creating new platforms for dialogue to influence regulations. These efforts establish it as a pivotal entity in Colombia's shift toward circular approaches for managing greasy waste. Some examples of the company's impact regarding enabling conditions include:

- Generation of technical evidence involves developing studies that demonstrate fats' potential as a biodiesel feedstock, the role of the HORECA sector in releasing fats into water, and the associated environmental and public health impacts.
- Policy advocacy via technical roundtables involves creating local and national forums to encourage the shift to a circular management model for greasy discharges. This approach offers benefits such as water protection, lower maintenance costs, reduced regulatory non-compliance, and the development of new business opportunities.
- Collaborating with authorities in Cartagena and Bogotá to advance initiatives like Free Fat Zones and an environmental seal, which motivate the HORECA sector to implement sustainable practices.
- Develop a recommendations document validated by national and local stakeholders to facilitate dialogue on necessary regulatory adjustments.
- The HORECA sector is starting to view brown fats not as troublesome waste but as a potential business opportunity in the country's energy transition.

Fondo Acción and ZhanaSolutions have achieved notable success in environmental initiatives, demonstrating strong execution and expanding their market presence. Nonetheless, ZhanaSolutions still needs to solidify its financial sustainability and impact on water conservation by closing investment gaps, boosting revenue, and creating jobs. Enhancing its commercial, economic, and legal capabilities has prepared the company for growth in the short and medium term and has opened opportunities to engage in regulatory discussions. The main challenge moving forward is to develop a sustainable financial model that enables business scaling and broader impact in Colombia and other regional countries.

Table 1. P4G progress indicators

Business		
Indicators	**Target**	**Achieved**
Total investment raised before and during the grant period by the commercial partner (USD)	3,000,000	1,329,250
Total non-commercial funding raised before and during the grant period (USD)	500,000	81,750
Total funding and investment (USD)	3,500,000	1,411,000
Number of employees in the commercial partner (Female)	10	4
Number of employees in the commercial partner (Male)	18	8
Total number of employees	28	12
Gross revenue (+/- USD or specified currency) (USD)	1,505,638	548,132
Percentage revenue change year on year (+/- %)	311%	44%
Gross Earnings EBITDA (+/- USD or specified currency) (USD)	499,465	11,555

Impact indicators		
Indicators	**Target**	**Achieved**
Amount of carbon emissions reduced or avoided projected to 2030 metric tons of carbon dioxide equivalent (MT CO2e)	449	1,457
Number of additional jobs created as a result of your business solution, beyond the commercial partner employees (Female)	10	4
Number of additional jobs created as a result of your business solution, beyond the commercial partner employees (Male)	10	6
Total additional jobs created	20	10
Number of individuals positively affected by greater climate resilience or adaptation related to the climate business, commercial partner, product, or solution Female)	280	276
Number of individuals positively affected by greater climate resilience or adaptation related to the climate business, commercial partner, product, or solution (Male)	120	144
Total number of individuals positively affected	400	420
Number of due diligence or other materials developed	35	52
Number of presentations made to prospective investors	150	282
Amount of resources mobilized by the business during P4G's programme period (USD)	1,784,000	1,329,250
Number of policy/regulatory interventions identified by partnerships in which NPs have engaged	4	7

Gender 2 x and othe		
Indicators	**Target**	**Achieved**
Percentage of women in senior leadership or management positions in the early-stage business partner,	75%	75%
Percentage of women in the climate business workforce	36%	-3%
How many liters of water are you saving from contamination?	694.779.120	186.019.680
How many liters of grease are you recovering?	463.186	124.013

Note: Progress achieved by Jun 30th, 2025.

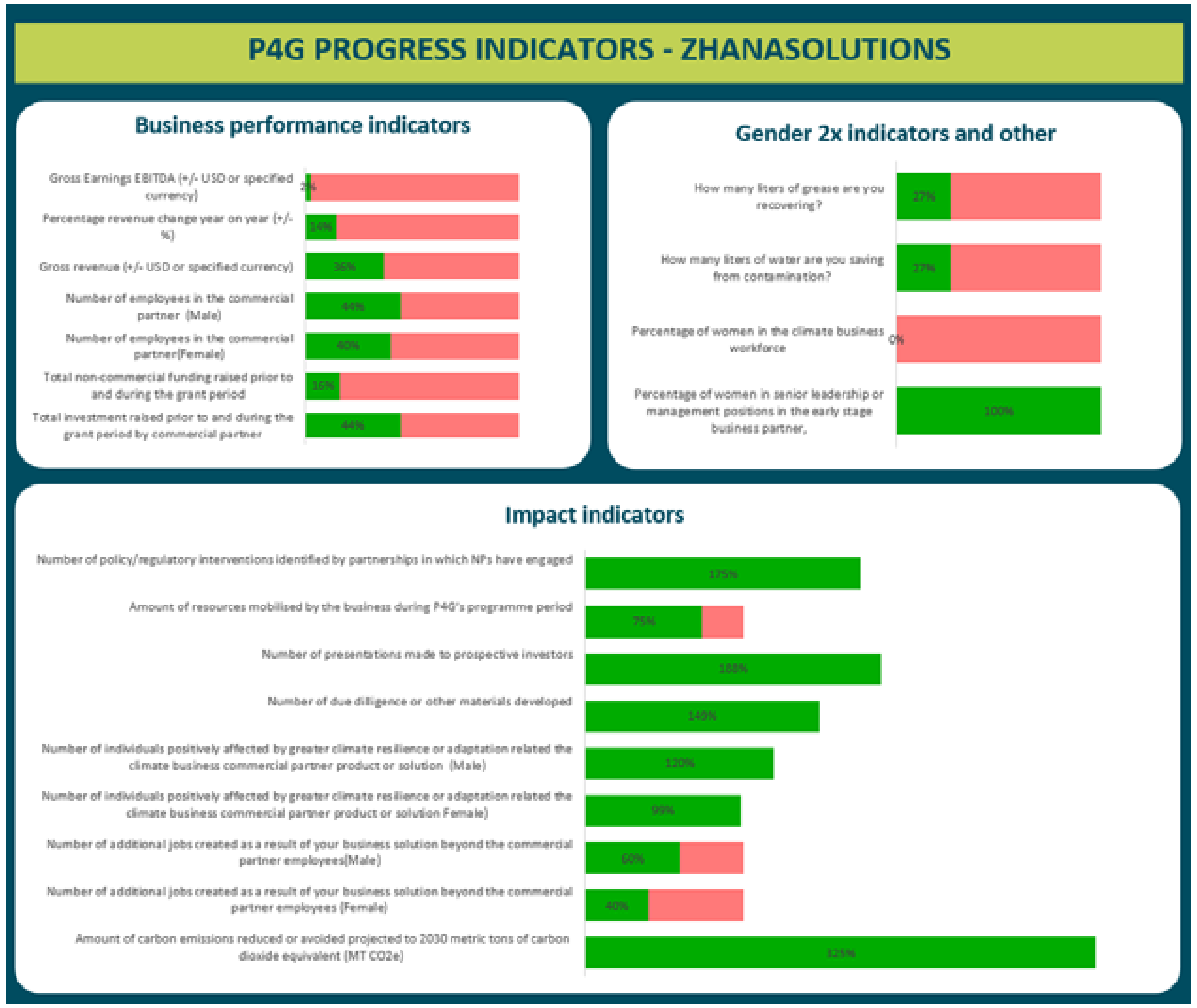

Figure 8. Progress towards targets. In green is the percentage of achievement. Source: ZhanaSolutions.

Challenges and solutions

As with any complex project implementation, ZhanaSolutions encountered challenges during the project's implementation that, rather than stopping progress, inspired innovative and strategic solutions. Here are the main challenges and how they were addressed.

Investment mobilization

- **Challenge:** The expected investment resources were not fully raised because of the adverse macroeconomic environment and the contraction of the impact investment sector. By June 2025, 44% of the original resource mobilization goal had been reached, mainly through commercial resources.
- **Solution:** Investment schemes and debt were coordinated to leverage the progress achieved with donation resources.

Team strengthening

- **Challenge:** The team could not be expanded as planned due to expense adjustments caused by the lack of external investment. As of the June 30, 2025, report cutoff, no new hires had been made.
- **Solution:** Donations enabled us to keep most of the equipment operational and hire external staff for installations and after-sales support. Two of these collaborators will become permanent team members at the plant.

Implementation capabilities

- **Challenge:** The entrepreneurial team faced a steep learning curve in meeting the requirements for executing P4G donation resources, which led to a slow project initiation.
- **Solution:** Fondo Acción, acting as a managing partner, played a vital role in supporting the entrepreneurial team throughout the hiring processes, ensuring resource quality and traceability. Consequently, the ZhanaSolutions team has enhanced its ability to perform complex administrative tasks, reducing risks.

Sales growth

- **Challenge:** Despite substantial sales growth, the projected target was not achieved because of the decline in the HORECA sector and the limited acceptance of the Zhana Zones.
- **Solution:** Formed strategic alliances with local authorities in Bogotá and Cartagena, as well as trade associations like ACODRES and ANGAT. The commercial efforts focused on franchises and major clients, aiming to meet short-term sales targets.

Profitability

- **Challenge:** EBITDA was positive but fell short of expectations because operational growth was limited by reduced new investment resources in Colombia.
- **Solution:** ZhanaSolutions has been managing bridge investment resources to leverage the achievements made with the P4G donation funds.

Access to national actors

- **Challenge:** Engagement with technical and political stakeholders at the national level was more limited than expected due to institutional barriers.
- **Solution:** By employing a high-level liaison recruited by the project, direct access was secured to important local and national stakeholders to foster partnerships.

Advances in ESG and gender

- **Challenge:** Despite progress in sustainability, gender-related efforts faced significant obstacles because of the limited presence of women in operational roles. This is a structural sector-wide issue, not exclusive to ZhanaSolutions.
- **Solution:** Emphasizing the integration of women into strategic and administrative sectors, focusing on sustainable growth in their participation.

BOX 2.

Critical decisions that enhanced the project's execution

Thanks to the hiring processes facilitated by the project's resources, which strengthened the company's teams and expanded partnership development efforts, a series of strategic decisions were made that resulted in the achieved outcomes.

Implementation of Donation Resources

Partnered with an experienced administrative team that has strong skills in managing non-reimbursable resources, offering full support to the team. From the project's inception, all hiring processes were thoroughly documented to enhance audit traceability.

Commercial Strategy

Focus on major accounts with full-service packages, develop a Commercial Strategy Manual, grow through franchising, implement specialized sales roles (SDR/BDR), and utilize HubSpot CRM. Prioritize hotels, restaurants, and food producers. Utilize metrics such as MRR, ARR, and LTV/CAC, along with dashboards, to enhance commercial performance and tracking.

Technology and Operations

Implementing IoT sensor technology to produce real-time data for informed decision-making. Incorporating sensors with backup storage and preventive maintenance programs achieved operational savings by repairing motors (cutting costs by 70%) and focusing collection efforts on high-generation points.

Institutional and Policy Participation

Enhanced dialogue with public policy entities through technical roundtables and a collaboration agreement with the SDA. The project developed an industrial kitchen wastewater management model utilizing solid technical data, contributed to the inclusion of fat management in the 2025 political agenda, and advanced proposals for fat valorization, all based on thorough technical studies conducted in collaboration with reputable partners, funded by the donation.

Financial and Investment Preparation

Environmental impact documentation was developed to attract investors, while financial models were refined with feedback from Fondo Acción. Ongoing training and coordination between commercial and financial teams improved data accuracy, supported by visual tools. A Shareholders' Agreement was also established to formalize governance roles and responsibilities.

Market and Communication

Shifted from a product-only approach to offering an integrated external service and focused on key clients (large chains) to encourage adoption among smaller businesses. Sustainability education was embedded into communication efforts, and outreach was broadened through Instagram, YouTube, and LinkedIn. Impact metrics were added to the financial dashboard to help clients improve their communication strategies and strengthen their brand.

Geographical and Strategic Adjustments

Activities shifted toward Bogotá and Cartagena, where greater progress was achievable. Budgets were reallocated to emphasize travel and sector events, while policy recommendations were revised to highlight the broad benefits of the industry rather than focusing solely on the leading company.

Systematization and Documentation

The financial partner not only supported the resource execution process but also shared their expertise in systematizing experience for learning, helping develop these capabilities within the team.

Lessons learned

Based on the results and the implementation process, the partnership between Fondo Acción and ZhanaSolutions yielded a set of lessons during the execution of the P4G donation resources. These lessons, together with the insights gained from this collaboration prior to the project, will inform the continuation of their joint work.

Commercial strategy and market dynamics

- Partnerships, events, and direct involvement proved to be the most successful channels for generating business opportunities.
- Adding a Sales Development Representative (SDR) led to more qualified opportunities and better conversion rates.
- Segmenting customers by type allowed for more effective personalized strategies; loyalty was based on consistent technical support rather than merely a strong sale.
- Market value perception relied on pedagogical narratives, where franchisees and restaurant chains were more convincing than regulators in showcasing benefits.

Technical and operational perspectives

- IoT traps encountered challenges in regions lacking reliable connectivity, leading to the adoption of offline solutions and backups stored on SD cards.
- The recurring technical failures highlighted the importance of regular support, as many clients were not performing proper cleaning.

- Redesigns in equipment, such as gears, increased their longevity, while monitoring tools played a crucial role in predicting failures.
- Maintenance was more frequent and costly than expected, reinforcing the need to budget for technical assistance as a continuous service.

Institutional and policy advocacy

- The P4G National Platform in Colombia conducted activities to monitor the project and offer guidance for coordinating with national entities. This support, which includes facilitating dialogues and providing technical advice, can help entrepreneurs learn more quickly and progress toward systemic change.
- Jointly and early defining the scope of each actor (business partner, administrative, liaison, and the national P4G platform) contributes to better coordination and ensures that expectations are aligned from the beginning.
- The collaboration with FONTUR, SDA, and sectoral guilds opened opportunities for scalability and replicability, although working with the public sector required more time and persistence.
- At the local level, working with environmental authorities allowed us to take advantage of programs like Green Businesses in Bogotá.
- Political advocacy requires specialized support and early alignment with public actors.
- The importance of sector-based regulatory differentiation was recognized, consistent with international practices.

Financial and governance

- While the G-Trap generates over 95% of the revenue, diversifying income sources between recurring and extraordinary income remains essential.
- The financial model overlooked the significance of including impact metrics for investors and the need for dedicated accounting personnel.
- Attracting new investors during a business growth phase involves understanding and managing the requirements and regulations associated with financial resources, which are aimed at strengthening the company. This underscores the value of support from a partner like Fondo Acción, which offers more than just financial input, and emphasizes the need for gradual implementation of necessary adjustments.

Environmental and impact measurement

- Monitoring environmental indicators has become a strategic tool for communication and credibility.
- The brown fat study revealed unforeseen technical conditions and confirmed both its energy potential and the risks of late collection.
- The G-Trap showed better environmental performance than passive traps, reducing emissions by 270% and gray water footprint by 340%, while also making progress in meeting other effluent standards (pH, BOD_5, COD).
- Measuring social impacts is not straightforward and requires specific studies that include working conditions, but also public health issues.

Photo: Juana Camacho

Recommendations

Drawing on ZhanaSolutions and Fondo Acción's experience in helping the company access investment funds and facilitate growth, here are several recommendations for donors and other entrepreneurs to optimize future initiatives.

For donors

Build strong, diverse, and inclusive teams across multiple disciplines.

ZhanaSolutions shows that integrating technical, commercial, financial, and public policy advocacy skills is crucial for progress in emerging markets. Combining expertise in financial management, stakeholder engagement, and sector knowledge enhances the company's ability to attract investment and create a positive impact. Teams that are diverse and inclusive bring a range of perspectives, enriching the ventures they undertake.

Provide adaptable financing options.

In contexts of economic contraction, innovative models require resources that reduce risks in early stages. Donations, bridge investments, and adapted debt mechanisms help sustain critical operations, consolidate teams, and lay the groundwork for large-scale commercial investment. Opportunities like those offered by P4G enable impact ventures to overcome the 'valley of death' in their growth process.

Help forge unconventional partnerships with public entities and private associations.

Utilize institutional partners to establish forums at both national and local levels where entrepreneurs can showcase their proposals for enhancing the enabling environment. This approach encourages collaborations and broadens the entrepreneurial network beyond just commercial activities.

For entrepreneurs

Establish transparent technical evidence and financial metrics to ensure accountability and transparency.

The development of solid studies on the energy potential of fats, along with their environmental and social impact, and commercial indicators such as MRR, ARR, LTV/CAC, or CO_2eq emission reductions, strengthens credibility with investors, clients, and regulatory authorities.

Positioning themselves as a tech company that delivers double impact.

Beyond just offering grease management services, ZhanaSolutions can enhance its value by establishing itself as a technology innovator, developing advanced solutions such as the G-Trap and remote sensing systems, which could be adopted in other markets. Moreover, through its circular management model, the company achieves a dual impact: safeguarding water resources and lowering emissions, while also linking into the biofuel industry's value chain. These initiatives address the interconnected challenges of water, energy, and materials.

Connect social inclusion and gender considerations to the business model.

Advancing the inclusion of women and young people in technical and administrative areas not only strengthens equity but also contributes to the sustainability of human talent and the social legitimacy of the model. It is crucial to recognize, however, that in the early stages of this company's development, the focus on gender and inclusion must compete for the limited time and resources of the entrepreneurs. Therefore, it is essential to assess the scope of the objectives in these areas.

Conduct a social impact assessment to communicate the impact clearly.

A crucial aspect for impact companies to achieve their goals is the capacity to quantify their social issues. This involves unique methodologies and approaches that a typical tech startup may lack. Therefore, it is essential to invest resources in creating measurement and evaluation tools for assessing their social impact.

Conclusions

Colombia's regulatory and policy environment is evolving rapidly toward stricter control of wastewater discharges and the valorization of organic residues, setting the stage for scalable market opportunities in circular sanitation and bioenergy. Although Resolution 0631 of 2015, which establishes permissible discharge limits for non-domestic wastewater, does not explicitly cover restaurants, hotels, or cafeterias, these sectors are increasingly recognized as major contributors of fats, oils, and grease (FOG) to sewer networks.

This regulatory gap has led utilities and local authorities to implement municipal-level discharge control programs and to demand preventive measures such as grease-trap installation, regular maintenance, and proof of proper disposal. ZhanaSolutions leveraged this context during the P4G project to advance policy dialogue, providing technical inputs for a broader policy discussion on the inclusion of commercial kitchens in national wastewater regulations, as well as incentives for the recovery and valorization of brown grease.

At the same time, the broader policy ecosystem is becoming increasingly favorable. The National Development Plan (2022–2026) prioritizes the reuse of treated wastewater, the adoption of a circular economy, and the decarbonization of urban infrastructure. The National Circular Economy Strategy (ENEC) and related roadmaps in Bogotá and Cartagena explicitly promote the valorization of organic waste streams. Complementary frameworks, such as Resolution 0316 of 2018 on the management of used cooking oil (UCO) and Law 2099 of 2021 on non-conventional renewable energy, reinforce regulatory momentum toward sustainable feedstock recovery and energy transition. These overlapping agendas create a policy convergence around waste-to-resource business models, where ZhanaSolutions' integrated approach directly aligns with public objectives for pollution control, renewable energy generation, and compliance facilitation.

ZhanaSolutions is uniquely positioned to capitalize on Colombia's evolving regulatory and policy landscape for wastewater and bioenergy. By identifying and addressing a blind spot in national regulation, the company established itself as a first mover in policy-aligned innovation and a trusted technical ally for both policymakers and utilities. Its leadership during the P4G project brought institutional attention to the problem of fats, oils, and grease (FOG) in urban wastewater systems, strengthening ZhanaSolutions' credibility as a reference for future regulatory frameworks. Even in the absence of explicit national mandates, ZhanaSolutions' comprehensive service model, combining grease-trap maintenance, digital telemetry, certified waste collection, and traceability, offers municipalities, restaurants, and hotels a practical path to compliance and environmental responsibility. These capabilities make Zhanasolutions the de facto compliance partner for local governments and private operators seeking to anticipate new regulatory requirements.

At the same time, ZhanaSolutions' integration of waste management, traceability, and bioenergy recovery positions it as a preferred partner for utilities and a key supplier to the renewable energy sector. Its operations directly reduce sewer maintenance costs and improve wastewater treatment performance, aligning with municipal objectives for a circular economy. With Colombia's biodiesel blend mandates and Law 2099/2021 providing stable demand and fiscal incentives for renewable feedstocks, ZhanaSolutions' certified FOG-derived inputs can command premium market value while contributing to national decarbonization goals. Through this combination of regulatory alignment, operational efficiency, and innovation in circular value creation, Zhanasolutions has solidified its reputation as a pioneer in the urban circular economy and an attractive partner for donors, investors, and public entities seeking a scalable and measurable impact.

Photo: Juana Camacho

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Annex

Table 2. Information sources

ID	Source type	Code	Institution or actor	Topic
1	Petition	DP-001	Office of the Attorney General of the Nation	Petition about resolution 0631 of 2015 revision
2	Petition letters	DP-002	Superintendence of Public Utilities	Supervision responsibilities and impact on public funds
3 4	Petition letters	DP-003	Environment and Sustainable Development Ministry	Answer to the petition about the adjustment of the resolution 0631 of 2015 from the Environment and Sustainable Development Ministry
5	Petition letters	DP-004	Office of the Attorney General of the Nation	Transfer of the inquiry regarding the adjustment to Resolution 0631 of 2015 to the Ministry of Environment and Sustainable Development (MADS)
6	Interviews	EN-001	Julio Galindo - P4G	Project supervision
7	Interviews	EN-002	Francisco Vivas - ZhanaSolutions	Project structure
8	Interviews	EN-003	Miguel Romero - CarbonBox	Carbon footprint and water footprint
9	Interviews	EN-004	Transforma Marketing - Gerardo Torres	Marketing
10	Interviews	EN-005	Sebastián Guerrero -Financial consultant	Financial model and processes
11	Interviews	EN-006	Tomás Correa - Sense IA	Sensor technology and telemetry
12	Interviews	EN-07	María Alejandra Urrutia	Stakeholder management
13	Interviews	EN-008	ZhanaSolutions Team	Project results
14	Interviews	EN-009	Katherine Ballestas	ACODRES Cartagena
15	Technical reports	ET-001	Universidad EAN	Ecotoxicological prospecting analysis
16	Technical reports	ET-002	Universidad EAN	Brown fat's chemical and physical analysis
17	Technical reports	ET-003	Zhana Solutions	Background on the management of oils and fats in wastewater
18	Technical reports	ET-004	Universidad EAN	Regulation analysis

ID	Source type	Code	Institution or actor	Topic
19	Technical reports	ET-005	CarbonBox	Carbon footprint and water footprint of G-trap
20	Consultant reports	IC-001	Biotrade	Brown fat analysis for biodiesel production
21	Consultant reports	IC-002	Quarta	Legal advisory
22	Consultant reports	IC-003	Camila Cristancho	Project management
23	Consultant reports	IC-004	Carolina Varón	Project management
24	Consultant reports	IC-005	Transforma Marketing	Marketing strategy
25	Consultant reports	IC-006	Santiago Morales	Sales process
26	Consultant reports	IC-007	Mateo Chalarca	Sales process
27	Consultant reports	IC-008	Sebastián Guerrero	Sales process
28	Consultant reports	IC-009	Danilo Arenas	Sales process
29	Consultant reports	IC-010	Sense IoT	Sensor technology
30	Meeting record	ME-001	DNP - DDU	Meeting with the Urban Development Department (DNP)
31	Meeting record	ME-002	Stakeholders	First technical roundtable in Cartagena
32	Meeting record	ME-003	Office of the Attorney General of the Nation	Bilateral meeting
33	Meeting record	ME-004	Cartagena's mayor's office	Meeting with the Cartagena Mayor's Office (Department of Tourism and Environmental Affairs)
34	Meeting record	ME-005	DNP - DIE	Meeting with the DNP office for infrastructure and sustainable energy
35	Meeting record	ME-006	Stakeholders	Second Technical Meeting: Incentives for the Private Sector
36	Other	OT-001	Cristian Espejo	Operational management
37	Other	OT-002	ZhanaSolutions	Quarterly report to P4G Q2 2024
38	Other	OT-003	ZhanaSolutions	P4G Workplan
39	Other	OT-004	ZhanaSolutions	Project concept note
40	Other	OT-005	ZhanaSolutions	Change theory for the project
41	Other	OT-006	ZhanaSolutions	Performance report Q2 2025

Table 3. Financial indicators

Financial Metrics	Before	After	Notes
Total Contract Value	$729,412.00	$966,101.00	
Revenue	$91,532.70	$164,574.21	Total revenue (jan-jun)
Gross Profit	$4,705.43	$104,477.03	Revenue minus cost of goods sold (COGS)
EBITDA	-$60,968.88	$24.700	Earnings before interest. Taxes. Depreciation and amortization
Net Income	$90,169.78	$17,763.58	Profit after all expenses and taxes
Operating Expenses	$111,942.78	$111,490.35	Total expenses for operations
Cash Flow	$33,900.21	$34,010.45	Net amount of cash inflow/outflow
Number of customers	26	56	Number of clients
Number of Offtake Agreements	28	67	Number of purchase agreements signed
Client Growth Ratio YoY	N.A.	65%	Increase in clients in the last year
Gross Margin Ratio	5%	63%	Gross Profit / Revenue x 100
Gross Ebitda Ratio	-67%	7%	Ebitda / Gross Profit x 100
Debt-to-Equity Ratio	NA	NA	Describe financial leverage in the last FY
Customer Acquisition Cost (CAC)	$1,894.00	$612.00	Cost of acquiring a new customer
Lifetime Value (LTV)	$21,307.00	$2,938.83	Total revenue expected from a customer
Investment Achieved	$1,216,000.00	$1,411,000.00	Investment achieved through equity. Debt and mixed instruments

Table 5. ESG Indicators

ESG Metrics	Before P4G Funding	After P4G Funding	Notes
Carbon Emissions (tonnes CO_2e)	56.6	95.8	Total CO2 emissions in the last FY
People positi-vely affected	240	420	These are individuals directly and indirectly positively affected by climate resilience or adaptation related to the climate business, commercial partner, product, or solution.
Jobs created	13	12	Jobs created outside of the commercial partner
Gender Diversity (% female employees)	38%	33%	Percentage of female employees
Compliance and Risk Management	Describe	Capacidades mejoradas en la gestión de riesgos. Los riesgos laborales y fiscales se mitigaron mediante asesoría legal especializada, que desarrolló plantillas conformes a regulaciones más estrictas. También se avanzó en el proceso de propiedad intelectual para patentar innovaciones.	Compliance Report (Laws and Regulations)
			Risk practices (processes and responsibilities)
			Risk management documentation (identification, mitigation, and control)
			Audit policies (internal - external)
ESG Reporting and Transparency	Describe	La inclusión y la diversidad han mejorado a nivel estratégico. Se creó una política de gobierno corporativo basada en buenas prácticas. Documentos corporativos creados.	Frequency of ESG reporting (# reports per year).
			Adherence to Standards (GRI SASB TCFD)
			Clear governance structure
			Integration with financial reporting
Board Diversity	75%	75%	% of Women on the board of members