Completion Report

MASCU, KENYA, NCF9 - 131

Grantee: Roam Electric AB (Opibus AB)

Local Partner(s): Roam Electric Ltd (Opibus Ltd)

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SALES EXECUTIVE

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1. EXECUTIVE SUMMARY

The MACSU project has achieved a significant milestone by introducing the first locally manufactured electric bus to the Kenyan market. Initially, the project had plans to bring ten converted buses to the market, but this changed course after a thorough evaluation of the business potential for retrofitting old buses. It became clear that in order to maximise impact and establish a sustainable long-term business strategy, a pivot was necessary, leading to the development of new buses. This strategic shift in 2022 fundamentally altered the original scope of the MACSU project.

The new strategy is geared toward enabling rapid expansion, further enhancing the project's impact, and advancing the deployment of electric mobility in the region.
Some noteworthy achievements from the project include:

- The successful launch of the first converted electric bus in Kenya by the end of 2021.
- The introduction of the first locally manufactured electric bus in September 2023.
- The signing of a groundbreaking lease-to-own financial arrangement for financing new electric buses, facilitated by Roam and one of Kenya's largest commercial banks, NCBA.

Key takeaways from the project emphasise that retrofitting old buses is not a viable large-scale solution. Developing new electric vehicles demands substantial resources and time, and building strong relationships with suppliers is imperative for successful scalability.

2. ACHIEVEMENT OF RESULTS

2.1 Achievement of outcomes and outputs

Expected outcomes and outputs	Indicator(s):	Achievement of outcomes and outputs:
Outcome 1.1: Converted and operational Matatus	1.1.1 Annual reduction of GHG emissions 294 tons CO2eq	One bus was converted and a new bus built. 15,7 tons CO2eq mitigated.
Output 1.1.1: Matatus converted and ready for operations	1.1.1.1: Mid term audit - Target 1 audit 1.1.1.2: Numbers of matatus built - Target 10 units	Mid term audit was conducted. Two buses have been financed. One bus is ready for operations.
Output 1.1.2: Business model created, validated and communicated	1.1.2.1: Business model created - Target 1 business model 1.1.2.2: Contracts signed with the Matatu operators - Target 1 contract	Business model has been established, validated and communicated. No actual sales contract has been signed within the project timeline. We have received multiple reservation fees from different operators which is the initial stage before a signed contract.
Output 1.1.3: Safe executing of the piloting of e-matatus enabled	1.1.3.1: Service model established - Target 1 1.1.3.2: Completed manual for matatus operators - Target 1 1.1.3.3: Training for operators - Target 1	After sale service model has been established. Manual has been completed and will be provided to future operators. Training program has been established with a partner. Two day course to learn how to operate an electric bus.
Output 1.2: Installed and functioning charging infrastructure	1.2.1: Number of urban transportation routes with operational e-matatus - Target 1	No buses have been sold to operators and therefore zero routes with electric buses.
Output 1.2.1: Charging locations identified	1.2.1.1: Contracts with charging stations stakeholders - Target 5 1.2.1.2: Location of charging points - Target 13	A Charging location project is undergoing during the closure of this project. By 2024 there will be 5+ locations with chargers installed.

		One charger with two charging point has been installed at Roam's facility
Output 1.2.2: Design of payment method for charging completed	1.2.2.1: Finished payment method - Target 1	The payment method of charging has been completed. Operators will use RFID cards to access their chargers.
Output 1.2.3: Deployment of charging infrastructure	1.2.3.1: Number of charging infrastructure including fast and slow chargers installed and operational - Target 13	One charger was installed. It does not reach the initial target. Mainly due to the fact that we don't have enough buses on the road yet.

2.2 Deviations from the planned outputs and activities

The primary change made to the project was transitioning from "Output 1.1: Converted and operational Matatus" to "Output 1.1: Number of buses built."

This shift in focus was driven by several compelling reasons:
Initially, our project concentrated on retrofitting existing buses to electric power, with the aim of retrofitting ten vehicles. However, this plan encountered challenges. While the first bus conversion was successful and demonstrated the feasibility of converting a bus to electric power, it also highlighted significant obstacles.

One of the main hurdles arose from the diverse modifications and services performed on diesel buses throughout their lifespan in Kenya. Each bus had unique structural and component configurations due to these modifications, making standardisation challenging. Installing a new electric powertrain required identifying mounting points for components, ensuring safety and reliability. The lack of standardised designs across buses made each conversion a complex customization project.

Furthermore, the bus market in Kenya featured numerous suppliers, resulting in a proliferation of powertrain designs. Each new bus model and modification added to the complexity, requiring extensive customizations. Integrating components sometimes proved difficult due to compatibility issues stemming from differing communication protocols.
Developing a powertrain for retrofitting also demanded a substantial investment in engineering hours for each unit. Considering these issues, the project team made a strategic decision to shift towards developing entirely new electric buses.

Creating new buses provided an opportunity to standardise manufacturing processes, streamlining production and reducing the carbon footprint in the East African public transport sector. This strategic shift aims to enhance speed, scalability, and overall impact in promoting sustainable electric mobility in the region.

We faced several setbacks in achieving our initial project targets. The revised project scope approved by NCF in 2022 halved our allotted time. Supply chain issues and uncontrollable COVID restrictions in China further impeded our progress. Additionally, our chassis manufacturing partner failed to meet expectations, prompting a realisation that a more thorough supplier assessment was needed. A comprehensive sourcing process led us to a new, reliable supplier for long-term collaboration.

The body building process took longer than anticipated, primarily due to insufficient supervision and overpromised timelines by our partner, Master. Quality checks were lacking, necessitating redoing substantial work to meet our standards. Our lack of expertise in body building processes prevented us from pushing Master when needed and foreseeing issues. This has been acknowledged in our improvement plan, set to be implemented in the first quarter of 2024.

A significant contributing factor to body building delays was finalising the design concurrently with the ongoing process. Master's claimed manufacturing capabilities fell short, revealing challenges that were difficult to assess during the partnership establishment. Trust played a role, but we are now incorporating these lessons into our future decision-making processes.

2.3 Achievement of NCF indicators

NCF core indicator	Results (quantitative)			Clarifications/Means of verification
Number of beneficiaries reached	women		0	None achieved.
	men		0	
	total		0	
Number of people with increased resilience to climate change	women		0	None achieved.
	men		0	
	total		0	
Number of people with improved livelihoods	women		0	None achieved.
	men		0	
	total		0	
New decent jobs created	full-time	women	2	Full time jobs at Roam.
		men	6	
		total	8	
	part-time	women	3	Employees at Roam who partly participated in the project.
		men	2	
		total	5	
	seasonal	women	0	Building the body and assembling the chassis in Kenya created a lot of jobs in manufacturing for our manufacturing partners. However, these jobs are only applicable when we have the chassis assembled or buses built. With our future scale up a significant number of new jobs will be created. In Kenya, manufacturing jobs are strongly dominated by men.
		men	20	
		total	20	

3. CLIMATE CHANGE

The direct climate change impact of the MACSU project did not meet the initial target of 294 tons of CO2 equivalent emissions reduction. Instead, the actual direct impact achieved was only 15,7 tons of CO2 equivalent emissions reduction. This shortfall in meeting the initial target can be attributed to the limited number of units deployed during the project's earlier phases.

However, it's important to note that the project anticipates significant indirect emissions reductions in the future. While the direct impact fell short of the target, the indirect emissions reductions, which are expected to result from the increased deployment of electric buses, are projected to exceed the initial target. This indicates that the project's strategic shift towards developing new electric buses has positioned it for a more substantial and lasting impact.

The introduction of the new electric bus to the market in September 2023 signifies a readiness to scale up deployment and make a more substantial contribution to reducing emissions in the years ahead. The MACSU project has not only been a catalyst for achieving environmental goals but has also enabled Roam to develop a product that aligns well with the evolving demands of public transportation in the region. It positions Roam for a promising future in meeting the transportation needs of the region while simultaneously addressing climate change.

The revised project scope, which now involves the construction of new buses, has implications for the transition to electric vehicles and their associated emissions. A significant portion of emissions is tied to the powertrain, a factor that would have remained consistent with the original bus conversion plan. Under our new strategy, we are streamlining the process by sourcing both the chassis and powertrain from a single supplier, thereby reducing emissions related to shipping.

The primary environmental impact of our revised strategy lies in the construction of the new bus body. However, it's worth noting that the longevity of the new buses is anticipated to surpass that of the older buses initially earmarked for conversion. Assessing the long-term environmental superiority of one approach over the other proves challenging.
In terms of passenger emissions, the Roam Move electric bus, capable of accommodating up to 51 people, demonstrates a reduction in emissions per passenger compared to the scenario involving four smaller buses.

Moreover, Kenya benefits from one of the world's greenest power grids, with over 90% of electricity generated from renewable sources, prominently including geothermal energy. This characteristic positions our project for substantial emissions savings during the operational phase, which carries the most significant environmental impact. Kenya also has a large surplus of electricity generation, especially during the night. Electricity tariffs are half the price during the night which is one of the main reasons why we design our bus to have sufficient range to operate the whole day. Some operators will have to top up during the day but a majority of charging will occur during night to maximise savings for the operator.

These considerations underscore the complexities of determining the superior environmental approach in the long run, and we remain committed to ongoing evaluation and improvement in our sustainability practices.

4. DEVELOPMENT IMPACTS AND CROSS-CUTTING ISSUES

Converting the first bus was a substantial undertaking that required a sizable team. If we had continued down the path of retrofitting existing buses, the project would have generated more high-quality job opportunities within Roam. However, with the new strategy, most of the manufacturing is outsourced, which has shifted the employment creation to Roam's service providers. This is imperative for electric mobility to gain traction and emerge as the future technology in this region. The presence of more qualified companies will catalyse rapid growth in the sector, leading to improved livelihoods and expanded opportunities for individuals beyond the current possibilities.

A more dependable and appealing public transport solution has the potential to draw in commuters who previously opted for other modes of transportation, such as motorcycles, which entail significantly higher risks. This shift not only enhances safety for a substantial number of individuals, including women and children but also contributes to a reduction in emissions and air pollution. Unfortunately, the impact of pollution tends to be more pronounced in low-income communities compared to their higher-income counterparts. This is often due to the location of their housing, which is frequently situated closer to major roads and other infrastructure with elevated pollution levels.

Roam has consistently maintained a strong commitment to gender equality, and as of September 2023, 40% of Roam's workforce comprises women. Nevertheless, there remains a challenge in attracting women to engineering roles, which is why the majority of engineers working on this project were men. Roam is dedicated to labour rights and boasts generous HR policies, including strong encouragement for both parents to make full use of parental leave, which is a fundamental part of the company's policies. Roam has modelled many of its labour laws after those in Sweden, which are notably more favourable than the Kenyan labour landscape.

At the inception of the project, several junior engineers were hired with the aim of providing them with the opportunity to learn and develop their professional skills. By project's end, we observed significant growth within our engineering team. Notably, two of our female engineers relocated to the Netherlands to pursue their passion for electric charging infrastructure and further advance their careers. Their experience gained from the MACSU project has equipped them with valuable knowledge and skills that will continue to support their ongoing career development.

The deployment of electric buses will yield a substantial positive impact on air quality and contribute to emissions mitigation. Additionally, the increased consumption of electricity

will benefit the national power grid authority by generating funding for the expansion of the grid's reach. This expansion will extend access to electricity to more rural areas, driving economic growth and creating a significant positive social impact, improving the lives of many individuals. In essence, the shift towards electric mobility has the potential to usher in a holistic transformation that benefits not only the environment but also the economy and society at large.

5. ASSESSMENTS OF THE RESULTS AND IMPACTS OF THE PROJECT

5.1 Relevance

As previously emphasised, the core principles of relevance and adaptability have always been central to our business approach. The decision to pivot from our original project outcomes was primarily driven by the need to remain relevant in a market that has undergone significant changes over the past three years.

Several noteworthy changes in the market landscape include:

1. Diesel Cost Increase: Over the last three years, the cost of diesel has surged by 100%, directly impacting the operating expenses of public transportation operators. This shift in cost dynamics prompted us to develop new buses that come with an initial investment 80% higher than diesel buses but offer operational savings that are 60% lower. Additionally, the extended lifespan of electric buses, facilitated by easier maintenance and operation, makes them a more economically viable option over the long term.

2. VAT Exemption for Electric Buses: Starting from July 2023, electric buses have been exempted from VAT, enhancing their competitiveness in the market.

3. Dedicated Electricity Tariff: The introduction of a new electricity tariff tailored specifically for electric vehicles further bolsters the value proposition of electric mobility.

4. Government Support: The current government, which assumed office in August 2022, has demonstrated a strong commitment to promoting electric mobility. Their efforts to create a more favourable policy framework for electric vehicles have been a driving force behind these positive changes.

5. Bus Rapid Transit plans: The Kenyan government has initiated the development of infrastructure for the inaugural Bus Rapid Transit (BRT) line designed to accommodate electric mass transit buses. Roam actively participated in a public tender last year. Unfortunately, the project encountered delays due to elections, leading to the formation of a new government. However, the current administration has demonstrated a strong commitment and significant investments to ensure the realisation of the BRT project. Ambitious plans include the implementation of five new BRT corridors in Nairobi by the year 2030.

The Roam Move bus is poised to seamlessly integrate into the future public transport network as an ideal feeder bus. Its role will involve transporting

commuters from their residential areas to the BRT lines, enhancing the overall efficiency and accessibility of the public transportation system.

These highlights underscore the evolving nature of the market. While it might be tempting, in hindsight, to conclude that building new buses from the outset would have been ideal, we are content with the direction in which the market is heading. We are excited to offer a product that aligns with the evolving needs of the market and has been developed locally in Kenya, positioning us to meet the demands of a changing landscape.

5.2 Effectiveness

The project has proven effective in achieving market consensus on our future direction for maximising impact. While the initial target of 10 buses was not met, we now have a clear and strategic pathway to enhance our future deployment with a product that aligns with market needs.

One significant outcome is the establishment of a robust business model. In September, we reached a milestone by signing the first framework agreement with NCBA, one of Kenya's largest commercial banks. This agreement outlines a lease-to-own financial structure that will lower the initial investment for operators, enabling them to start generating earnings from the first day of operation. We are currently in the process of finalising similar framework agreements with other banks in Kenya. These banks are already familiar with financing diesel buses using a lease-to-own structure. Importantly, this approach resonates with stakeholders in the public transport sector, as it aligns with their preference for asset ownership. Our strategy is to work with established financing structures, making it easier to convince operators to transition to electric vehicles.

As mentioned earlier we faced multiple challenges throughout the course of the project. The revised project scope approved by NCF in 2022 halved our allotted time. Supply chain issues and uncontrollable COVID restrictions in China further impeded our progress. Additionally, our chassis manufacturing partner failed to meet expectations, prompting a realisation that a more thorough supplier assessment was needed. A comprehensive sourcing process led us to a new, reliable supplier for long-term collaboration.

The body building process took longer than anticipated, primarily due to insufficient supervision and overpromised timelines by our partner, Master. Quality checks were lacking, necessitating redoing substantial work to meet our standards. Our lack of expertise in body building processes prevented us from pushing Master when needed and foreseeing issues. This has been acknowledged in our improvement plan, set to be implemented in the first quarter of 2024.

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short, revealing challenges that were difficult to assess during the partnership establishment. Trust played a role, but we are now incorporating these lessons into our future decision-making processes.

The initial delay in deploying the first bus has posed challenges in finalising sales contracts. In Kenya, the business environment often demands a trial period for significant investments, particularly with products like buses. Despite having a substantial level of interest and a large pipeline, we've encountered this hurdle.

To address this issue, we've implemented a reservation fee structure as a preliminary step before signing actual sales contracts. Clients are required to pay a fee to reserve a bus for a week. Encouragingly, we already have six clients who have committed to this reservation fee. Once we expand our commercial pilot operations, we anticipate that the formal sales contracts will be signed as part of the process.

On the charging infrastructure front, we have devised innovative strategies. Initially, we plan to install charging stations at our customers' premises where they park and service their vehicles overnight. As we witness the scaling up of electric buses, we will embark on the development of the Roam Depot, essentially a public charging station for electric vehicles equipped with service stations and parking facilities for buses. This approach addresses the classic "chicken and egg" dilemma in electric transportation – we need buses to justify investing in charging infrastructure, and we need reliable charging infrastructure to ensure the smooth operation of our clients' electric buses.

In summary, the project has provided us with a clear direction and a solid foundation for future growth and impact. We have established key partnerships, developed a viable business model, and devised innovative strategies for charging infrastructure, all of which position us for success in the evolving electric mobility landscape.

5.3 Efficiency.

Technical development often unfolds with unexpected challenges that can prolong the timeline beyond initial expectations. Multiple iterations and troubleshooting processes are typically required, contributing to delays. In our case, we encountered several challenges and delays during the project, which can be attributed to both internal and external factors.

Supply Chain Disruptions: One major issue we faced was disruptions in our supply chain, primarily caused by COVID-19 restrictions in various countries. These disruptions prevented us from testing and validating certain components as originally planned. The pandemic presented exceptional challenges that tested our project execution capabilities, making it difficult to adhere to the intended timeline.

Efficiency and Timeliness: It can be argued that our efficiency and timeliness were not as optimal as desired. This inefficiency was partly due to issues within our

control, such as supply chain management and team composition, and partly due to external events like the pandemic. While we employed a junior team of engineers from Kenya to keep costs lower, this approach had both advantages and disadvantages. While it reduced costs, it also led to timely impacts on the project as some issues could have been anticipated with more experienced personnel.

Team Size and Efficiency: The decision to employ a larger team for bus conversion would have incurred additional costs. However, it is not certain that a larger team would have necessarily increased efficiency, as it can put pressure on streamlined engineering software support tools to maximise resource utilisation. In the initial stages of development, we were still fine-tuning our processes to determine the most efficient approach.

Revised project scope has had a notable impact on the project's efficiency. Had we opted for the revised project design at the beginning, we are confident that more buses would have already been deployed on the road. This accelerated deployment would have in turn triggered the establishment of additional charging stations, resulting in a higher quantity of mitigated emissions.

There is a significant underspending in the project that stems from the delayed deployment of the ten units, which resulted in reduced expenses. However, it is also notable that we have been able to secure a chassis at a lower cost than our initial expectations. Additionally, as we anticipate larger volumes with our new strategy and increased production, we anticipate negotiating down the cost further for both the bus body and the the chassis.

In line with our new strategy, we have optimised our staffing approach, reducing the overall number of project team members while ensuring that those involved are working almost full-time on the project. This adjustment has allowed us to control costs more effectively.

The most substantial expense in the latter part of the project pertained to development costs, reflecting the investments made in refining and launching our market-fit product. Despite the underspending in other areas, these development costs were necessary to achieve our project goals and deliver a product that meets market demands.

In conclusion, technical development projects often face unforeseen challenges and uncertainties that can impact efficiency and timeliness. Our experience highlighted the importance of adapting to changing circumstances, managing supply chain disruptions, and carefully considering team composition and resource allocation to strike the right balance between cost-effectiveness and project efficiency.

5.4 Impact

This project has played a significant role in raising public awareness and addressing the challenges inherent in the current transportation system. It's been heartening to witness operators and stakeholders, who are primarily profit-driven, engage in discussions about climate change and their potential contributions to mitigating it. We've actively welcomed diverse delegations from various sectors to discuss our electric buses and their potential to benefit different segments of society. Spreading awareness has been a central mission for us throughout this project, and as a result, Roam is now regarded as a leader in electric mobility in East Africa. This recognition comes with both opportunities and pressure to maintain our leadership role.

One noteworthy trend we've observed is a growing interest from private schools in transitioning their school transport services to electric. Private schools have dual motivations for this shift. Firstly, by providing safe and sustainable transportation solutions for their students, they contribute to the well-being and health of the students themselves. Secondly, it aligns with their marketing and Environmental, Social, and Governance (ESG) agendas, making them more attractive to potential students and, ultimately, increasing their revenue.
The issue of pollution is a major contributor to declining public health in urban areas of Kenya. Public transportation vehicles alone account for nearly one-third of all pollution generated by the transportation sector in Nairobi. The positive aspect is that people are increasingly aware of the issue and are willing to take action. They understand that a range of solutions is already available. However, the cost of electric vehicles remains a significant barrier. Many stakeholders need to witness electric buses in operation and fully comprehend the substantial impact of this change before they can be convinced to make the transition.

Unfortunately, there will always be doubters and naysayers who propagate negative agendas to hinder growth and progress in this transformative journey towards cleaner and more sustainable transportation. Despite these challenges, the momentum is growing, and the project has been instrumental in driving this positive change towards a more environmentally friendly and health-conscious transportation system in Kenya.

5.5 Sustainability

The implementation of new government policies and the growing public awareness surrounding electric vehicles have created a highly favourable environment with profound long-term benefits. The commitment of large financial institutions to support electric vehicle deployment sets the stage for a scenario where all stakeholders involved stand to gain significantly. As soon as it becomes financially viable, we can anticipate a rapid and substantial shift towards electric buses.

The financial structures and manufacturing strategies that we have successfully established are likely to serve as models for other companies entering the market in the future. This will

demonstrate that the region is indeed ready for a transition towards a sustainable and green future. It will also attract larger companies to consider market entry, further advancing the cause of green mobility.

In addition to these advocacy efforts, Roam has collaborated with its competitor to establish a driver training program for electric buses. This program is designed to educate drivers on operating electric buses and harnessing their benefits. A significant emphasis is placed on eco-driving techniques, with a focus on utilising regenerative braking systems that recover energy during braking. By encouraging a more conservative driving behaviour that minimises the use of traditional brakes, this program not only enhances the efficiency of electric buses but also contributes to accident prevention in an already challenged transport sector. The result is improved safety for pedestrians and the potential to save lives, highlighting the broader positive impact of electric mobility beyond environmental benefits.

5.6 Coherence

The emergence of a new competitor in the electric bus market, with 19 buses currently in operation and a distinct business model, has added an interesting dynamic to the landscape. This competition, surprisingly, has played a constructive role in advocating for electric mobility within the government. Roam took a collaborative approach and, in partnership with other electric mobility companies in Kenya, established the Electric Mobility Association of Kenya (EMAK).

EMAK has quickly gained recognition as the leading association in the private sector, spearheading efforts to engage with public affairs. A notable achievement was the organisation of the first electric mobility parade on September 3rd, which coincided with the Africa Climate Summit hosted by the Kenyan government from September 4th to 6th. This event was a resounding success and effectively demonstrated to both the world and the Kenyan government that, despite the previous absence of enabling policies, Kenya has experienced remarkable growth in the deployment of electric vehicles.

EMAK is poised to play a pivotal role in shaping policies that will create an environment where electric vehicles become more competitive and affordable. The transition to electric mobility, whether for motorcycles or buses, is anticipated to have a positive impact on local businesses and job creation in the years ahead.

6. INNOVATION

The project has introduced several noteworthy innovations that have had a significant impact on the electric mobility landscape in Kenya:

1. Local Manufacturing of Electric Buses: Perhaps the most substantial innovation is the development of the first locally manufactured electric bus. This achievement not only promotes the adoption of electric vehicles but also emphasises the importance of local manufacturing, leading to job creation and improved livelihoods in the region. The design and body building process are key components in this achievement.

2. First Locally Retrofitted Electric Bus: The project also marked a milestone with the first and only locally retrofitted electric bus in Kenya. This demonstrates the capability to convert existing buses into electric vehicles, potentially extending the lifespan of older vehicles while reducing emissions.

3. Innovative Financial Solution: The project's orchestration of the first financial solution has played a crucial role in making electric buses more financially viable for operators. By lowering the upfront costs, this innovation paves the way for a rapid deployment of electric mobility, making it more accessible to a wider range of stakeholders.

4. Introduction of Fast Charging Stations: Installing the first fast charging stations in Kenya represents a significant innovation that supports electric bus operations. Fast chargers are instrumental in enabling longer routes to be electrified, as they allow for quick battery top-ups. This is particularly important since batteries are one of the most expensive components of electric vehicles. Fast charging stations ensure that operators can efficiently maintain their buses in operation without extensive downtime, contributing to the overall success of electric mobility in the region.

These innovations collectively highlight the project's dedication to advancing electric mobility while addressing economic, environmental, and operational challenges. They have not only laid the groundwork for sustainable transportation solutions but also serve as examples for future initiatives in Kenya and beyond.

7. POTENTIAL FOR SCALING UP AND FOLLOW-UP INVESTMENTS

The future of this project is characterised by a high level of certainty and confidence in its scalability. The project's success has positioned us to bring a product to the mass market that is ready for deployment. With the commercial traction gained, we are ambitious in our goals and plan to deploy 50 buses by the end of 2024.

Several key elements are in place to facilitate this expansion:

1. **Established Supply Chain:** The supply chain has been effectively established, ensuring a smooth flow of components and materials for manufacturing.
2. **Product Design Finalised:** The product design has been completed, ensuring that the buses meet the required specifications for mass production and market readiness.
3. **Completed Business Model:** A robust business model has been developed, which will guide the project's expansion and revenue generation.
4. **Determined Financing Structure:** A financing structure has been determined, providing the necessary financial framework for scaling up operations.

In terms of investments, the project anticipates requiring approximately $3 million in working capital for 2024. Importantly, as manufacturing scales up, the project aims to become self-sustaining, with organic financing generated from its operations.

In 2023, Roam successfully raised $7 million in equity, and additional working capital of $2 million are being set up for early 2024. Looking ahead, Roam will actively seek grants to fund the initial Roam depot charging stations, further facilitating its growth and impact in the electric mobility sector.

The bus department at Roam is set to receive ample funding to sustain its growth. It's important to highlight, from a company perspective, that our electric motorcycles demand substantial capital, presenting a challenge in terms of balance. Managing two products with significant potential necessitates strategic solutions for effective capital allocation. This underscores the importance of thoughtful financial planning to maximise the potential of both the bus and motorcycle departments.

Overall, the project's trajectory is marked by a clear roadmap for scaling up and a solid financial foundation, ensuring its continued success and contribution to sustainable transportation in Kenya.

Roam has established ambitious expansion plans and goals for the upcoming years. Currently, we are in the process of outlining our market entry strategies for the East African market, focusing on 2024-2025. Rwanda, Tanzania, and Ethiopia have demonstrated themselves as viable markets for entry, with Rwanda being the most accessible option currently. Looking ahead, West Africa, particularly Nigeria, holds immense potential, and it is a market that Roam aims to expand into in the coming years. The strategic entry into these markets aligns with our commitment to growth and making a positive impact on the mobility landscape across Africa.

8. RISKS

The project encountered several prominent risks that materialised, with a primary focus on supply chain challenges:

1. Supply Chain Disruptions: The most significant risk was related to the supply chain. To address this, the project had to resort to air freight for certain components to ensure the development could continue. These disruptions underlined the vulnerability of global supply chains and the need for contingency plans. We have also changed the chassis supplier during the project, which always come with inherent risks. Over the past years, Roam has accumulated valuable insights and established robust structures to validate and mitigate risks associated with new suppliers. Through on-the-ground visits by our dedicated staff and leveraging external consultants, we have successfully streamlined our operations and validation processes.

2. Extended Body Building Process: The body building process for the buses took longer than initially anticipated. This delay stemmed from the fact that it was the first bus of its kind to be built in Kenya. The project initially underestimated the time required, relying on partner recommendations. Subsequent meetings were held to devise an improvement plan aimed at shortening lead times for future units. The project also recognized the importance of taking greater ownership of the process to enhance accountability.

3. Cost Escalation: An initial risk assessment indicated that the electric bus would be more cost-effective. However, as development progressed, it became evident that the costs had risen beyond the project's comfort zone. In response, the project adjusted its business model to accommodate the higher investment costs while simultaneously ensuring that operators could increase their profits. Interestingly, the project benefited from the significant increase in diesel costs during the last year, which strengthened the value proposition for the electric bus. This development was beyond the project's control but contributed positively to the overall business case.

These risk materializations underscore the dynamic and often unpredictable nature of large-scale projects. The ability to adapt to challenges and mitigate their effects, as demonstrated by the project's adjustments in response to supply chain disruptions and cost escalations, is critical for overall success.

9. MONITORING AND EVALUATION

The evaluation of project activities has primarily been conducted internally at Roam. However, the project has actively sought input and feedback from key stakeholders, including potential customers and the body building partner. This collaborative approach has been integral to the project's development process.
Here's how various stakeholders have contributed to the evaluation and refinement of project activities:

1. **Potential Customers:** Throughout the project's development, potential customers have provided valuable feedback on the design and features they desire in the electric buses. This feedback loop ensures that the final product aligns with the needs and preferences of the market.

2. **Body Building Partner:** Roam's partnership with a body building expert with over 30 years of experience in Kenya has been particularly instrumental. Their insights and recommendations have been invaluable in identifying ways to standardise the bus design, shorten lead times, and reduce costs. Leveraging the partner's expertise has enhanced the project's chances of future success.

3. Testing and validation: Throughout the entire project, rigorous testing has been a priority to guarantee adherence to quality requirements. Numerous technical integrations have been a cornerstone of our efforts to ensure the reliability and safety of the bus.

By actively involving these stakeholders in the evaluation process, the project has been able to benefit from diverse perspectives and ensure that the final product not only meets industry standards but also addresses the specific requirements of the Kenyan market. This collaborative approach underscores the project's commitment to delivering a high-quality, market-fit product.

10. LESSONS LEARNT

The MACSU project has been a valuable source of learning experiences, and several key lessons have emerged from its journey:

1. Supply Chain and Manufacturing Challenges: The project involved a comprehensive review of the entire supply chain and manufacturing process to deliver the first electric bus. While setting up partnerships with suppliers is a crucial step, the actual execution of the steps to create a finished product demands patience and determination. Managing coordination and communication among different operational teams with diverse cultural backgrounds has proven to be a challenging process.

2. Continuous Improvement and Reflection: The project has dedicated a substantial amount of time to reflection and evaluation. This commitment to ongoing improvement is essential as the project transitions into the next phase, focusing on scaling up operations across all fronts. Adapting to future demand requires continuous assessment and enhancement of processes.

3. Supplier Relationships: One of the most critical lessons is the significance of supplier relationships. The experience with the initial chassis supplier, which did not meet expectations, prompted the establishment of a new partnership with a different company. The project has implemented a new evaluation methodology that includes site visits to the supplier's factory in China and reciprocal visits to Kenya. These visits have underscored the importance of personal interactions in building mutual understanding and support. Building long-term, reliable partnerships with suppliers is essential as both bus products are brought to market.

4. Reevaluation of Initial Scope: Reflecting on the project's journey, it has become evident that the initial scope should have prioritised the development of new buses from the beginning. The dynamic nature of the market, which has evolved significantly since the project's inception, underscores the importance of adapting to changing circumstances and market conditions.

In essence, the MACSU project's evolution has been marked by a commitment to learning and improvement. These lessons learned are invaluable as the project looks ahead to its next phase of growth and development, ensuring that it is well-prepared to navigate the evolving landscape of electric mobility in Kenya.

11. OUTREACH

We have utilised press releases and events to announce our project launches, aiming to engage with both the general public and potential customers.

A link the first conversion digital launch:

https://techcrunch.com/2022/01/19/first-ev-mass-transit-bus-by-swedish-kenyan-startup-opibus-begins-operation-amidst-plans-for-regional-launch-by-2023/

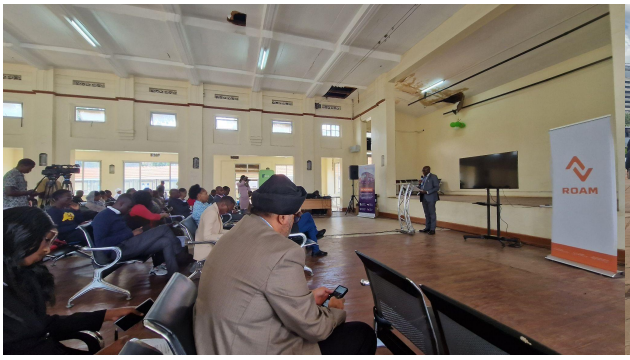
A few links to different news articles for the Roam Move launch.

https://cleantechnica.com/2023/09/18/roam-introduces-the-roam-move-electric-bus-in-kenya/

https://techcrunch.com/2023/09/18/roam-move-ev-bus/

https://www.roam-electric.com/post/roam-introduces-the-roam-move-an-electric-shuttle-bus

We organised a physical launch event for the Roam Move in September 2023. All stakeholders and media were invited. It was a successful launch.



Other conferences and events we have attended to promote and spread the awareness of Roam's electric buses.

- Africites 2022 in Kisumu
- Matatu Owners Association annual meeting 2022 (one of Kenya's largest private bus owners association)
- Africa E-mobility week 2023
- UN events
- GIZ events

As the movement and company continues to grow we are poised to attend and participate in countless events with the aim to share knowledge and spread awareness.

12. FINANCIAL SUMMARY

Since the local partner is a subordinate to Roam Electric AB all the money is spent within the company. Roam Electric AB receives the money and transfers them to Roam Electric Ltd.

Table 1. Project financing per partner

	Financing, EUR			
Expenditures, EUR	NCF	Roam Electric AB	Roam Electric Ltd	Total
Roam Electric AB	6 789	110 542		117 331
Roam Electric Ltd	355 855		260 649	616 504
Total	362 644	110 542	260 649	733 835

13. CONCLUSIONS AND RECOMMENDATIONS

The project has achieved significant success, serving as a catalyst for the introduction of electric buses tailored to the East African market. It has empowered us to craft a business model that aligns with the local market dynamics, facilitating the accelerated adoption of electric buses in the future.

The fast-paced evolution of the market necessitates proactive measures to ensure our continued relevance in the years ahead. The value proposition for electric vehicles has never been more compelling, particularly with government backing. Electric vehicles are poised to become a fundamental component of Kenya's future public transportation system, further underlining their significance.

Annex 1 Project completion fact sheet

Project Name:	**MACSU - Matatu Conversion for Sustainable Urban environment**		
Project no.	NCF - C9 - 0131		
Country:	Kenya	**Financing:**	
		EUR	**%**
Nordic Partner:	Roam Electric AB (Opibus AB)	110 542	15%
Local Partner:	Roam Electric Ltd (Opibus Ltd)	260 649	36%
Other Partner:			
	NCF grant disbursed	362 644	49%
	Total	**733 835**	**100%**
Classification:	Mitigation		
Project cycle:	Project start date: 23/11/2020 Original closing date: 23/11/2022 Actual closing date: 30/09/2023		
Short project description:	The MACSU project initially aimed to introduce the first electric buses to Kenya by retrofitting diesel buses with electric components. While one bus underwent successful retrofitting, evolving market conditions led to a strategic shift. Consequently, a new electric bus, designed for local manufacturing, was developed to meet future market demands. The project's adoption of a new business model is poised to accelerate the deployment of electric buses not only in Kenya but also across East Africa. As part of the project's pilot phase with potential clients, the first fast charger was installed to provide rapid charging capabilities for the initial electric bus. This marks a significant step in the project's journey toward promoting electric mobility in the region.		

Project performance:

Expected Outcomes and Outputs	Achieved	End-of-project status
10 new buses operational	Partly	2 bus completed
Business model created	Yes	Completed
Safe execution of electric bus pilot	Yes	Pilot bus operational
Charging stations installed and operational	Partly	One charger installed
Charging locations identified	Partly	Mapping ongoing
Design payment method for charging	Yes	Completed

Climate change outcomes and impacts:	Roam's MACSU project initially aimed for 294 tons of CO2 equivalent emissions reduction but achieved only 15.7 tons, primarily due to limited early deployment. However, future indirect emissions reductions are expected to surpass the initial target, aligning with the project's strategic shift towards constructing new buses. The emphasis on sourcing from a single supplier reduces shipping-related emissions, but challenges arise in the environmental impact of new bus body construction. Overall, the project positions Roam for a sustained environmental impact.
Development outcomes and impacts:	Roam's project underwent a significant strategy shift, moving from retrofitting buses to outsourcing manufacturing. The project aims to enhance public transport safety and environmental impact, with a focus on low-income communities. Despite Roam's commitment to gender equality, challenges persist in attracting women to engineering roles. The initiative has facilitated professional growth for junior engineers, including two female engineers who relocated for career development. The deployment of electric buses is expected to positively impact air quality, emissions reduction, and societal well-being.

NCF core indicators

NCF core indicator	Results (quantitative)		Clarifications/Means of verification
Number of beneficiaries reached	women	0	None achieved
	men	0	
	total	0	
Number of people with increased resilience to climate change	women	0	None achieved
	men	0	
	total	0	
Number of people with improved livelihoods	women	0	None achieved
	men	0	
	total	0	

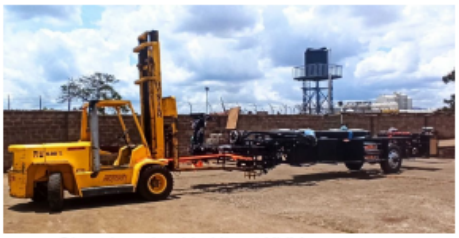
	New decent jobs created	full-time	women	2	Full time employees at Roam.
			men	6	
			total	8	Part time jobs at Roam during project.
		part-time	women	3	
			men	2	
			total	5	
		seaso-nal	women	0	
			men	20	
			total	20	Manufacturing and assembly jobs at our local partners during the building process.

Annex 2 Results Framework

Expected outcomes and outputs	Indicator(s):	Achievement of outcomes and outputs:
Outcome 1.1: Converted and operational Matatus	1.1.1 Annual reduction of GHG emissions 294 tons CO2eq	One bus was converted and a new bus built. 15,7 tons CO2eq mitigated.
Output 1.1.1: Matatus converted and ready for operations	1.1.1.1: Mid term audit - target 1 audit 1.1.1.2: Numbers of matatus built - Target 10 units	Mid term audit was conducted. Two buses have been financed. One bus is ready for operations.
Output 1.1.2: Business model created, validated and communicated	1.1.2.1: Business model created - Target 1 business model 1.1.2.2: Contracts signed with the Matatu operators - Target 1 contract	Business model has been established, validated and communicated. No actual sales contract has been signed within the project timeline. We have received multiple reservation fees from different operators which is the initial stage before a signed contract.
Output 1.1.3: Safe executing of the piloting of e-matatus enabled	1.1.3.1: Service model established - Target 1 1.1.3.2: Completed manual for matatus operators - Target 1 1.1.3.3: Training for operators - Target 1	After sale service model has been established. Manual has been completed and will be provided to future operators. Training program has been established with a partner. Two day course to learn how to operate an electric bus.
Output 1.2: Installed and functioning charging infrastructure	1.2.1: Number of urban transportation routes with operational e-matatus - Target 1	No buses have been sold to operators and therefore zero routes with electric buses.
Output 1.2.1: Charging locations identified	1.2.1.1: Contracts with charging stations stakeholders - Target 5 1.2.1.2: Location of charging points - Target 13	A Charging location project is undergoing during the closure of this project. By 2024 there will be 5+ locations with chargers installed. One charger with two charging point has been installed at Roam's facility

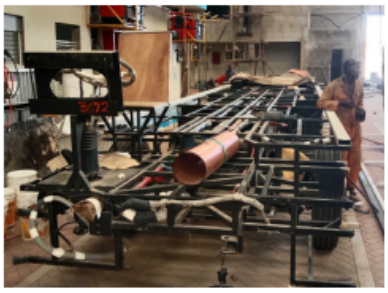
Output 1.2.2: Design of payment method for charging completed	1.2.2.1: Finished payment method - Target 1	The payment method of charging has been completed. Operators will use RFID cards to access their chargers.
Output 1.2.3: Deployment of charging infrastructure	1.2.3.1: Number of charging infrastructure including fast and slow chargers installed and operational - Target 13	One charger was installed. It does not reach the initial target. Mainly due to the fact that we don't have enough buses on the road yet.

Annex 3 Pictures

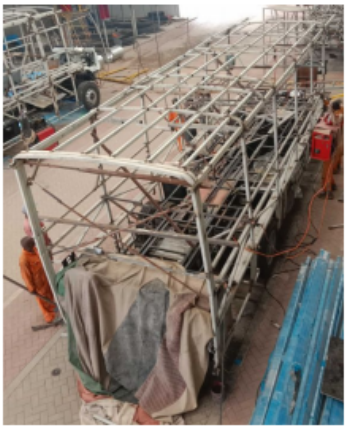


Chassis arrived in kits at KVM

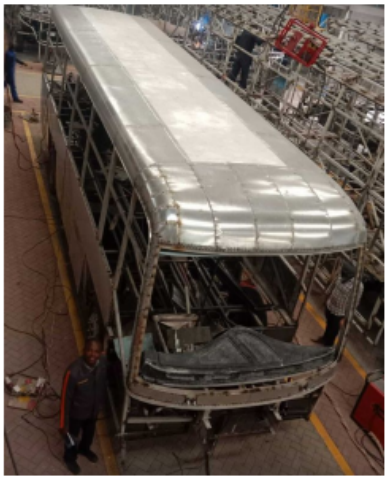
Our driver Paul is ready to drive the chassis to Master



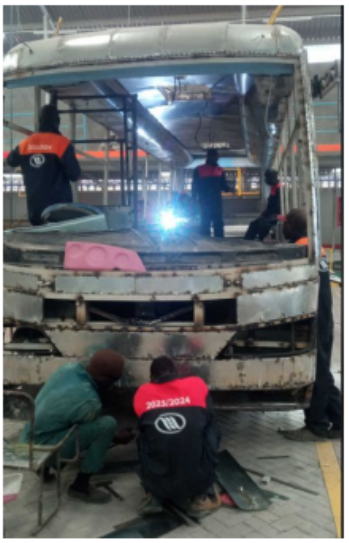
Body structure work begins



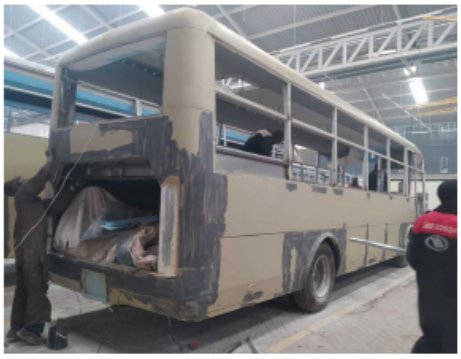
Body frame progress



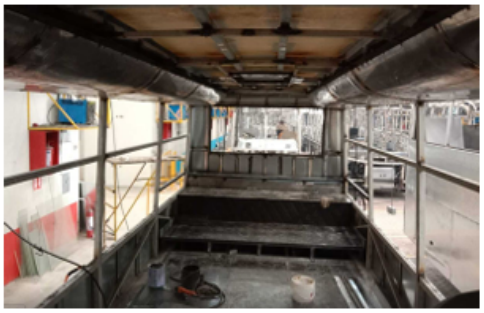
Panel work proceeds



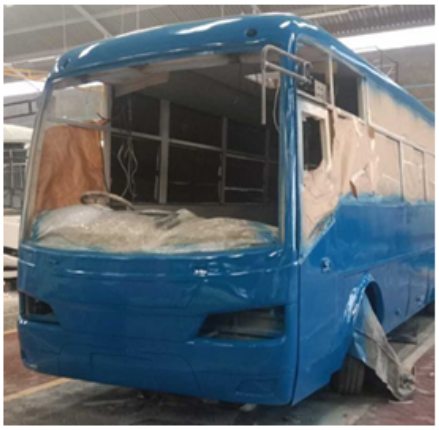
Front face work begin



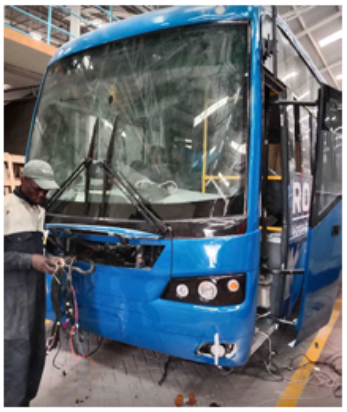
Panel work complated



Interior work begin



Paint work completed



Front face finalisation

Seats are being fitted

Final check ups

First locally manufactured electric bus in Kenya

All photo credits Roam.

Annex 4 Other supplementary deliverables/documentation/links

Annex 5 Impact story

The unveiling of Kenya's first locally built electric bus marked a significant milestone in the country's pursuit of sustainable transportation solutions. This groundbreaking project, not only symbolises technological advancement but promises to have far-reaching social, environmental, and economic impacts.

Social Impact:

1. **Accessibility:** The electric bus offers an eco-friendly and cost-effective mode of transportation for Kenyan citizens. Its introduction means that cleaner and more affordable public transport options are now accessible to a larger portion of the population, reducing the burden on low-income communities.
2. **Job Creation:** The development and production of the electric bus have generated employment opportunities in manufacturing, engineering, and maintenance. This project has not only upskilled the local workforce but has also opened doors for vocational training in sustainable technologies.

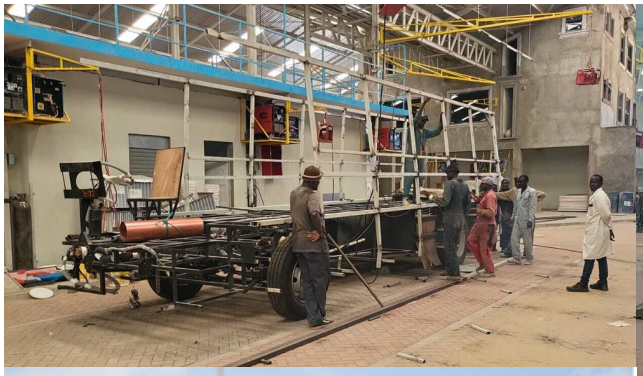
Environmental Impact:

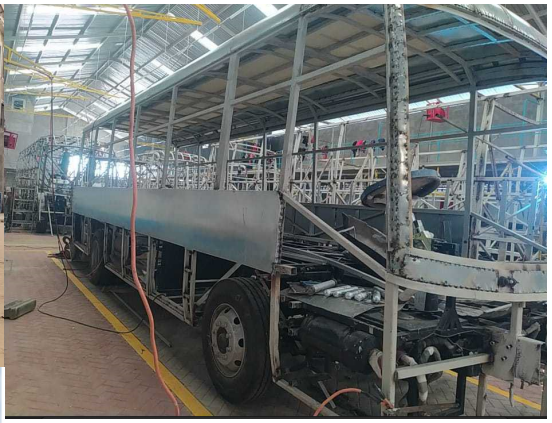
1. **Reduced Emissions:** The electric bus is a green alternative to traditional diesel-powered vehicles. Its zero-emission operation contributes significantly to air quality improvement, helping combat the negative effects of pollution in urban areas.
2. **Resource Conservation:** By shifting away from fossil fuels, Kenya takes a step towards resource conservation. Reduced dependency on imported oil and lower carbon emissions contribute to a more sustainable and environmentally responsible future.

Economic Impact:

1. **Investment Attraction:** The successful development of the first locally built electric bus demonstrates Kenya's commitment to sustainable transportation solutions. This is likely to attract further investment in the renewable energy and electric vehicle sectors, fostering innovation and economic growth.
2. **Cost Savings:** Electric buses are more energy-efficient and have lower maintenance costs than their diesel counterparts. Over time, the operation of a fleet of electric buses can lead to significant cost savings for public transport authorities.
3. **Export Potential:** With successful local production, Kenya may explore opportunities to export electric buses to neighbouring countries, creating a new revenue stream for the country and bolstering its position as a regional leader in sustainable transportation.

In summary, the introduction of Kenya's first locally built electric bus represents a significant leap toward a cleaner, more accessible, and economically vibrant future. The project showcases the nation's potential to lead in sustainable innovation, promising a host of social, environmental, and economic benefits. As the production scales up, Kenya is poised to become a model for green transportation solutions in the region and beyond



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