



Project_Scoping
Urban Electric Mobility Initiative
2019

TANZANIA

PROJECT

SCOPING

**E-mobility for last-mile
connectivity in Dar es Salaam**



**Wuppertal
Institut**

UN HABITAT
FOR A BETTER URBAN FUTURE



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Berlin, 2019

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The project has received funding from the European Union's Seventh Framework Programme and Horizon 2020 under the grant agreements no 604714 (SOLUTIONS) and no 723970 (FUTURE RADAR)

DAR ES SALAAM



COUNTRY OVERVIEW

OVERVIEW

DAR ES SALAAM

Dar es Salaam, with a population of around 4.3 million (annual growth rate 5.6%), is the largest city in Tanzania. In 2017 Tanzania's GDP per capita (PPP adjusted) amounted to \$2,945. CO2 per capita in Tanzania was estimated at 0.221 metric tons in 2014 with the transport sector contributing 57% of the total CO2 emissions from fuel combustion. With renewable electricity output currently at 43 % of total electricity output, the country aim is to increase its share of renewable energy production through increasing use of hydro-power, solar and other renewable energy sources.

Due to rapid urban growth and growing individual motorisation, the transport system suffers from chronic congestion. This has led Dar es Salaam City Council to introduce a Bus Rapid Transit (BRT) scheme in 2016 (named DART). 140 fossil-fuelled buses are currently running, connecting the city centre with the Western suburbs (phase 1). The existing BRT stations and terminals are therefore important transport hubs. Further plans include new routes and the addition of 150 buses, which could be powered by CNG. The city however also considers other sustainable solutions including electric mobility solutions (e.g. e-Feeder to BRT, e-BRT-Busses, e-bike sharing).

Apart from the BRT, public transport predominantly depends on a large fleet of privately-owned minibusses (so-called dala dala), which are often not roadworthy and contribute to congestion and air pollution. In the medium to long term public authorities envisage to phase-out the minibusses on all major roads and replace them with BRT buses. In addition to these bus services, motorised two- and three-wheeler taxis (motor taxis) are very common since mid of the 2000s. They are being used by the population for shorter distances and they enable feeder-connectivity into DART and the paratransit-buses. In areas without process access to buses, motorcycle-taxis are the only publicly available mode of transportation and hence offer a de-facto public transport service filling a gap in the transport system. Despite these obvious benefits for peoples' mobility, the two- and three-wheelers have contributed to increased pollution in the city.

Compared to 2-wheelers, 3-wheelers are more sustainable as they can carry three passengers plus the driver and provide easier access for disabled persons. Apart from increasing mobility, 3-wheeler-motor taxi provides much-needed employment opportunities. Till to-date, the market had already created an estimate of about 50,000 direct jobs. The growth has been fuelled by a large number of mainly small-scale investors who offer vehicles to drivers

who cannot afford to own vehicle. Besides a minor share of independent owner-drivers, the two- and three-wheeler market, therefore, is dominated by drivers who rent a vehicle or have a hire-purchase-contract, where ownership of the vehicle is transferred from the initial owner/investor to the driver (typically) after 18 months. Recently, registered drivers' associations have started copying these business models and provide vehicles for their members at better conditions. Generally, the business models in the 3-wheeler-market have developed within the past 10-15 years and are well established. Hence, the current equilibrium between drivers, drivers' associations and investors should be handled with care, as destroying these complex interrelations could decrease the acceptance and provoke resistance of those fearing to lose their source of income. Looking at the vehicles, the conventional 3-wheeler vehicle market is dominated by three manufacturers: the Indian brand TVS King, the Indian company Bajaj and the Italian company Piaggio.

POLICY ENVIRON MENT

Electric vehicles: The government has indicated to prospectively support electrification as a means to achieve sustainable mobility and to accomplish its commitments with concerning the Sustainable Development Goals (SDGs) and the New Urban Agenda (Habitat III). The national transport regulatory authority of Tanzania SUMATRA indicated to integrate electric vehicles in the upcoming revision of its road service regulations . As a first step, the Tanzania Bureau of

Standards (TBS) has revised its vehicle standards to permit the certification of electric three-wheelers and has confirmed supporting a piloting project in the short term by a temporary certification process . Tanzania's scientific institutions also have a strong interest in electric mobility, amongst them institutions such as the National Institute of Transport (NIT), Tanzania's National Transport Research Centre, and the Department of Electric Engineering at the University of Dar es Salaam (UDSM).

Energy regulations: Renewable energies are strongly promoted by public authorities and associations such as the Tanzania Renewable Energy Association (TAREA). To further increase the share of renewable energy, the energy regulatory authority EWURA recently revised regulations to support net metering, thereby supporting small-scale (solar) energy production. As a result, the national energy supplier TANESCO will implement a net metering programme shortly. Procedures to register energy selling or re-selling kiosks are in place and TANESCO has the mandate to process applications.

E-MOBILITY FOR LAST-MILE CONNECTIVITY IN DAR ES SALAAM

The demonstration project in Dar es Salaam will focus on integrating 60 electric feeder/e-3-wheeler and distribution services with Dar es Salaams BRT (DART) to support first/last mile connectivity. The e-3-wheelers (50 imported/provided by DART and 10 with Valeo components), will be an integral part of public transport both physically and for the tariff. This will happen at 5 DART stations considering urban locations: a) in the city centre, where fossil-fuelled 3-wheelers are currently banned for environmental reasons and where accessibility to/from the BRT stations can be limited due to longer distances; b) in peri-urban areas where combustion-fuelled 3-wheelers are currently very common as feeder-modes.

As the city is in nascent phase for EVs and no electric vehicles exist to-date, a feasibility study on the electrification with respect to vehicle specifications (range, speed), charging infrastructure (type and location) will be carried out first. As part of this, state-of-the-art data collection methods using geo-localization-devices will be applied for a detailed derivation of the systems specifications. Subsequently, a masterplan for the introduction of e-3-wheelers is developed. This will follow a systemic approach and also include the development of business models (vehicle ownership, rental schemes, and maintenance), the charging infrastructure and localisation. Further aspects to be assessed relate to the battery type (fixed vs. battery swapping), ownership models (leasing/pay-per-use model), the use of existing telecom and power distribution boxes to accommodate vehicle charging, fleet bundling, and eco-routing.

Interaction with the passengers and the system will be fostered through the MaaS-smartphone application that will consider the growing smartphone ownership of Dar es Salaam's population to allow a maximum spread of the use and increase smart metering services. An open API will be made available to allow 3rd-parties to develop further services. The demonstration project will furthermore include local stakeholders as much as possible to increase the acceptance of the system: The current 3-wheeler market employs many people in Dar and the inclusion of current drivers will be a crucial target of the project. Furthermore, capacity building on sustainable maintenance of the vehicles will be carried out, building on the current structures of OEMs in Tanzania. Tanzania has already a high share of renewable energies through hydro-power which will be used for the services.

DEMONSTRATION ACTIONS

The demonstration action will focus on the integration of advanced electric feeder and distribution services relying on electric three-wheelers as an integrated part of public transport with Dar es Salaams BRT (DART). It thereby addresses two highly important challenges of urban mobility: Firstly how-to overcome the last-mile connectivity issue of mass-transit services such as BRT, secondly the issue of sustainability for combustion fuelled small-scale vehicles. Innovative aspects of the project are as follows:

- It will make electric 3-wheelers appear on the streets of Dar es Salaam for the first time, showcasing the suitability and advantages of electric vehicles.
- It will be placed in 4-5 different locations in the city (central/down-town, commercial, residential and sub-urban) to test various types of locations and environments with respect to the usability of electric three-wheelers. This includes BRT stations and terminals that are served by 3-wheeler-taxis already and where e-mobility can easily adapt to the micro-local context and integrate into the existing system. The city centre will become accessible for electric 3-wheelers exclusively.
- Infrastructure will be developed for a physical integration of BRT and electric 3-wheelers. This encompasses the demarcation of parking areas for the 3-wheelers at or next to the BRT stations, installation of (solar-powered) charging infrastructure at the parking areas, and safe walkways to connect BRT passenger platforms and the parking areas.
- Development of business models for electric 3-wheelers, reflecting the current ownership structures of the 3-wheelers market and focus on the inclusion of drivers and other existing stakeholders to increase the acceptance. Business models should be affordable for the operators and the project will assure that rental costs are lower (or at least not higher) as compared to the current situation.
- Evaluation of the battery type as well as the development of business models for the battery (ownership, battery swapping) with leasing/pay-per-use model, using existing telecom and power distribution boxes to accommodate vehicle charging, fleet bundling, and eco-routing.
- Exploration of how-to increase the local added value in the vehicle assembling and knowledge about the maintenance. Collaboration with existing local vehicle assemblers and distributors is therefore envisaged.
- Inclusion of the electric 3-wheelers in app-based on-demand mobility services (hailing, intermodal planning, payment, routing, pre-price prediction) including the provision of an open API for third-party developers to foster intermodal routing.
- Usage of renewable energy sources.
- The demonstration project will consider sustainable life-cycle-coverage from assembling the vehicles up to the disassembling and recycling of sorted-out vehicles and batteries.

The summary of the activities that will be carried out in the demonstration project are:

- Feasibility study on the electrification with respect to vehicle specifications (range, speed), and charging infrastructure, choice of the charging infrastructure location.
- Business case: 3-wheelers as taxi-services (based on ownership model adapted to the local context), provision of charging infrastructure including smart services and payment
- Ex-post evaluation: EV feasibility, charging infrastructure utilisation, emission reduction, impact on service delivery and income generation, public acceptance
- 60 e-3-wheelers (Taxi) are planned to operate in identified prominent DART stations together with appropriate infrastructure and services



LOCAL, INDUSTRY, KNOWLEDGE AND IMPLEMENTATION

SUPPORT PARTNERS

The planned project activities will be coordinated and supported by DART Agency which has oversight responsibility for the whole transport system in Dar es Salaam including general traffic management and planning duties, in close collaboration with NIT – Tanzania National Institute of Transportation.

The other local stakeholders include Dar es Salaam City Council, SUMATRA – Surface and Marine Transport Regulatory Authority, UDSM – University of Dar es Salaam, Department of Electric Engineering, TBS – Tanzania Bureau of Standards, MAPIMAMATA – National motorcycle-taxi drivers' association (12,750 members in Tanzania; 6,900 members in Dar es Salaam), Sollatek – a solar energy company based in Dar es Salaam, and at a later stage a recycling company for vehicles and batteries. The project will require the collaboration and cooperation with existing transport operators and companies from the public and private sectors, amongst others, motorcycle-taxi drivers and their associations, vehicle owners, vehicle assemblers and distributors.

PROJECT TENTATIVE PLAN FOR DEMONSTRATION ACTION

Within €500,000 budget for the demonstration activities in Dar es Salaam, 60 electric 3-wheelers taxi introduced at 4-5 highly frequented DART stations, the total worth of €380,000. The rest (€120,000) will be planned for charging solutions such a docking/charging stations, smart services (apps for customers/clients and for drivers) and capacity development. The number of vehicles and the budget plans for the vehicles, charging solutions and services is indicative.

FINANCING AND IMPLEMENTATION

The proposed demonstration project concept on 'E-mobility for last-mile connectivity in Dar es Salaam' was developed under Urban Pathways project and was submitted on 25 April 2019 as a part of EC H2020 proposal for funding. The technical support on project proposal development and activities, provided by "Urban Pathways" project, was funded by the International Climate Initiative and implemented by UN-Habitat, Wuppertal Institute and UN Environment.

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