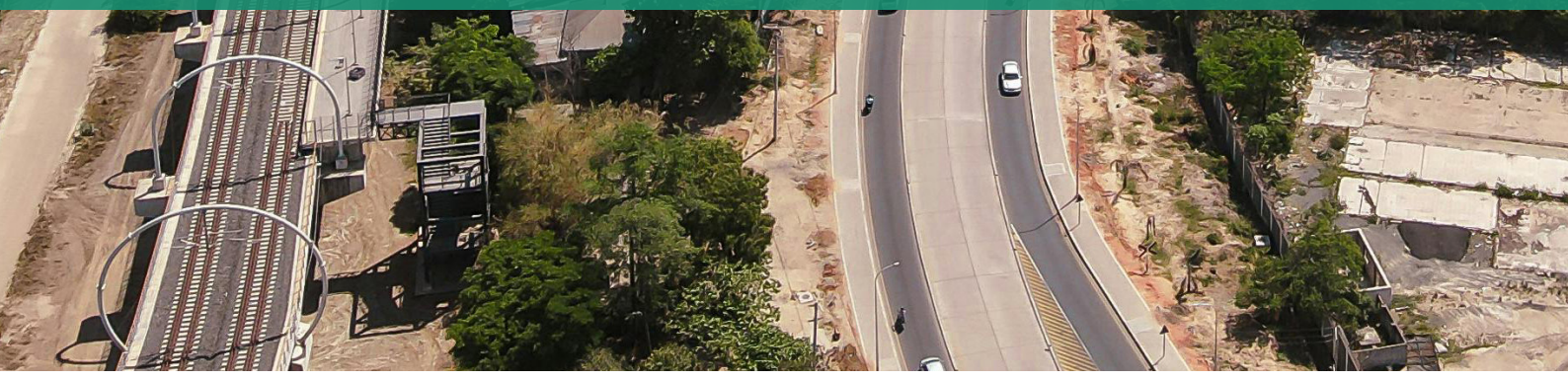
SCALE-UP CONCEPT NOTE:
PROJECT TITLE: "SCALING SUSTAINABLE AND ELECTRIC URBAN MOBILITY SOLUTIONS IN DAR ES SALAAM"



This project has received funding from the European Union Horizon 2020 research and innovation Programme under grant agreement no. 875041

PROJECT PARTNERS

ABOUT

This brochure has been prepared for the project SOLUTIONSplus. The project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement no. 875041

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PICTURES

All the pictures are provided by the SOL+ partners

June, 2024

Scale-Up Concept Note

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Dar es Salaam, Tanzania

1. Background

1.1. Urban mobility in Dar es Salaam

Dar es Salaam, the largest city and economic hub of Tanzania, is a vibrant coastal metropolis situated along the eastern shores of the Indian Ocean. It is home to a substantial and rapidly growing population of 5.38 million people in 2021 and with an average annual population growth rate of 5% (The United Republic of Tanzania, 2022; Dar es Salaam City Council, 2021). The city's significance as a major urban centre and gateway to Tanzania is underscored by its high population density, influenced by factors such as urbanisation, economic opportunities, and infrastructure development. However, in response to rapid urban growth and increased individual motorization, Dar es Salaam faces chronic congestion. Most of the city dwellers travel by minibus or walk: 51.2% of residents use public transport by minibus (47.9%) or BRT (3.3%), 39% walk, 4.9% use motorcycles, 3.7% cars, 0.5% bicycles, 0.4% commuter rail, and 0.3% ferry (JICA, 2018). In areas unserved by minibuses, for-hire three-wheeled motorised vehicles (“bajajs” or “bajajis”) or motorcycle taxis offer a de-facto public transport service filling a gap in the transport system. Yet, despite significant benefits for people’s mobility and much-needed employment opportunities, two- and three-wheelers have contributed to increased pollution in the city. At the national level, the transport sector contributes to 57.6% of the total CO2 emissions due to fuel combustion. Motorised two- and three-wheelers have considerably expanded in Tanzania from 52,015 in 2007 to 1.2 million, which poses a challenge due to their reliance on fossil fuels.

Recognising these challenges, Dar es Salaam pioneered the transition to sustainable urban mobility in East Africa with the creation of a dedicated public transport agency (Dar Rapid Transit Agency - DART) in 2007, and the subsequent operation of the first BRT line in 2016. The city is implementing five other BRT corridors which will include integration with non-motorised transport infrastructure to improve accessibility. Currently, 201 fossil-fueled buses connect the city center to the Western suburbs. Expansion plans include new routes and the addition of further buses, potentially powered by Compressed Natural Gas (CNG) or electricity. Remarkably, Dar es Salaam was the first African city to receive the Sustainable Transport Award in 2018.

Along with the promotion of transit-oriented development centred around public transport and active mobility, a shift has recently started towards the introduction of low-emission vehicles as part of the city’s green urban mobility agenda. An ecosystem of companies providing electric vehicles is emerging,

accompanied by efforts from research institutions and international organisations. The Tanzania Climate Action Plan recognises the importance of low-emission mobility, with the Flagship Action n°23 planning an increased use of alternative energy sources such as electricity within the vehicle fleet. Under the transport sector, the NDC commits to expanding the BRT system, and promote non-motorised transport in cities. DART supported the electrification of existing three-wheelers providing feeder services to the BRT.

1.2. Main achievements from the demonstration action

In Dar es Salaam, the project promotes the electrification of three-wheelers (hereafter “bajajis”) already providing feeder services to the BRT, tests new mobility options in the form of pedal-assist electric bicycles used for urban deliveries, raises awareness on electric mobility, and identifies policies to remove barriers to sustainable and electric urban mobility.

The partners forming the SOLUTIONSplus Living Lab in Dar es Salaam are the Dar Rapid Transit Agency (DART), UN-Habitat, UN Environment, the Urban Living Lab Center (ULLC), a UN-Habitat Collaborative Center gathering the Urban Electric Mobility Initiative (UEMI) and the Wuppertal Institute (WI), the Institute for Transportation and Development (ITDP Africa), the Deutsches Zentrum für Luft- und Raumfahrt – German Aerospace Center (DLR), FIER Automotive, and PluService.

Very positive results have been achieved. While there were no electric three-wheelers (“e-bajajis”, also “e3Ws” hereafter) for passenger services in 2020 at the start of SOLUTIONSplus, five companies supported by SOLUTIONSplus now test different new or retrofitted bajajis using lithium-ion batteries. These companies represent the largest fleet using lithium-ion batteries instead of less efficient and environmentally damaging lead-acid batteries. SOLUTIONSplus introduced pedal-assist electric bicycles for urban deliveries, a vehicle type not previously used in Dar es Salaam. The E-Mobility Forum in March 2023 was the first large event on electric and sustainable urban mobility in Dar es Salaam gathering key Tanzanian and sub-Saharan stakeholders.

Key metrics

- Electric three-wheelers
  - 1 large and collaborative Feasibility Assessment to electrify three-wheelers, identifying 82% of drivers interested in piloting electric three-wheelers, and providing a wide range of operational, financial and technical data to design e3Ws technical specifications
  - 39 new three-wheeled prototypes and three-wheeled locally assembled
  - 4 retrofitted three-wheelers, i.e. internal combustion engines (ICE) converted to electric
  - 1 large multi-criteria Impact Assessment
  - 1 e3W Retrofitting Guide
  - GHG emissions of e3Ws 76% lower than internal combustion engines
  - GHG emissions drop by 29% by 2030 in an optimistic scenario (70% of vehicles sold being electric in 2030) or by 12% in a conservative scenario
  - 22.49% Internal Rate of Return for e3Ws companies

- Pedal-assist electric bicycles
  - 16 pedal-assisted electric vehicles daily transporting urban deliveries & medical supplies
  - 5 additional batteries
  - 45 persons trained on the assembly, maintenance, repairs, and safe operations of pedal-assist electric bicycles in 3 workshop rounds spanning 3 to 5 days each
  - 2,723 kg of CO_2e reduced per year if switching from ICE motorcycles to pedal-assist electric bicycles
  - 1 feasibility study to scale up the use of electric bicycles in Tanzania
  - 1 digital booking application developed to facilitate urban deliveries
  - 2 workshops on e-bicycle scaling-up, business improvement, and digital literacy
  - 1 Africa E-Bicycle Start-up Booklet

- Cross-cutting aspects
  - 1 EV Centre at a Research Institute hosting electric two- and three-wheelers activities
  - 1 E-Mobility Forum, the first high-level e-mobility event and EV Exhibition in Dar es Salaam
  - 1 Policy Paper on E-Mobility Policies in Tanzania
  - 1 National Urban Mobility Policy and Investment Programme
  - 1 Dar es Salaam E-Mobility roadmap
  - Numerous capacity-building activities using various suitable formats (in-person, online, hybrid) on various e-mobility topics including EV Charging Infrastructure, EV battery technologies and end-of-life management, paratransit electrification, vehicle types, etc.

Detailed activities and results

Inform

SOLUTIONSplus partners collectively identified a dearth of data on current ICE bajajis, which was significantly hindering the identification of suitable charging and vehicle technologies, hence hindering a sound transition to electric bajajis.

Consequently, the SOLUTIONSplus team **engaged in extensive data collection efforts** throughout 2021 and 2022 to assess the feasibility of electrification of e-bajajis in Dar es Salaam. This included GPS tracking, surveys of drivers and users, and a meticulous analysis of operational and business strategies.

Figure 1: Feasibility Assessment (top), data collection via GPS, survey, and interviews with bajaji drivers

The resulting **wealth of data-informed appropriate technical specifications for vehicles, charging infrastructure, and operational strategies**, focusing on the needs and preferences of drivers. This includes, for instance:

- Integrating the views and preferences of bajaji drivers on 3 key aspects (sufficient range, vehicle robustness, and availability of spare parts) is essential to ensure a just and efficient transition.
- The average daily mileage with ICE bajajis in the areas studied is found to be 120 km going up to 136 km. To avoid immobilisation as much as possible during the day, most of the charging should take place overnight, with a battery capacity of circa 7 to 8 kWh. Charging during the day should serve as a limited top-up, not necessarily requiring a full charge.
- Pilots can start with drivers parking at home, having a safe and earthed grid connection. Going forward, for the other half drivers found to park at a third party guarded space (e.g. political party's office or a supermarket), another system involved the third party needs to be designed.
- Shifting to e-bajajis reduces the drivers' operational costs by removing the high fuel costs, which currently represent nearly half of their daily costs.
- The general interest of the drivers in an e-bajaji pilot (82% of them) is a positive factor. Selecting waiting points where drivers showed clear interest in the pilot is important for local ownership of the project and continuous dialogue.

This collaborative and inclusive approach was recognised as a positive case study in the C40 global publication 'City guide for two and three-wheeler management and electrification'.

Informing partners of SOLUTIONSplus Dar es Salaam on modalities and characteristics of electric mobility was done through capacity-building (see next row) and **knowledge products available on the SOLUTIONSplus online toolbox**. In particular, several guides on the electrification of three-wheeled vehicles in Asia and electric bicycles were incorporated into and used by partners of the Dar es Salam Living Lab, since those two vehicle types are the core of the Dar es Salaam demonstration action.

Lastly, informing all about the results of the pilots was done through a **thorough impact assessment** throughout the project duration, assessing baseline, ex-ante, ex-post and scale-up scenarios.

Inspire

On top of the online e-courses on e-mobility available for all SOLUTIONSplus partners worldwide, stakeholders in Dar es Salaam benefited from several **regional and city training sessions** focusing on training topics identified as priority areas in 2020. Week-long training sessions addressed EV Charging Infrastructure for all modes (2021), EV battery technologies and their end-of-life management (2022), and public transport electrification (2023).

A **high-level E-Mobility Forum** was organised in 2023, gathering key Tanzanian and sub-Saharan stakeholders, providing an area for exchanges on e-mobility in Tanzania and Africa, and organising an EV Exhibition Fair. This was the first event on e-mobility in Dar es Salaam, raising large interest from decision-makers and the private sector.

Figure 2: Regional training on EV Batteries Technologies and End-of-life Management (top); Africa E-mobility Forum (bottom)

Additionally, **peer-to-peer exchanges** were facilitated with stakeholders from the SOLUTIONSplus city network on electric three-wheelers. An exchange with Indian cities, which are more advanced in these vehicles, took place in July 2022. Partners from DART exchanged with Hamburg transport stakeholders on bus electrification and electric

micro mobility, as well as other demonstration actions partners across the globe, during the study visit in Hamburg in September 2022.

Initiate

Five local start-ups received financial and technical support in Dar es Salaam: four working on electric three-wheelers (Auto Truck/DIT, SESCOM, TRI, Ekoglobe) and one local cooperative operating pedal-assist electric bicycles (FASTA).

The **seed funding for the e-bajaji project component** followed a two-phase approach. Between 2020 and 2023, a Phase I focused on promoting local Research & Development, in the form of either ICE bajajis retrofitted to electric bajajis or prototypes, of fully new electric bajajis. Vehicles were locally designed, manufactured, and assembled, using locally sourced materials or components as much as possible (DIT/Auto Truck and SESCOM, total of 6 vehicles). Between 2023 and 2024, a Phase II looked to expand the e-fleet with a total of 37 vehicles, locally designed and locally assembled, which represents advancement compared to the mainstream previous practice of importing fully or semi-assembled vehicles (Ziotio Company-brand TRI and Ekoglobe). More information on the two phases is given in section “Implement”.

Alongside seed funding, SOLUTIONSplus provided **technical advice support** through consortium members or external EU organisations selected through EU matchmaking calls. In Dar es Salaam, start-ups received technical support on battery sizing and on the retrofitting process through the SOLUTIONSplus partner IDIADA and the Germany-based PEM Motion selected through an EU matchmaking call. In June 2024, a technical training programme on electric mobility for local technicians was organised by SOLUTIONSplus with DIT, EURIST and FABIO in Dar es Salaam.

Figure 3: Auto Truck e-bajaji manufactured at DIT (top); assembly of Africrooze electric bicycles at DIT (bottom)

DIT staff and students were trained at DIT to a assemble, repair, maintain and safely use pedal-assist electric bicycles. Through this process, EURIST transformed into a new company known as AfricroozE GmbH with an important market potential, now with 300 electric bicycles present in 8 African countries.

Implement

In the pursuit of sustainable and innovative transportation solutions, the SOLUTIONSplus Dar es Salaam concentrated on **two key areas: transition towards electric three-wheelers in place of current ICE ones, and introduction of pedal-assist electric bicycles** as a fully new mobility option in Dar es Salaam. The endeavour involved a multifaceted approach, encompassing the development of prototypes, local partnerships, and extensive data collection.

One key aspect of this initiative is the **introduction of electric three-wheelers** designed for passenger feeder services to the Bus Rapid Transit (BRT) system. In total, SOLUTIONSplus enabled the roll-out of a total of 43 electric three-wheelers in Dar es Salaam (39 new vehicles and 4 retrofitted vehicles), deployed by five different companies. These electric three-wheelers are either retrofitted (converted) fossil-fuel bajajis into electric bajajis, or fully new electric three-wheelers. Thus, a wide range of vehicle designs and technologies were tested. The project carefully studied the patterns of ICE bajajis to identify appropriate technical specifications, in particular, the battery capacity and the charging strategy (SOLUTIONSplus Feasibility assessment to electrify feeder three-wheeled vehicles in Dar es Salaam, 2023). Lastly, all electric three-wheelers all use lithium-ion batteries, comparatively more performing than lead-acid batteries and more adapted to the needs of the drivers of bajajis, and representing a shift away from other electric three-wheelers found using polluting and less efficient lead-acid batteries.

During **Phase I focusing on promoting local Research & Development**, two companies were financially supported by UN-Habitat. Auto Truck assembled two new electric bajajis and retrofitted one ICE bajaji at the Dar Institute of Technology (DIT). The collaboration with the DIT has provided strong local anchorage, enabling the assembly of vehicles and the training of engineering students. The vehicles are charged at DIT. The vehicles have been tested and are currently pending certification from TBS and registration with TRA which will allow for subsequent commercialisation. Designs for the fleet application management system were developed in collaboration with the Kenyan branch of the hardware supplier Teltonika, a company based in Lithuania. Another company, Sustainable Energy Services Company (SESCOM) retrofitted three ICE bajajis. After finalising a retrofitting manual and proceeding to the technical operational testing, the vehicles were tested and are pending certification by TBS. They will then be registered with TRA and LATRA authorities and deployed along the Tangi Bovu – Goba route. This route connects to the Mbezi Mwisho BRT terminal, and connecting to other minibus bus stops, such as the Ulomi bus stop.

Figure 4: Phase I - Auto Truck/DIT Company Ltd (left) and SESCOM (right)

During **Phase II focusing on expanding the locally assembled e-fleet** (2023-2024), Ziotio Company (brand TRI) and Ekoglobe were selected to provide additional vehicle design and charging approaches, with seed funding provided by UEMI. Via SOLUTIONSplus, TRI deployed 20 electric bajajis using plug-in charging overnight and topped up during the day, and 5 further vehicles of the iterated bajaji model E2 in 2024.

Ekoglobe assembled 12 electric three-wheelers for passenger services and trained 12 drivers. The vehicles are operated at a bajaji waiting point close to a BRT station, where drivers use them to provide passenger feeder services to a university and residential area. The technical specifications and the route selected for the pilot are based on the 2023 SOLUTIONSplus feasibility study to electrify existing three-wheelers near BRT stations.

Figure 5: Phase II - Expanding the e-bajaji fleet: new e-three wheelers by TRI (top) and Ekoglobe (bottom)

In addition to the electric three-wheeler project, SOLUTIONSplus introduced 16 **pedal-assist electric bicycles designed for urban deliveries** and the transportation of medical supplies. These vehicles were not present in Dar es Salaam prior to the project.

In 2022, the SOLUTIONSplus team collectively mapped needs and stakeholders, which led to identifying urban deliveries as the most promising use case for the electric bicycles. Partners identified potential receivers and established partnerships with the FASTA Cycling Cooperative and the Dar es Salaam Institute of Technology (DIT). Co-designed by EURIST and the German company HNF Nicolai, these 16 electric bicycles and 5 additional batteries were shipped in October 2022. A three-day workshop held at the Dar Institute of Technology in November 2022 enabled to train DIT staff, students and FASTA cyclists on the use and the assembly of the electric bicycles. Participants assembled the electric bicycles before the official inauguration ceremony at the Aga Khan Hospital.

Currently, the e-bikes are actively employed for transporting medical supplies on behalf of the Aga Khan Health Services, showcasing significant scale-up potential. Realising that electric bicycles do not receive as much attention as other vehicles in Africa such as electric motorcycles, this pilot prompted SOLUTIONSplus partners to develop an Africa E-Bicycle Start-up Booklet disseminated by UNEP and receiving significant interest among African partners. In addition, the pilot has laid the foundation for a prefeasibility study in 2024 to further scale up the use of e-bicycles for urban deliveries in Dar es Salaam and the broader East African region.

Figure 6: Electric bicycles: official launch in front of the Aga Khan Hospital (left); UN-Habitat communication video (top right); one FASTA cyclist riding an electric bicycle

Impact

SOLUTIONSplus took a leading role in several areas: feasibility assessment, policy analysis, visibility of e-mobility, and preparation of follow-up projects.

First, SOLUTIONSPlus paved the way by **assessing the regulatory, fiscal, and market environment** for the introduction of electric three-wheelers. Looking at the wider policy environment, SOLUTIONSplus identified barriers to the uptake of electric mobility jointly with the Africa E-Mobility Alliance. Leaning on this analysis, SOLUTIONSplus issued key recommendations for national and local policies. At national level, SOLUTIONSplus issued a policy paper on electric mobility policies in Tanzania, as well as a National Urban Mobility Policies and Investment Program. At local level, SOLUTIONSplus developed a City Roadmap identified pathways for sustainable and electric urban mobility in Dar es Salaam.

Visibility on electric mobility was significantly increased through the high-level E-Mobility Forum, first event on e-mobility in Dar es Salaam, and EV Exhibition Fair.

Lastly, SOLUTIONSplus partners engaged **preparations for two key follow-up projects**, sharing suggestions for a follow-up project with the EU Delegation and through the already approved EU R&D eBRT2030 project.

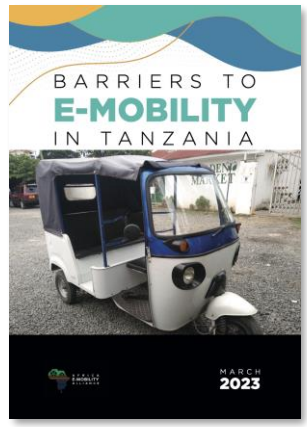

Figure 7: Joint SOLUTIONSplus-AFEMA publication (top); participants to the E-Mobility Forum (middle); EV Exhibition Fair (bottom)

1.3. Further needs and gaps to address

Efforts towards collective and sustainable mobility need to be maintained and scaled to accompany the staggering growth of Dar es Salaam, whose population is projected to reach 9.7 million by 2030 and 15.6 million by 2050 (Dar es Salaam Climate Action Plan, 2020-2050).

Based on knowledge generated between 2020 and 2023, the SOLUTIONSplus team has identified at least **four areas that need to be further addressed to scale electric mobility** at national and local levels:

1) On the policy side, the work initiated by SOLUTIONSplus to identify barriers and recommendations on **electric and sustainable urban mobility policies** should be taken further, as the remaining lack of a clear regulatory framework, incentives, and supporting infrastructure is a clear barrier identified by start-ups to scale in Tanzania. Clear national policies on scaling, electrifying public transport and prioritising active modes for first and last-mile connectivity are essential to prioritise projects and attract the private sector. An analysis of the opportunity and impact of recommended policies should be conducted and discussed with Tanzanian national institutions. National policies should not only look at lithium-ion battery-powered vehicles, but also control more tightly the proliferation of low-quality of lead-acid battery-powered vehicles, having a much shorter lifespan and without any clear regulatory framework for their end-of-life management.

2) As current low-carbon developments mostly lean on pilots or small fleets, there is a need to **scale up existing SOLUTIONSplus pilots** that consist of electric three-wheelers feeding the BRT system and pedal-assist electric bicycles used for urban deliveries. Data needs to be collected at a larger scale to identify required charging infrastructure needs, and to analyse the performance and impact of newly introduced e-vehicles. Finally, promising start-ups should receive support in transitioning from the seed phase facilitated by SOLUTIONSplus in 2020-2024, to the maturity stage.

3) Beyond existing pilots, there is a need to **assess the feasibility of electrifying additional transport modes** and vehicle types such as BRT buses, feeder buses, and motorcycles. Feasibility assessments should also look at the potential to use second-life EV batteries as storage systems supporting the uptake of renewable electricity generation, ultimately reinforcing the circular nexus transport-energy-waste.

4) A final aspect lies in addressing remaining **capacity-building needs**, as the UEMI and UN-Habitat funding calls show an overreliance of companies on equipment from Asian manufacturers without sufficient knowledge and critical distance towards technical specifications, costs of quality products, and environmental impacts. Without further training, there is a risk that e-mobility may develop with sub-standard or unsafe products. The role of academic, local technical and vocational institutions should be reinforced to strengthen technical skills, also for maintenance and repairs. Furthermore, as interest in e-BRTs continues to rise within the region, there is an increasing demand for enhanced capacity development, the exchange of knowledge, and a deeper comprehension of the planning, infrastructure, and operational prerequisites necessary to establish effective e-BRT systems.

2. Follow-up project n°1: EU-supported project on Green Urban Mobility in Tanzania

2.1. Goal

The EU can play a major role with an integrated and multi-dimensional programme to scale efforts. The EU is in an excellent position to build upon current projects, fill gaps and support Tanzania's sustainability commitments with a programme entailing the following four pillars.

2.2. Scale-up Approach

The Scale-up Approach is based on the identification of four areas that need to be further addressed to scale electric mobility at national and local levels, based on knowledge generated between 2020 and 2023, as shown in Figure 8.

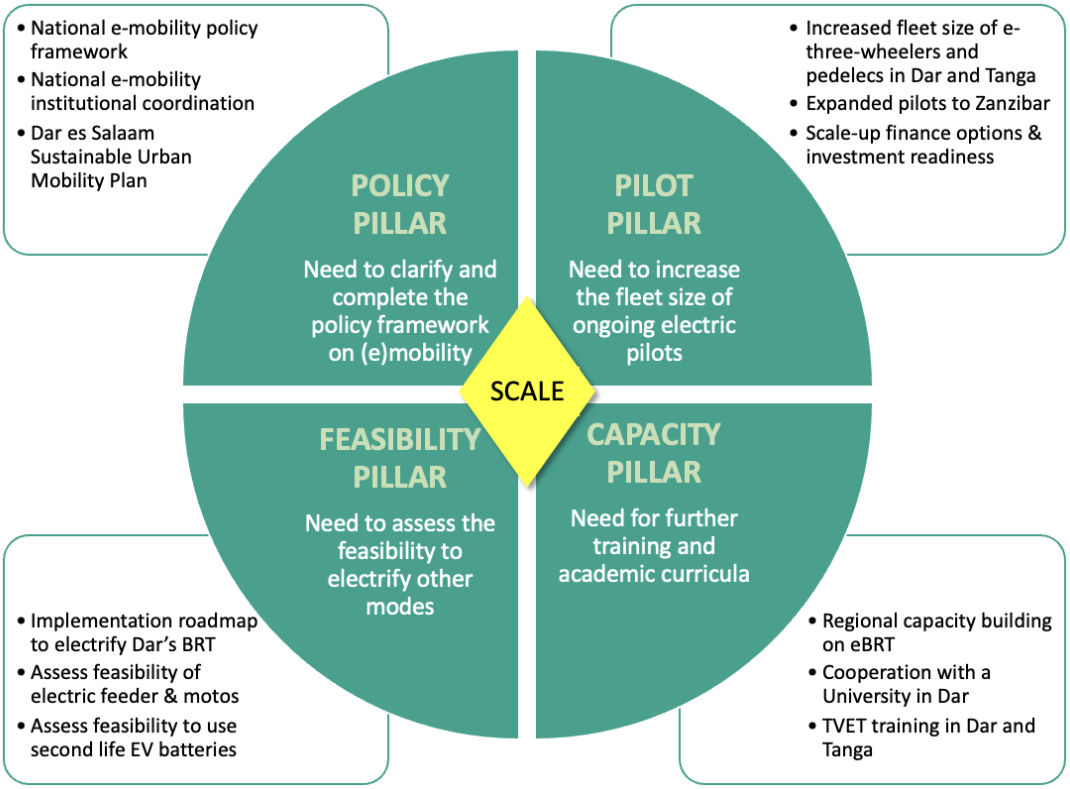

Figure 8. Green Urban Mobility:
Four Pillars to Address Remaining Gaps to Scale

The Tanzania Climate Action Plan recognises the importance of low-emission mobility, with the Flagship Action n°23 planning an increased use of alternative energy sources such as electricity within the vehicle

fleet. Under the transport sector, the NDC commits to expanding the BRT system, and promote non-motorised transport in cities.

2.3. About the scale-up project

Overview of activities typology: (1) studies, policies and electrification roadmaps (2) capacity-building and training at local, national and regional levels (3) in-person and online workshops (4) site visits (5) integration of e-mobility courses into university degrees, student exchange and internship programmes (6) small-scale funding to scale up pilots in Dar es Salaam and Tanga (7) awareness-raising events.

2.4. Timeframe

Recommended: 2024-2028 (four years)

2.5. Stakeholder Engagement

A collaborative approach is targeted with a dual approach:

- SOLUTIONSplus partners and implementing partners forming the core group (UN-Habitat, DART, ULLC, UNEP, ITDP Africa, DLR, DIT), in partnership with the Belgian development agency ENABEL
- Work with political partners as recipients of the technical assistance, such as the Ministry of State in the President's Office, Regional Administration and Local Government (PO-Ralg), the Land Transport Regulatory Authority (LATRA), the Ministry of Works, Transport and Communications, the Ubungo Municipal Council, the Kinondoni Municipal Council, the Temeke Municipal Council, the Ilala Municipal Council and the Kigamboni Municipal Council, the Tanzania Electric Supply Company Limited (TANESCO), the Energy and Water Utilities Regulatory Authority (EWURA), the Tanzania Commission for Science and Technology (COSTECH), the University of Dar es Salaam (UDSM), the National Institute of Technology, the National Institute of Transport (NIT), the Dar es Salaam Institute of Technology (DIT), the Tanzania Bureau of Standards (TBS), Tanzania Revenue Authority (TRA), Tanzania Electrical, Mechanical and Electronics Services Agency (TEMESA).

2.6. Budget

Recommended: 4 million EUR

2.7. Recommended content

POLICY		
Clear policies have set up an incentivizing regulatory environment creating certainty for the private sector to invest in integrated electric mobility in Tanzania		
Enabling national regulatory framework for low-emission urban mobility solutions in Tanzania		
	Achievements & remaining needs	Proposed follow-up project
Institutional coordination on electric mobility at national level	Achievements - Implementation of pilots in Dar es Salaam through DART as the leading agency and through information exchange with relevant Tanzanian governmental entities including DART, PO-RALG, LATRA, TBS, TANESCO, COSTECH, etc. Gaps - No platform allowing institutional coordination and public-private dialogue on e-mobility. A possible regional example of enhanced coordination exists in Kigali with the Rwanda E-Mobility Technical Committee launched within SOLUTIONSplus, enabling exchanges between government entities and dialogue with the private sector on the implementation of policies.	- Update the analysis of the institutional landscape around low-emission solutions for urban mobility in Tanzania. - Organise workshops to identify modalities for enhanced institutional coordination on e-mobility with relevant government entities. This will involve entities involved in energy, transportation, finances, industry, urban planning, and research. - Set up a platform for enhanced institutional coordination between government authorities and ideally with representatives of the private sector on e-mobility barriers, needs, and policies.
National policies for low-emission urban mobility solutions	Achievementsju - Analysis of the current regulatory framework on electric mobility. - Analysis of barriers faced by electric mobility companies to deploy electric vehicles in Tanzania. - Preliminary analysis of policies to support the uptake of electric mobility in Tanzania, via desk research, interviews, participatory workshops, and initial recommendations. - Initial recommendations on a National Urban Mobility Policies and Investment Program (NUMP). Gaps - Need for a more wholesome and integrated approach encompassing sustainable urban mobility and electrification. - Feedback from Tanzanian authorities on SOLUTIONSplus recommended policies; engagement on impact and implementation modalities.	- Engage with relevant Tanzanian authorities via workshops to identify feasible policies and incentives for electric and sustainable urban mobility, on the basis of the existing SOLUTIONSplus policy recommendations. This will look at electric mobility as a part of an integrated mobility approach (e.g. e-mobility combined with a shift to collective and active mobility) and look at all relevant aspects (e.g., registration, standards), including a gender-inclusive focus. - Assess government capacities including financial, human, and technical resources for implementation, enforcement, and evaluation of national-level policies selected by Tanzanian government authorities among the SOLUTIONSplus recommendations.

Improved urban mobility policy and planning in Dar es Salaam		
	Achievements & remaining needs	Proposed follow-up project
One Sustainable Urban Mobility Plan (SUMP) in Dar es Salaam	Achievements - Identification of Dar es Salaam's sustainable urban mobility initiatives and climate action objectives. - Identification of regulatory uncertainties for urban mobility in Dar es Salaam, e.g. the definition of feeder services and framework applying to three-wheelers. - Development of a city roadmap for e-mobility (to be published soon). Gaps - No current, overarching document with an in-depth analysis of Dar es Salaam's mobility needs, presenting priorities and actions for sustainable urban mobility indicating timelines, cost and responsible agencies for projects. - Lack of clarity on the role of electric mobility within sustainable urban mobility.	- Engage with Dar es Salaam Municipal councils, DART, and other stakeholders to identify modalities, feasibility and cost implications to operationalise the Tanzania Climate Action Plan's targets for sustainable mobility and low emissions transport solutions (actions 19, 20, 21, 22, 23, 25). - In partnership with relevant national and urban Tanzanian institutions, develop a Sustainable Mobility Plan for Dar es Salaam that ties in components of electrification as a wholesome approach to urban planning, including implementation modalities for measures actionable at the local level (e.g. low-emission zones). - The Dar es Salaam Sustainable Mobility Plan will build on the existing plans and policies such as the Dar es Salaam Public Transport Master Plan, by using data to identify priority projects, having clear implementation plans and budgets while also addressing emerging electrification opportunities.

PILOT SCALING		
E-mobility start-ups have been able to increase their fleet size following initial pilots.		
Increased pilot fleet sizes		
	Achievements & remaining needs	Proposed follow-up project

E-bajaji Scale-up, Dar es Salaam	Achievement
	- Feasibility assessment report collecting data with ICE bajajis to identify appropriate technical specifications of e-bajajis.
	- Grant funding to 4 companies for a total of 43 new or retrofitted e-bajajis to provide BRT feeder services.
	  ○ Phase I: grant funding to companies manufacturing prototypes with a high share of locally available components, and retrofitting (Auto Truck, SESCOM).
	  ○ Phase II: grant funding to companies locally assembling a higher number of vehicles (TRI, Ekoglobe).
	- Technical assistance to companies, e.g. on battery design, retrofitting.
	Gaps
	- Limited fleet sizes and pilot areas.
	- Financing for upscaling the current fleet and needed charging infrastructure.
		- Study to identify further feeder deployment areas beyond the pilot zones to cover a more significant portion of the city, and in coherence with the upcoming BRT phases. This will be done in coordination with corresponding funding entities (including EIB), based on the results of the SOLUTIONSplus impact assessment.
		- Small-scale funding for extension of some solutions tested within SOLUTIONSplus with regards to additional vehicles, additional or new charging infrastructure (e.g., swapping instead of plug-in charging), and locations.
		- Development of a centralised technical training on e-mobility at a University or TVET institution.
		- Peer-learning activities with Indian stakeholders with knowledge on challenges of similar vehicle types.

Electric Bicycles Scale-up, Dar es Salaam	Achievements - SOLUTIONSplus grant funding to introduce 16 pedal-assist electric bicycles in Dar for urban deliveries. - Establishment of a partnership with the FASTA Cycling Cooperative, the Dar es Salaam Institute of Technology (DIT) and the Aga Khan Hospital. - Training workshop at DIT on assembly and use of electric bicycles. - Pre-feasibility study to assess the opportunity to shift from ICE motorcycles to electric bicycles. - Booklet on electric bicycles start-ups in African cities. Gaps - Small fleet size and pilot. - Need to convince larger customers to pilot e-bicycles instead of ICE motorcycles, e.g. e-commerce	- Dialogue and workshops with potential larger e-bicycles customers, e.g., e-commerce platforms, institutions. - Up to two individual studies on impact and feasibility for e-commerce platform to use electric bicycles for urban deliveries instead of ICE motorcycles. - Small-scale funding for extension of the e-bikes to organisations interested in switching from ICE motorcycles to electric bicycles. - Regional peer learning with electric bicycle companies. - Integration of electric bicycles in urban planning and EV policies and incentives.

	- Safe infrastructure for e- bicycles.	- Recruitment of women as e-bicycle delivery riders.
Increased access to finance		
	Achievements & remaining needs	Proposed follow-up project
Financial mechanisms to scale	- Start-up incubator; courses on innovation management; individual coaching sessions on Business Models Canvas and business models. - Training and webinars with investment companies.	- Incubator activities for simplified access to financing - Study on the feasibility for carbon credits and e-mobility in Tanzania.

FEASIBILITY		
Clarity has been shed on the feasibility and opportunity to electrify further vehicle types that had not been assessed in previous projects, such as BRT buses, minibuses, and motorcycle taxis.		
Technical capacity and planning for Dar eBRT		
	Achievements & remaining needs	Proposed follow-up project
Capacity-building on eBRT requirements and characteristics	Achievements - Several in-person and online training sessions on public transport electrification, including global and sub-Saharan case studies. - Modules on bus electrification in the 2021 Africa EV Charging Infrastructure two-weeks training. - Dar es Salaam E-Mobility Forum in March 2023: three-day training session on public transport electrification. - In-person eBRT capacity building and peer to peer exchange with CETUD in Senegal (May 2024). Gaps - Training on bus electrification but not on e-BRT specifically. - No large eBRT cases in Africa at the time of SOLUTIONSplus, but currently changing in Dakar and Nairobi.	- Provide capacity-building programmes on eBRT, leveraging synergies with the EU-funded projects eBRT2030 project and creating a regional BRT community. - Peer-to-peer exchange and study visits between Dar es Salaam, Nairobi (eBRT line financed by EIB, eBRT2030 project) and Dakar (first fully electric BRT in Africa). - Capacity-building covering a wide range of topics from conception, procurement, and operations to tools to assess the impacts on GHG emissions, air pollution and the grid (e.g. UNEP's EMOB Calculator, UEMI's e-Bus Emissions Assessment Tool eBEAT, tools developed by UNEPs Africa Support and Investment Platform).

Dar es Salaam eBRT and Feeder Bus Implementation Roadmap	Achievements - *Outside of the SOLUTIONSplus project: UNEP supported and completed "Promoting Soot-Free Bus Buses in Tanzania" project, which resulted in a report including a tentative timeline for a soot-free bus induction plan.* Gaps - There exists no roadmap at present detailing the feasibility and implementation strategy for introduction of e-buses for each phase of the BRT exploring charging strategy, vehicle and charging specifications, requirements for depots, etc. - With the expansion of the BRT system in Dar es Salaam, the electrification of the BRT buses and the feeder services operated by DART as part of a trunk and feeder system offers great opportunities for an efficient, electric public transport system. Operating contracts covering both trunk and feeder operations can include clauses incentivising e-buses over diesel buses. - Other actors are looking at the possibility to retrofit minibuses, e.g., E-Motion Africa in Arusha, which aligns with the UNEP-led policy paper on retrofitting that will be completed within SOLUTIONSplus by mid-2024.	- Technical assistance for the introduction of e-buses planned for the phase 2025-2030, leaning on UNEP's work on soot-free buses and TUMI E-bus mission in Nairobi. - Development of an implementation roadmap to guide the deployment of electric BRT buses and feeder bus services. This roadmap should include: charging strategy, suitable vehicle type, impact on operations, timeline, analysis of all depots to identify the most suitable energy, analysis of the possibility of retrofitting existing depots, consider multimodal charging solutions at future electric bus depots to integrate charging services for feeder vehicles, financial model, business model). - Identify relevant ICT solutions, e.g. smart tools to optimise safety and efficiency, and real-time information to optimise energy efficiency during vehicle operation.
Integrating and electrifying feeder electric motorcycles		
E-boda boda Assessment	Achievements - *Electrification of moto taxis outside of the SOLUTIONSplus demo focus areas in Dar es Salaam*. - Key learnings gathering on moto-taxi electrification in Kigali, Rwanda through SOLUTIONSplus. Gaps - No assessments have been conducted in Dar es Salaam specifically, and for this specific mode.	- Study to assess the feasibility to electrify motorcycle taxis as part of initiatives to reduce carbon emissions in Dar es Salaam. - Integration of electric motorcycle companies in WP 4.1 Skills development (see below).
Circular Value Chains Assessment		
Transport, energy and waste sector coupling	Achievements - Regional capacity-building activities on circular end-of-life management of EV batteries.	- Accompany e-mobility in their end-of-life management plans, incl. on financial soundness.

	- Workshop in circularity of e-bus batteries in March 2023 in cooperation Oeko-institut. - Policy paper on circular end-of-life management of EV batteries in sub-Saharan Africa. Gaps - Limited localisation of findings in Tanzania due to comparatively less advanced EV Market. - Risk of e-waste mismanagement due to a lack of clear policies and company plans. - Regional standards for management of EV battery management.	- Connect e-mobility company to end-of-life management companies, e.g. WAGA. - Include circularity in the national policy discussion on urban mobility (WP1.2). - Support the Ministry of Environment and the Vice President's Office to integrate EV batteries in e-waste management guidelines. - Support development of standards for recycling and re-use of EV batteries at the East African Community (EAC) level.

CAPACITY		
Companies, vocational and educational institutes possess solid knowledge on safe and sound deployment and maintenance of electric vehicles.		
Strengthening local skills		
	Achievements & remaining needs	Proposed follow-up project
Skills development	Achievements - General and individualised training sessions provided to e-mobility companies, in cooperation with the Dar es Salaam Institute of Technology (DIT) . Gaps - Mostly online training sessions in the Covid context. - Persisting knowledge gaps identified in recent calls for funding.	- Gap assessment summarising issues found with electric vehicle technical specifications and risks for safety. - Based on the assessment, additional technical training to key technical and vocational stakeholders, including DIT aiming to become an EV Center, the National Institute of Technology, and start-ups. - Peer learning with stakeholders in geographies with similar vehicle types, e.g. India.
Curriculum development	Achievements *Cooperation with a university in Dar es Salaam such as DIT or UDSM, to ensure the localisation of learnings.* - *Curricula currently being developed for universities and TVET schools in other sub-Saharan Countries focusing on electric mobility and sustainable mobility policy and planning*.	- Identify and assess gaps and opportunities of educational programs and curricula of academic facilities in Tanzania on electric mobility. - Based on identified gaps, propose to strengthen the curriculum at DIT and NIT, with modules to develop and provide the needed expertise on planning and operation of electric public transport. - Student exchange and internship programmes with partner

		universities in African countries and the EU. - Initial steps to request authorisation to create a corresponding academic degree and creation of funding for a junior professor position and two PhD students. - Special attention to recruiting women to participate in these programmes.

3. Follow-up project n°2: eBRT2030 (Horizon Europe)

3.1. Goal

eBRT2030 seeks to support sustainable urban transport by **proposing innovative solutions for electric Bus Rapid Transit (BRT)**. A major milestone in electric mobility, eBRT2030 aims to demonstrate the applicability of a new generation of eBRT systems in different urban contexts with innovative solutions that are economically viable and enhanced with new automation and connectivity functionalities.

eBRT2030 will **work closely together with end-users** to understand how the developed eBRT services can be improved to support the needs of citizens. Following this, the project will heavily focus on advancing passenger experience and enhancing mobility access of underserved areas, or regions with increased transportation needs.

eBRT2030 solutions will be tested in **real-life demos in Europe and beyond**, bringing around the table public transport operators, bus manufacturers, technology providers and academia. An important focus of the project will be to translate and apply eBRT solutions not only in Europe, but also to tackle challenges on pollution and emissions in developing countries.

3.2. Scale-up Approach

The eBRT project is global in nature. It will work with one of the trailblazer cities in terms of BRT globally-Bogota, Colombia, to test and integrate BEV feeder buses to the Transmilenio fleet, complemented by smart tools and value services that would aim at optimizing the utilization of such within the context of the BRT fleet. Innovations will be tested such fleet management, information provision for control centers, drivers, and public transport organisations; dynamic priority management services; optimisation of energy efficiency during vehicle operations; innovative smart charging solutions for large fleets. These activities will then be complemented by **feasibility studies and demonstration projects in different cities, including Dar es Salaam, Tanzania.**

The scale-up approach of the eBRT project aligns with countries' priorities for sustainable mobility by:

- Reducing Urban Congestion: Integrating BEV buses with BRT systems can significantly reduce congestion in urban areas, making mobility smoother and more efficient. The studies relating to the integration of BEV feeder buses aims to improve public transport reliability and efficiency and would contribute towards addressing the growing demand for urban mobility in one of Africa's rapidly urbanizing cities.
- Improving Air Quality: By transitioning to electric feeder buses, cities can substantially lower their greenhouse gas emissions and improve air quality, contributing to healthier urban environments.
- Promoting Energy Efficiency: The project's focus on optimizing energy efficiency during vehicle operations and implementing innovative smart charging solutions ensures that the transition to electric mobility is both sustainable and economically viable.

The eBRT project also directly contributes to supporting commitments under the Paris Agreement by:

- Lowering Carbon Footprint: Transitioning to BEV buses within the BRT system significantly cuts down carbon emissions from public transport, a substantial source of urban emissions.
- Encouraging Renewable Energy Use: The implementation of smart charging solutions can be integrated with renewable energy sources, further reducing the carbon footprint of public transport systems.

- Setting a Precedent for Climate Action: By demonstrating the feasibility and benefits of integrating BEVs into public transport, the project sets a benchmark for other cities and countries to follow, thereby contributing to global climate mitigation efforts. By pioneering the integration of BEVs in its BRT system, Tanzania sets an example for sustainable urban transport solutions in the African continent, encouraging other nations to undertake similar initiatives.

Through feasibility studies and demonstration projects, the initiative aims to showcase a scalable model for electric urban mobility that can be adapted to different sub-Saharan African settings including Tanzania, considering the unique challenges and opportunities of each locale.

3.3. About the scale up project

In Bogota's world-renown BRT system, feeder line e-buses by Scania will be tested, which includes testing interoperability solutions for electric buses and charging solutions for the feeders as well as the main lines. This builds on currently available e-bus models by Scania in Colombia and provides an entry point for expansion into the BRT system in Bogota as well as other cities in the region, once higher capacity e-buses by European providers become available. The demonstration activities in Bogota will be complemented by **feasibility studies and small-scale demonstration at main BRT lines in Quito, Ecuador, Nairobi, Kenya and Dar es Salaam, Tanzania**. This will help validating the EBRT 2030 approach, foster the development of partnerships with local authorities, operators and entrepreneurs and test business models. This will help enabling better access of European e-bus and charging solutions providers to enter EBRT systems in cities in developing economies. It will also foster the role of the EU in global climate action and facilitate international partnerships towards e-bus systems that are globally competitive

The eBRT project will support demonstration activities in the global south, including in Dar es Salaam. These demonstration activities will aim at contextualising the solutions that are to be tested in Bogota, and will serve as replication studies of such applications.

Moreover, a **global public user group (Future EBRT cities)** will be set up to facilitate the interaction of the project and inform its direction. The said group shall comprise of cities who have already expressed interest (including Dar es Salaam).

3.4. Timeframe

January 2023 – December 2026

3.5. Stakeholder Engagement

49 partners across Europe and beyond, coordinated by UITP (International Association of Public Transport)

3.6. Budget

EUR 23 million

4. References

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