Colombia

SOLUTIONSPLUS I SCALE-UP CONCEPT NOTE

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PROJECT PARTNERS

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Scale-Up Concept

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Scale-up Concept and Strategy

Introduction

The decarbonization of transportation has become a central aspect in the sustainability agendas of organizations, in line with established global objectives. According to the International Energy Agency (IEA, 2023)*, achieving the goal of net zero emissions by 2050 requires a 20% reduction in transport sector emissions by 2030. Additionally, transport emissions have increased at an average annual rate of 1.7% from 1990 to 2022, faster than any other sector except industry.*

China maintained its lead in electric vehicle (EV) sales globally in 2022, dominating not only in cars but also in light commercial vehicles, 2-wheelers, buses, and trucks. The United States made significant strides in transport decarbonization through policies like the Inflation Reduction Act, focusing on accelerating EV adoption and production of alternative fuels. The European Union pushed for EV transition with initiatives like the Green Deal Industrial Plan and agreements mandating public charging infrastructure. Norway led in electric car sales share, reaching nearly 90% in 2022. India introduced schemes like Production Linked Incentives to boost domestic battery manufacturing and promote sales of advanced automotive components and vehicles. Australia committed to implementing fuel efficiency standards for vehicles and formulated a National Electric Vehicle Strategy to promote EV adoption in early 2023 (ibid).

In the case of developing countries, initiatives have been developed to promote the use of electric vehicles, alternative fuels, and the adoption of new distribution models in business operations. However, significant challenges persist regarding infrastructure, public policy formulation, decision-making within companies, investment in electric vehicle charging infrastructure, promotion of fiscal and financial incentives for the acquisition of clean vehicles, and collaboration between the public and private sectors to develop comprehensive and scalable solutions. These obstacles remain a significant impediment to achieving the objectives mentioned (Valencia, Olaya, & Arango, 2023)

In this context, it is crucial to provide recommendations to the private sector to facilitate a smoother transition without impacting operational costs. This document focuses on developing a roadmap *for a company in the food sector, and it is organized as follows: 1) Objective, 2) Cost analysis, 3) Recommendations and road map, 4) Budget, and 5) References.*

Objective

The aim of this document is to analyze the scalability of the project conducted under the Solutions Plus replica pilots, in collaboration with Nutresa. It aims to provide recommendations and a roadmap to guide the integration of new technologies and distribution models into their operations.

Cost analysis: Total cost of ownership

When it comes to electric vehicles, the high costs of this technology stand out as a major barrier. Despite the incentives offered by various countries to promote their adoption, there is a belief that they still represent a considerable investment for companies transitioning to a more environmentally friendly fleet. On the other hand, in the case of new distribution models, the main obstacle is the infrastructure available for last-mile deliveries, a challenge that can be overcome through collaboration between companies. Therefore, this section will focus on understanding the total cost of acquiring an electric vehicle compared to the costs of a conventional internal combustion vehicle, aiming to determine which option is more cost-effective in the long run. Evidence suggests that in many cases, the total cost of ownership of an electric vehicle may be lower than that of a diesel vehicle, even without financial incentives provided by governments (Gil & Silveira , 2023).

Total cost of ownership (TCO) is a critical analysis for decision-making both at the individual and business levels. Therefore, various studies have been conducted in this regard. For example, Weldon et al. (2018) *conducted a detailed comparative analysis of the ownership costs of electric vehicles and similar internal combustion engine vehicles. They considered the following costs: Government incentive (benefits), cost of vehicle purchase, costs of battery replacement, annual vehicle tax, maintenance, and repair costs. The results indicated that electric vehicles are cost-competitive with internal combustion vehicles when considering a 10-year analysis period.*

Wu et. Al (2015) *conducted a study using probabilistic simulation analysis to compare the total cost of ownership of electric vehicles with that of internal combustion engine vehicles. They found that while the costs of owning an electric vehicle might be lower than those of an internal combustion vehicle by 2025, the results suggested that the TCO approach used in the study might not fully capture how consumers decide on vehicle purchases. They recommended introducing policy measures to educate consumers about the total costs of ownership associated with different vehicle types.*

On the other hand, Bubeck et. Al (2016) *conducted an analysis of the total cost of ownership of passenger electric vehicles in Germany, using a component-based approach and providing a projection of their future development until the year 2050. In their study, they explored various vehicle categories, user profiles, and propulsion technologies. Additionally, they examined the CO2 reduction potential offered by different types of electric vehicles and assessed incentives for buyers as a strategy to promote the adoption of electric vehicles on German roads. The results revealed that, for electric vehicles to be competitive currently, incentives for buyers are required, ranging from 9,144 to 34,451 USD, depending on the vehicle size and user profile. Finally, according to cost projections, electric vehicles are estimated to achieve economic viability without incentives starting from the year 2030.*

Considering the above, three scenarios are proposed in which the total cost of ownership of an electric van, two electric motorcycles, and two electric tricycles will be calculated, comparing them with the TCO of a combustion van. This analysis considers all costs that occur throughout the life cycle of a particular asset and aims to be useful when conducting comparative analyses. The costs related to the acquisition of a vehicle begin from the moment of purchase until its sale or final disposal (Clement & Moyo, 2023). *Additionally, we will use a discount rate, which allows us to calculate the present value of future money (ibid).*

For the TCO calculation, the net present value (NPV) methodology will be used, considering the variables specified in Figure 1.

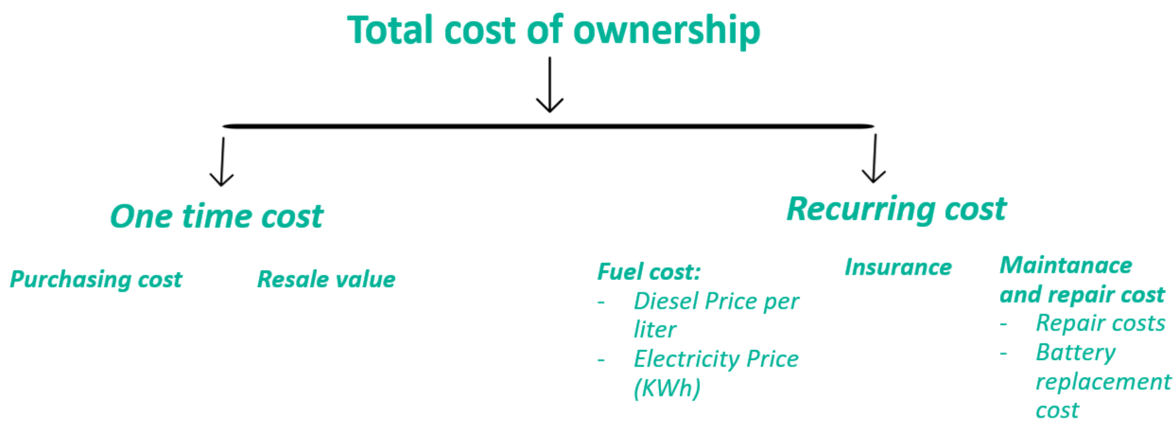

Fig 1. *Variables considered in the analysis.* (Clement & Moyo, 2023)

The vehicles to be considered in the analysis are an electric Dongfeng van with a one-ton loading capacity, a Minitruck TM internal combustion platform of the same capacity, 2 electric tricycles, and 2 electric motorcycles. The technical specifications of each vehicle are shown below.

Vehicle features	***Electric Dongfeng van***	***Electric tricycle***	***Electric motorcycle***	***Minitruck TM***
Autonomy (km)	*240*	*35*	*50*	*N/A*
Load capacity (max)	*1100 kg*	*250*	*400*	*1340 kg*
Battery capacity (KWH)	*41.86*	*0.672*	*1*	*N/A*
Battery lifespan (Full charge cycles)	*2500*	*800*	*500*	*N/A*
Charging time (h)	*8 - 10*	*4-6*	*6-10*	*N/A*
Maximum speed (km/h)	*90*	*15*	*35*	*163.22*
Engine reference	*N/A*	*N/A*	*N/A*	*DAM 15R*

Vehicle features	*Electric Dongfeng van*	*Electric tricycle*	*Electric motorcycle*	*Minitruck TM*
Engine displacement (cc)	*N/A*	*N/A*	*N/A*	*1498*
Fuel	*N/A*	*N/A*	*N/A*	*Gasoline*

Table 1. *Vehicle specifications.* (FOTÓN, 2024)*;* (Auteco, 2024)*;* (LOLA, 2023)*;* (Ecotriciclos, 2023)

The selling price of the ***electric van*** *is* ***$24,200*** *USD (VE1 from now on), for the* ***electric motorcycle*** *(VE2 from now on) is* ***$4,075 USD****, for the* ***electric tricycle*** *(VE3 from now on)* ***is $5,680 USD*** *and for the* ***minitruck*** *is* ***$20,124 USD (****VE2 from now on). According to Law 1964 of 2019 in Colombia, the vehicle tax for electric vehicles cannot exceed 1%, while for combustion vehicles, it is 2.7% (Autofact, 2024). Additionally, the Compulsory Traffic Accident Insurance (SOAT) is considered, which has an approximate value of $968,800 COP (Sura, 2024), with a 10% discount for electric vehicles. Finally, the Technical-Mechanical Inspection must be taken into account, which must be carried out from the fifth year of purchasing the vehicle, for the electric vehicles we will assume a value of $115 USD, and for the VC2, it will be $127 USD. It's important to consider that electric tricycles (VE3) are not required to pay vehicle tax, SOAT, or technical-mechanical inspection.*

In the specific case of the VE1 batteries, considering their lifespan of 2500 charging cycles, it can be inferred that the battery should be replaced by the seventh year of operation. This estimation is supported by various studies suggesting that lithium batteries are typically replaced between 6 and 10 years of use (Clement & Moyo, 2023)*. According to a study published by Bloomberg New Energy Finance (2019), it is expected that by 2030, the prices of lithium batteries will plummet to USD 73 /KWh. For the VE2 and VE3, a battery lifespan of 2 years is considered, according to the manufacturers' specifications. This will incur a cost of $255 USD.*

Regarding the costs of gasoline and electricity, this study assumes a constant price of $3,82 USD per gallon for gasoline and $0,038 USD per kWh for electricity. When it comes to vehicle maintenance costs, this study includes tire replacement for all vehicles in the fifth year of operation, with a standard price of $84 USD for the case of the VE1 and the VC2, $33 USD for the case of the VE2 and the VE3. For the VC2, maintenance costs include oil and filter changes, which should be done every 6,000 kilometers and are estimated at $46 USD. For VE2 and VE3, an average annual maintenance cost of $153 USD is considered, excluding battery and tire replacements, in case of any eventualities. In Colombia, the price of vehicle insurance depends on various factors such as the insurance provider, the model, the driver's behavior, the driver's marital status, etc. Therefore, since the process is personalized and the price range is wide, this variable will not be considered in the equation.

Finally, depreciation can be understood as an accounting mechanism that allows estimating the loss of value of a specific asset due to its use and wear (Zuluaga & Mora, 2022). In the case of vehicles, this depreciation is related to the model, mileage, and natural wear and tear. Thus, in the Colombian context, within the first two years, a car loses 20% of its original value (Autofact, 2024). For the purposes of this study, we will define a depreciation rate of 10% annually for VC 2 and a rate of 20% for VE1, VE2 and VE3.

This is because zero-emission technology vehicles tend to depreciate faster than conventional ones, given the constant advancements in this regard (Clement & Moyo, 2023).

The formula used to calculate the total cost of ownership is described below (Clement & Moyo, 2023)*:*

$$TCO = PP - \frac{RV}{(1+r)^n} + \sum_{n=1}^{N} \frac{(FC + 1 + MR + AT)}{(1+r)^n}$$

Where:

TCO = Total cost of ownership of the vehicle

PP= Original price

FC = Fuel cost of the vehicle

MR = Maintenance and repair costs

RV = Resale value

AT= Annual taxes

r = discount rate (5%)

n = Vehicle ownership period

N = lifetime of vehicle ownership

On the other hand, the resale value of the vehicles is calculated as follows:

$$RV = PP(1-i)^n \cdot \frac{1}{(1+r)^n}$$

Where,

RV = resale price

PP = Purchasing price

i = depreciation rate

n = years of ownership of the vehicle

It was found that the total cost of ownership in a 10-year analysis for the VE1 is $35,325 USD, whereas for the VC 2, it is $70,927 USD. We can see how, even with double the depreciation, a higher initial price, and considering a battery replacement in the seventh year, the electric vehicle is much cheaper in *terms of costs, positioning itself with a significant difference of $35,602 USD. In the second scenario, it was determined that the total cost of ownership for two motorbikes is $17,368 USD, representing a difference of $53,559 USD compared to the combustion Minitruck. As for the third scenario, it was observed that 2 tricycles have a total cost of ownership of $15,940 USD, which implies a difference of $54,986 USD compared to the VC2. (**Fig 2**)*

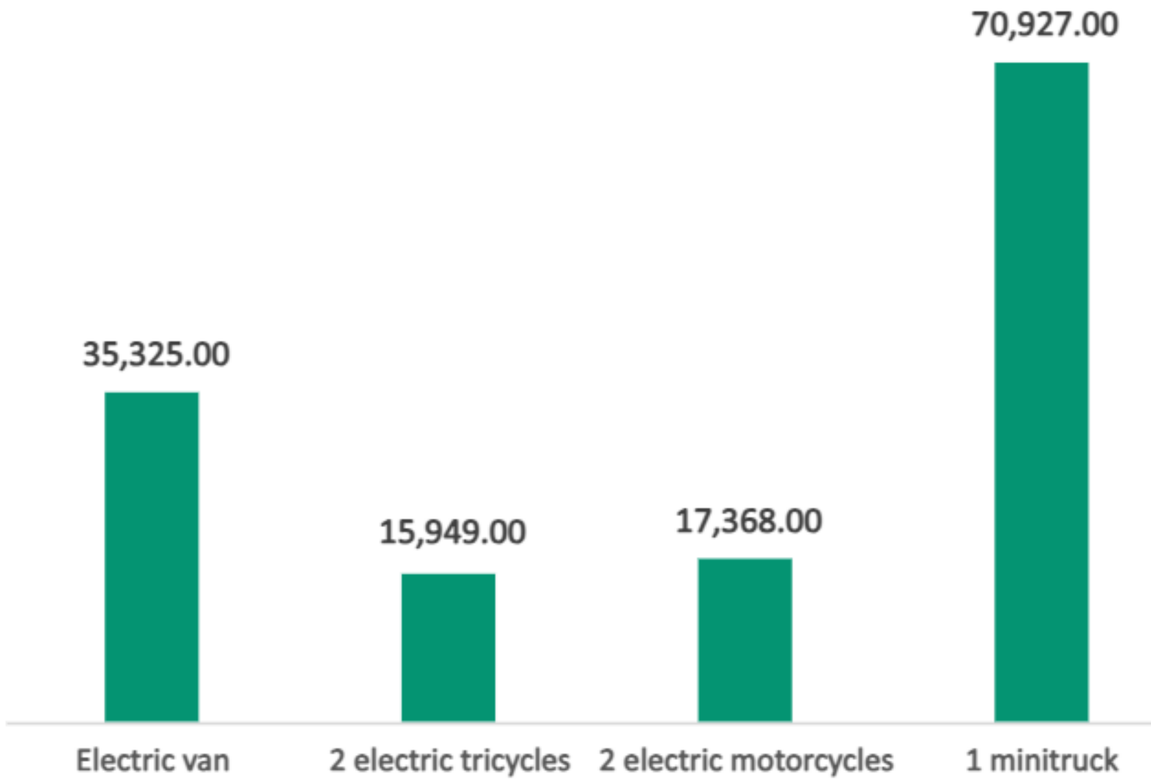

***Fig 2.** Total cost of ownership of each vehicle (USD)*

Current status of Nutresa

Grupo Nutresa is a prominent company in Colombia's food sector, with eight business units covering meats, biscuits, coffee, consumer foods, ice cream, pasta, and other products (Grupo Nutresa, 2023)*. The company handles the processing of raw materials and the distribution of its products. For its distribution operations, Nutresa has a hybrid model, i.e. part of its outsourced fleet is its own and the other part is outsourced. Currently, it has approximately 534 vehicles for its transportation operations throughout the country, of which only 21% are operated by the company itself, while 79% are outsourced and operated by companies commonly known at Nutresa as "Commercial Agents".*

*The outsourced fleet is distributed according to fuel type as follows (**Fig 3)**:*

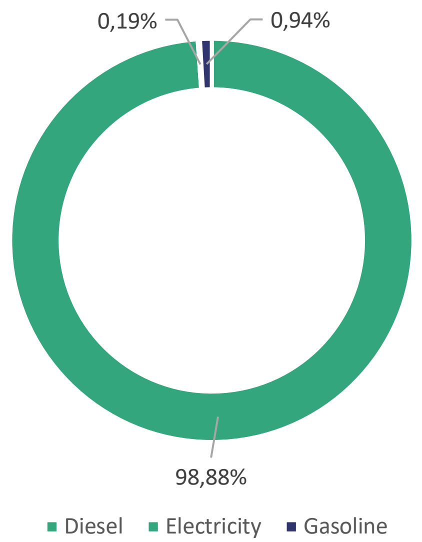

Fig 3. *Classification of outsourced fleet by fuel type*

Figure 3 shows that in the case of the outsourced fleet, the main fuel used is diesel, since approximately 99% of the vehicles use this type of fuel.

Likewise, Figure 4, which shows the classification of the company's own fleet by type of fuel used, shows that diesel is the predominant fuel with about 89%, but here we can see the first efforts in Nutresa for the electrification of its transport operations, since approximately 10% of its vehicles in its own fleet are powered by electricity.

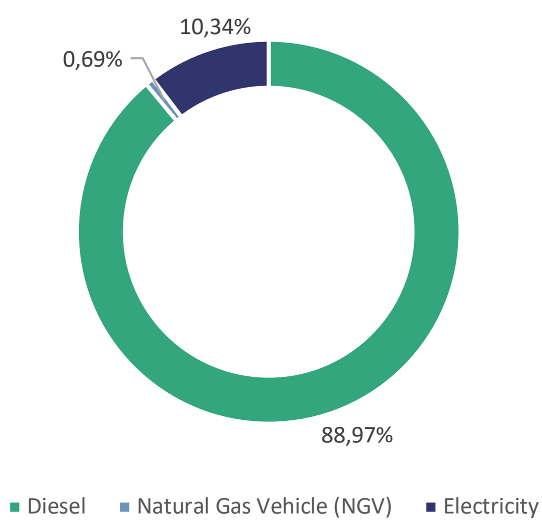

Fig 4. *Classification of own fleet by fuel type*

Since 2019, with the introduction of the first electric vehicles, Nutresa has been making efforts to electrify its transportation operations, mainly motivated by its environmental commitment. Additionally, since 2020, Nutresa has been working hand in hand with LOGYCA to develop pilots to evaluate the feasibility of using alternative vehicles such as electric-assisted trikes and electric three-wheelers, mainly in the cities of Bogota and Medellin. However, with the development of the replica project in the context of the SolutionPlus call, we were able to test the viability of this type of vehicles in an intermediate city such as Barranquilla and in some municipalities of the Department of Atlántico as was the case of the operation in Baranoa and Sabanalarga.

Although Nutresa has already started its journey towards the electrification of its vehicle fleet, seeking to reduce the carbon footprint of its transportation operations. It is no secret that it still has a long way to go, overcoming barriers such as the financing costs for the acquisition of vehicles, the low supply of electric vehicles in Colombia, the need to implement charging infrastructure in its distribution centers, among other aspects.

Considering the above, the following section presents a roadmap for the electrification of Nutresa's transportation operations, where each of the steps that the company must take into account for the renewal of its entire vehicle fleet with electric vehicles is described, as well as the introduction of alternative operating models that allow the replicability of logistics micro-hubs such as the ones they have in Bogota for the operation of the electro-assisted tricycles.

Roadmap for electrification of transportation at Nutresa

The transport of goods, especially in urban centers, plays an essential role in the social and economic aspect of the development of cities. Globally, urban logistics represents between 10% and 15% of the kilometers traveled in cities and employs about 5% of the labor force in cities (TERI, 2020). In Colombia, rapid urbanization is driving demand for freight transportation. According to the United Nations, it is estimated that by 2050, more than 85% of Colombians will live in urban areas, which will likely lead to an increase in commercial activities and the movement of goods.

Today, the transportation sector is responsible for approximately one-fifth of the greenhouse gases emitted in the world. Road freight transport accounts for 20% of freight transport activity, but 75% of the total energy consumed. The road freight transport sector faces a difficult challenge to decarbonize in line with the 1.5 degree trajectory (Smart Freight Centre et al., 2023).

In this context, electromobility emerges as a viable and attractive alternative to improve last mile performance in the food sector. Electric vehicles offer advantages such as reduced greenhouse gas emissions, fuel savings, lower maintenance, lower noise and the possibility of accessing low-emission areas or traffic restrictions. Considering the above, the adoption of new technologies brings both environmental and financial benefits. When combined with efficient distribution models, significant operational and social benefits can be achieved.

However, the adoption of electric vehicles for the last mile also involves a series of challenges and barriers that must be overcome, such as the availability and cost of vehicles, charging infrastructure, autonomy, fleet management, personnel training, regulation, market acceptance, among others.

Therefore, a roadmap is required to guide and facilitate the transition to last mile electromobility for Nutresa, taking into account the particularities of the sector, the country and the different cities. This roadmap is based on international recommendations and on the main conclusions of the pilot operation

"Electrifying the Last Mile" financed within the framework of the call for Solution Plus replica projects for Latin America, implemented in the department of Atlántico, and in the cities of Bogotá and Medellín, where the benefits and positive impacts of electromobility in the last mile were evidenced, both for the company and for the operators and customers. The following roadmap is intended to be an action plan that specifies a series of steps necessary to successfully implement new profitable distribution models, as well as the use of new technologies. This is intended to contribute to the environmental sustainability and operational efficiency of the company. In this case, the scalability analysis is proposed following the route shown in Figure 5.

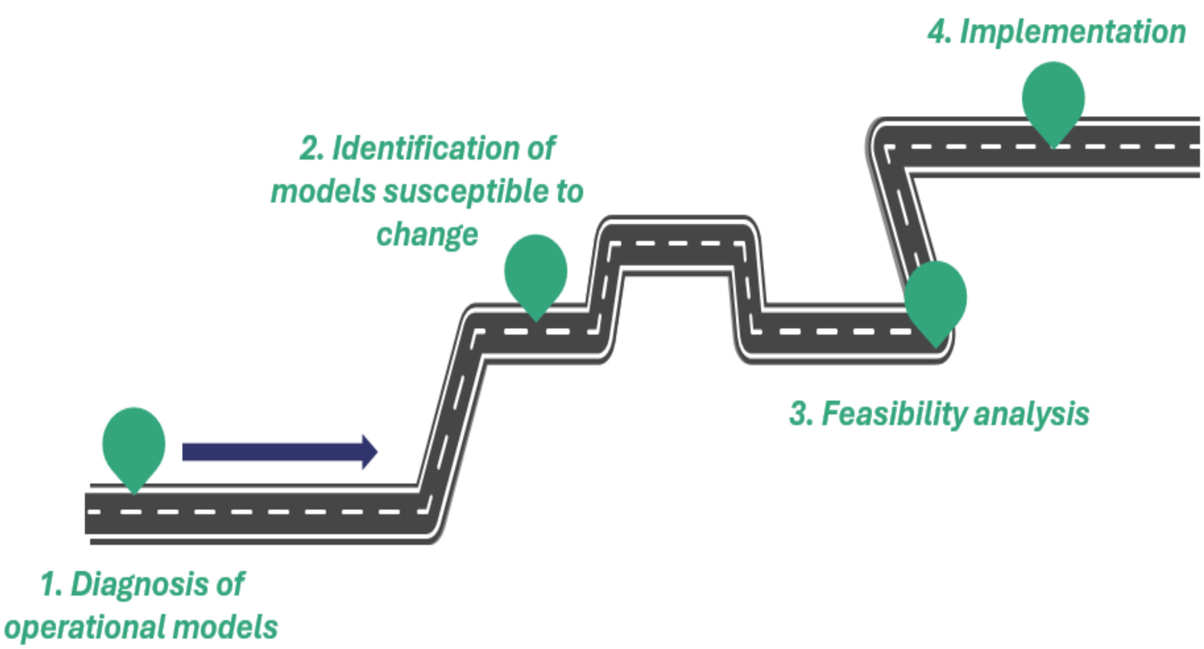

Fig 5. *Scalability roadmap for last-mile operations using electric vehicles at Nutresa*

The first step, ***Diagnosis of Current Operating Models****, should focus on performing a characterization of the operating models used by Nutresa in the different cities in the country where it is currently present. This characterization seeks to evaluate the current fleet, the infrastructure used (Distribution Centers, micro-hubs, cross-docking platforms, etc.) and the delivery routes to understand the use of fuel and* CO_2 *emissions. This includes the analysis of the frequency of deliveries, distances traveled and operating times. Figure 6 shows the main actions required during this phase, as well as the resources needed, and the estimated time required.*

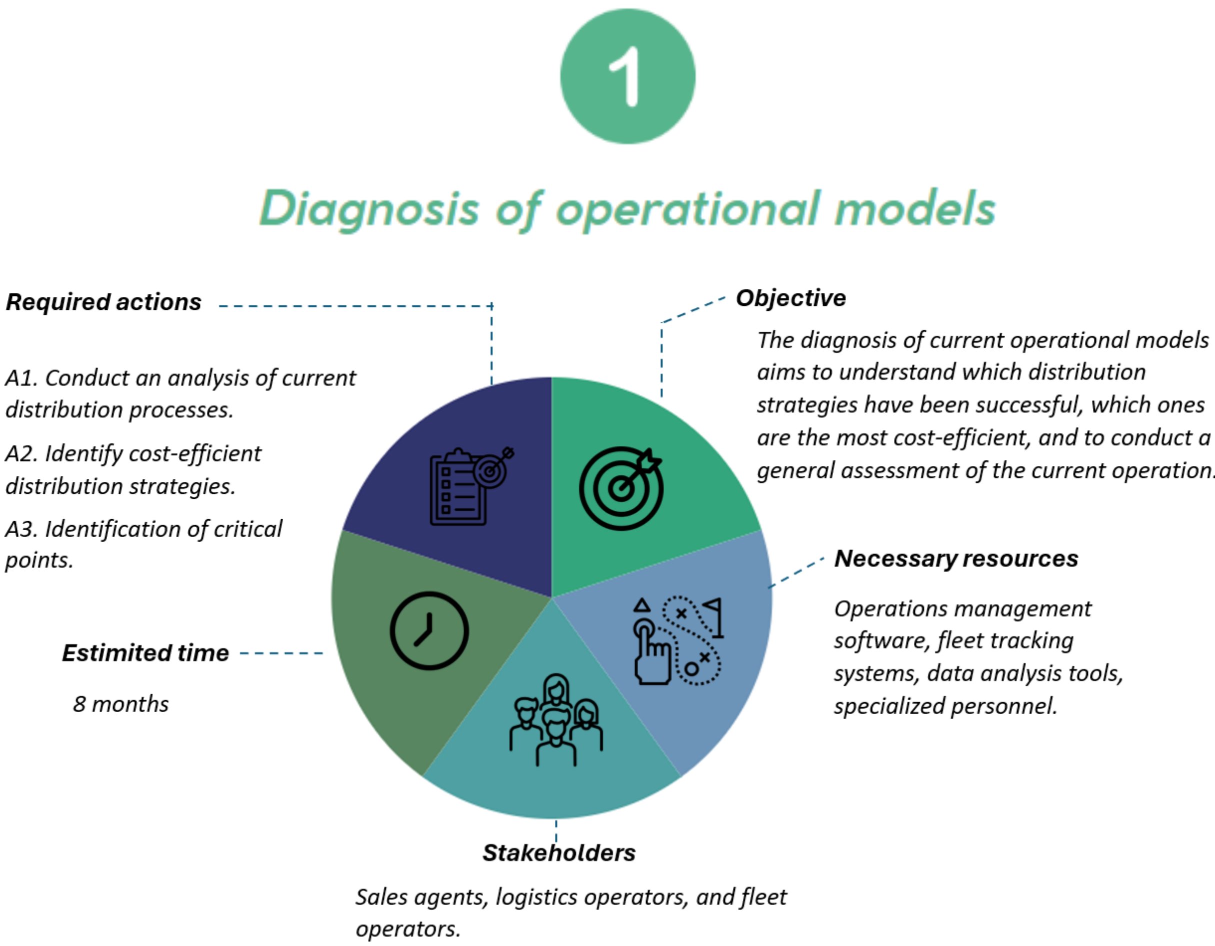

Fig 6. *Diagnosis Phase*

In the second phase, an analysis is conducted to prioritize the operations where the transition to electric vehicles would have an immediate and significant impact, both in terms of operational efficiency and carbon emissions reduction. In addition, critical points that could hinder the transition, such as the lack of charging stations or the need for vehicles with greater autonomy, are identified. Furthermore, the areas of opportunity that could arise from adopting more innovative operating models are evaluated. This includes the possibility of implementing advanced logistics systems, the use of information technologies to optimize routes, and the exploration of strategic partnerships with electric mobility solution providers.

Finally, during this phase, a comprehensive review of zero-emission operating models and vehicles successfully implemented in other countries is planned. This review provides a clear view of international best practices and helps to adapt proven solutions to the Colombian context. Both commercially available electric vehicles and renewable fuel alternatives are considered, always with the goal of achieving an emission-free last mile operation. Figure 7 shows in detail the scope of phase 2.

With these steps, the second phase establishes a solid foundation for a successful transition to electrification of last-mile operations, aligned with global trends and best practices in sustainability and efficiency.

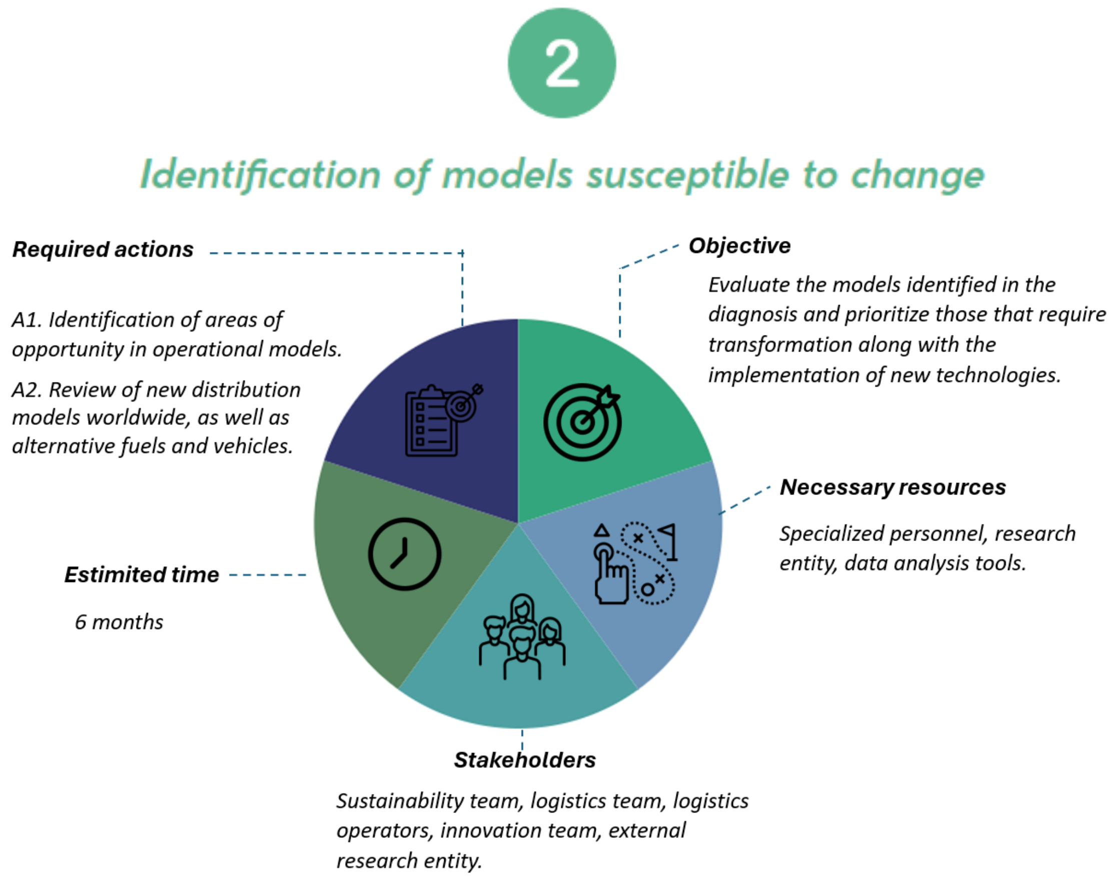

Fig 7. *identification of models susceptible to change.*

The third phase, the feasibility analysis, is crucial to assess whether the transition to electric vehicles is feasible from different perspectives. In the following, I will detail the key aspects of this phase.

- *Technical Feasibility: assess the technical feasibility of electrification of the prioritized operations, considering the available infrastructure, electric vehicle technology and charging needs. This analysis requires assessing the technical compatibility of electric vehicles with existing operations. This includes verifying whether electric vehicles can cover the required distances, support delivery loads, and operate in local climatic conditions. Likewise, it is important to investigate the availability of specific electric vehicle models that adapt to Nutresa's needs. Consider aspects such as autonomy, load capacity and durability.*
- *Financial Feasibility: Conduct a cost-benefit analysis to determine the economic feasibility of electrification, considering investment costs, operational savings, and environmental benefits. Costs associated with electrification should be calculated. This includes the costs*

of purchasing electric vehicles, installing charging infrastructure, maintenance, and operating costs. Compare these costs with current costs (fuel, maintenance of internal combustion vehicles) to determine if the investment in electric vehicles is profitable in the long term.

- *Operational Feasibility: It is important to assess how electrification will affect day-to-day operations. Consider aspects such as the availability of charging points, charging logistics, staff training and fleet management. In addition, identify potential operational challenges and develop strategies to overcome them. For example, establish efficient charging schedules or implement real-time monitoring systems.*
- *Environmental and Social Feasibility: Evaluate the positive environmental impact of electrification in terms of reduced greenhouse gas emissions and improved air quality. It is also necessary to consider the social impact, such as brand perception and acceptance by customers and the community.*

Ultimately, the feasibility analysis provides a sound basis for making informed decisions about electrification of last-mile operations. It is important to involve electric mobility experts, economists, and key stakeholders to ensure a thorough and accurate assessment.

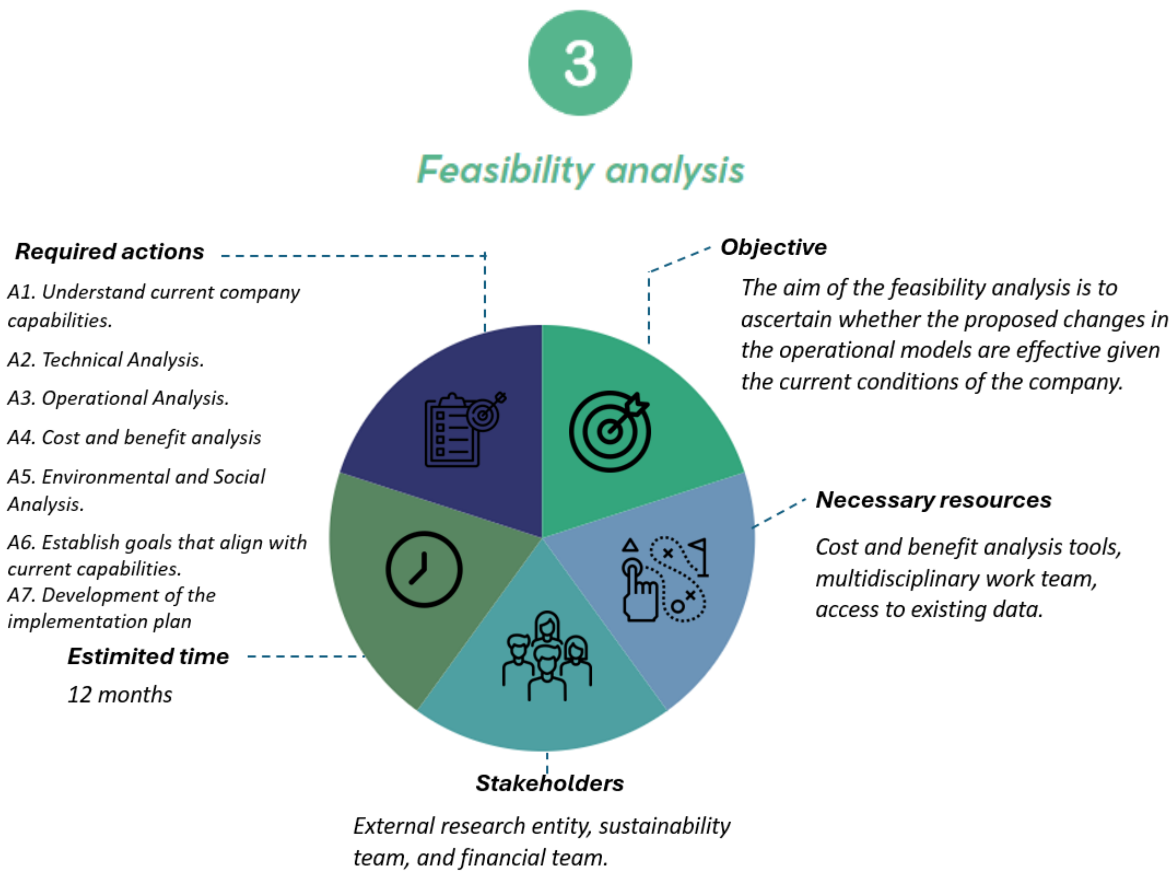

Fig 8. *Feasibility analysis phase.*

The third phase will end with the development of the implementation plan, for which the following activities will be considered.

- *Definition of strategic actions: Identify and prioritize the strategic actions necessary to achieve the objectives set for the electrification of Nutresa's transportation operations. These actions must be specific, measurable, achievable, relevant, and time-bound (SMART).*
- *Planning and sequencing of activities: Establish a detailed planning of the activities necessary for the implementation of the strategic actions. This includes defining deadlines, necessary resources, dependencies between activities and success criteria for each stage of implementation.*
- *Assignment of responsibilities: A governance scheme for the implementation and development of the implementation plan will be constructed through a stakeholder analysis for each of the strategic actions. Through the governance model, the stakeholders responsible for the implementation of each established strategic action will be defined. This may include specific individuals, departments, strategic allies, or other relevant stakeholders. Under this model, it is intended to establish clarity of responsibilities and promote collaboration among stakeholders.*
- *Establishment of indicators and targets: Define monitoring indicators and quantitative and qualitative targets to evaluate the progress and impact of the implementation plan. These indicators should be monitorable over time and allow measuring progress towards the established objectives.*
- *Monitoring and evaluation: Establish periodic monitoring and evaluation mechanisms to review implementation progress. This will make it possible to identify possible adjustments, challenges or barriers that may arise during the process and ensure the adaptability of the strategy based on the results obtained.*
- *Participation of key stakeholders: Through the development of working groups, the participation of key stakeholders in Nutresa will be encouraged for the design and validation of the implementation plan.*

The last phase will focus on the execution of the implementation plan developed in the previous phase. It is important to emphasize that this phase should start with the dissemination of the plan to all employees within the organization in order to mobilize all staff in achieving the objectives set.

Likewise, a communication and awareness campaign should be developed for customers and suppliers about the company's commitment to electromobility, highlighting the environmental, social and economic advantages of this initiative, and seeking their support and collaboration. A communication strategy should be developed and disseminated to inform, motivate and recognize customers and suppliers for their participation and contribution to electromobility, as well as to resolve their doubts, concerns and suggestions in this regard.

In addition, it is important to develop training models for operators for the proper use of these vehicles, since during the pilot it became evident that the operators did not have experience in handling this type of vehicle. A training and awareness program should be developed and implemented to address the technical, operational, environmental and social aspects of electromobility, as well as good practices and recommendations for its use, aimed at all personnel involved in the last mile, including drivers, operators, supervisors and managers, providing information on the use, handling, maintenance, safety and benefits of electric vehicles.

Also, it is important to work jointly with vehicle suppliers, mainly of alternative vehicles such as motorcycles and electric bicycles, in order to develop technical assistance models on the part of the suppliers, providing greater support to the operation when there are problems with the vehicles during their routes, since during the operation, mainly in Bogotá, there were some mechanical failures of the tricycles, which affected the fulfillment of the route and scheduled deliveries.

It was evidenced that the use of alternative electric vehicles, such as motorcycles and electric-assisted bicycles, are in an initial stage of maturity in the country in which the vehicles do not meet the specifications of their data sheets, which was evidenced in the operations of the electric-assisted tricycle that operated in the area of Restrepo in Bogotá and the motorcycles in the department of Atlántico, where the vehicles used a higher amperage and voltage than stipulated, which hindered the operations of the instrumentation of the vehicles. Therefore, joint efforts should be made to develop public-private initiatives to strengthen the capacities of suppliers of this type of vehicles.

Finally, efforts during this stage should focus on securing sources of financing for the acquisition of the vehicles and the development of the freight infrastructure required for their operation. It is important to consider the development of pilots to evaluate the viability of some of the prioritized operational models under Nutresa operating conditions, road conditions, environment, among other aspects.

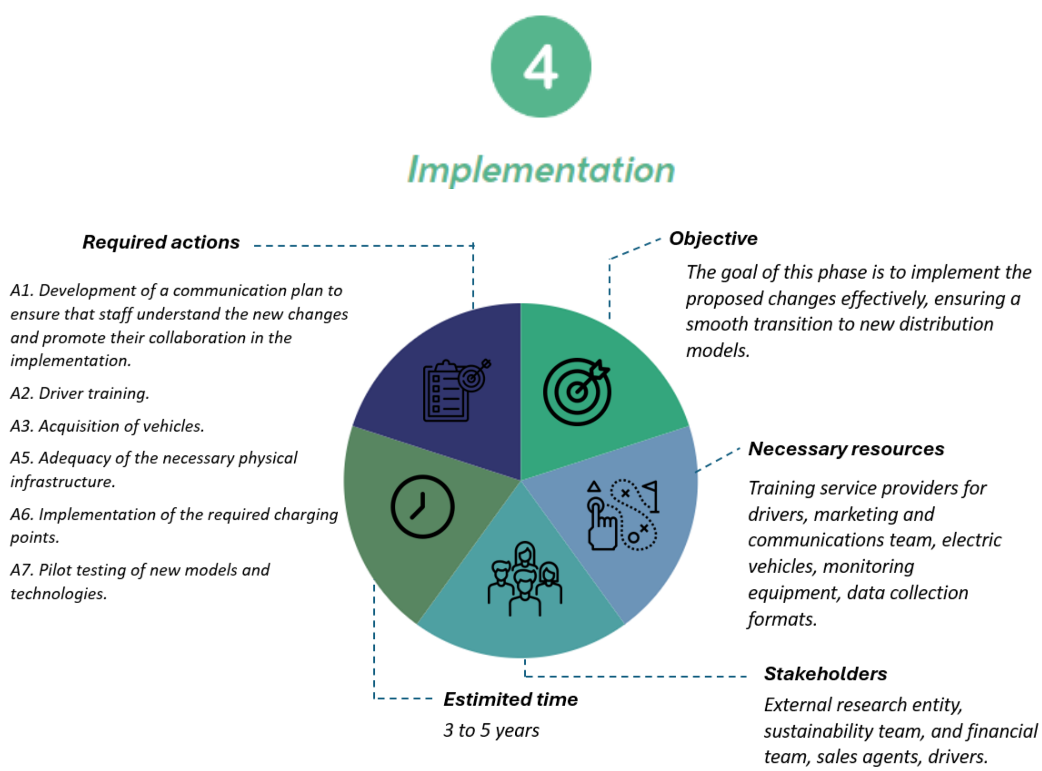

Fig 8. *Implementation phase.*

Budget and financing aspects

To carry out an electrification plan for Nutresa own fleet, understanding that the company has greater control over these vehicles in the decision-making processes, a budget of approximately US$7 million is required. Most of the resources, 80%, are used for the acquisition of electric vehicles, while the installation of charging point infrastructure would require 17% of the budget and the remaining 3% would be used to develop the studies required for the development of the implementation plan.

These high initial investment requirements represent a barrier to the massification of the use of electric vehicles in Nutresa transportation operations. Which is along the same lines as the findings of the 2018 research study published by UPS and GreenBiz that found that for most commercial fleets, the biggest barrier to electrification was the initial cost associated with the vehicles and charging infrastructure, for example, the price of an electric vehicle can be up to three times that of a diesel vehicle with the same characteristics.

Charging infrastructure is essential to the development of an enterprise-wide plan for electrification of transportation operations. Not only must they be available, where and when they are needed, but the type and quality of charging services must match the needs of electric freight vehicle operations. It is expected that the fleet operator will have to provide charging infrastructure in its parking lots to ensure charging during the idle time of each electric vehicle. The development of this charging infrastructure will entail a significant capital investment, associated with the purchase of equipment, construction and installation, which alone may cost as much as one electric vehicle.

For the above mentioned, it is important that Nutresa explores different sources of financing, it can seek funding through multilateral agencies that finance electrification or decarbonization of transport operations projects. For example, Bavaria, which is the company that currently has the largest fleet of electric vehicles in operation with about 200 vehicles operating, in 2020 thanks to the resources obtained in the multilateral initiative Partnering for Green Growth (P4G) began its electrification process through which it financed the first month of this type of vehicles for 20 SMEs, encouraging partnerships and promoting the implementation of this type of technology nationwide.

Conclusions

In light of the need to promote sustainability and efficiency in transportation operations, the reduction of GHG emissions in the short, medium and long term has become a fundamental aspect to mitigate the environmental impacts of freight transportation operations.

For this reason, the electrification of freight transportation represents a revolution in modern business logistics, not only for its potential to significantly reduce the carbon footprint, but also for its ability to optimize costs in the long term. For companies, adopting electric vehicles for freight transportation is a strategic decision that responds to the growing demand for sustainability from consumers and shareholders. It also aligns with government policies that encourage cleaner practices. Investing in electric fleets not only improves corporate image, but also prepares organizations for future stricter environmental regulations. Furthermore, the transition to electrification can generate savings in fuel and maintenance, and promote a more efficient and resilient supply chain in the face of volatile oil prices.

Considering this, Nutresa for some years has been developing different efforts aligned with the electrification of its last mile operations, where we can highlight the participation jointly with LOGYCA in pilots that have evaluated the feasibility of alternative vehicles such as electro-assisted trikes and electric three-wheeler in last mile operations, including the replica pilot "Electrification of the last mile" financed within the framework of the solution plus call for proposals. Likewise, since 2019 Nutresa has incorporated 16 electric vehicles to its own vehicle fleet.

However, there is still a long way to go, which is why a roadmap was designed consisting of four main steps: a diagnosis of the current operating models, the selection of models susceptible to change, a feasibility analysis and finally the implementation phase. The roadmap presented here seeks to facilitate the construction and successful implementation of a plan for the electrification of transportation operations, maximizing environmental, economic, and social benefit.

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