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Zero emission mobility solutions around the globe, tailored to the local needs

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Executive Summary

SOLUTIONSplus is an EU-funded flagship project that accelerates the transition towards zero emission mobility in low- and middle-income countries by assisting cities, public authorities, and local entrepreneurs. Although electric mobility solutions and contexts widely differ, a multi-stakeholder and living lab approach, benefitting from the support of European expertise in electric mobility, brings great added value to the cities deploying the pilots. Within SOLUTIONSplus multiple interesting collaboration processes between European research and industry partners and local entrepreneurs have led to tailor-made electric mobility solutions.

1. Background and motivation

The focus at the EVS has been very much at the electrification of passenger cars, busses and, in recent years, trucks. However, transportation needs vary substantially worldwide, mainly driven by different speeds of economic development and geographical contexts. At the end of 2020, there were approximately 10 million electric cars in the world (IEA, 2021), in 2019 there already was an (estimated) stock of 350 million electric two- and three-wheelers (IEA, 2020). Only by a massive and worldwide transformation of transport and mobility, the global CO_2 reduction targets can be reached.

The EU-funded flagship project, SOLUTIONSplus is working in partnership with the sister project Global Electric Mobility Programme supported by GEF (Global Environment Facility). SOLUTIONSplus assists cities and public authorities in low- and middle-income countries in their transition to zero-emission mobility. This is done via policy support to cities and national authorities as well as via hands-on and tailored assistance to local entrepreneurs. Together with the city authorities, policy and implementation plans are developed to electrify fleets and deploy accompanying charging infrastructure, tailored to the specific city needs. Local entrepreneurs are matched with products, technology, and knowledge of European start-ups, industry, and research institutes to accelerate the company and market development.

SOLUTIONSplus operates 10 demonstration actions (living labs) in the SOL+ demo cities and several replication cities, both depicted in figure 1. The demonstration cities are core members of the SOLUTIOINSplus consortium, and they implement innovative components that help developing electric mobility in their respective areas. The replication cities are associated partners in the SOLUTIONSplus project and will receive direct support for participation in some key steps of the program e.g., the development of demonstration concepts and the adaptation of business models. The replication activities, along with the cooperation of the SOLUTIONSplus project with partners as UN Environment and the International Energy Agency, are aimed at increasing the impact, also beyond the timespan of the SOLUTIONSplus program.

Regional teams have been formed to support the acceleration of zero emission mobility. The regional teams consist of regional focal points, local advisors in the local public authorities, and advisors at regional/national institutions, supported by European research and industry partners, international organizations and NGOs. Each regional team coordinates the relevant demonstration projects, actively supports the implementation, data gathering, stakeholder dialogues, scale-up, finance and other activities related to the demonstration activities. The regional embedding is important to effectively exchange the knowledge of European research and -industry partners in the local context.

Figure 1 Overview of SOLUTIONSplus

To accelerate the transition towards zero emission mobility, SOLUTIONSplus has three areas of focus. The project is boosting the availability of **electric vehicles**, foster the efficiency of **operations,** and support the **integration** of different types of e-mobility in large urban areas.

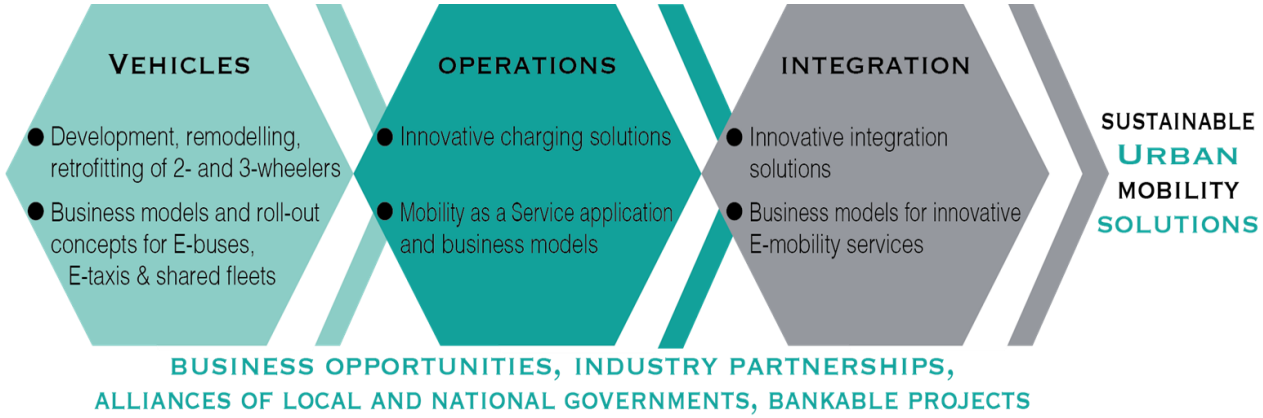

Figure 2 Actions in the SOLUTIONSplus program

In this paper, the differences, and the similarities between the main mobility characteristics of European cities and the targeted low- and middle-income countries in SOLUTIONSplus are elaborated upon. The differences show that integrated e-mobility solutions from Europe cannot be copied directly to low- and middle-income countries. However, the knowledge gained throughout Europe on e-mobility solutions over the past decades is directly applicable to the targeted regions in SOLUTIONSplus. This is shown through the similarities between Europe and the targeted regions and examples from the SOLUTIONSplus project.

2. Differences

There are several differences among countries that effect the implementation and uptake of E-mobility solutions. Some examples:

1) Socio-economic factors including disposable income, and housing patterns. This is key to address higher upfront investment costs and to come up with innovative business models smoothing the transition. Housing characteristics will influence charging solutions adopted.

2) Availability and affordability of vehicles and charging infrastructure. Currently, OEMs steer most of their supply towards Europe, North America, and China since supply follows demand.

3) Grid availability, capacity, and reliability. In many European countries grids have continuously been reinforced because there always was a high demand, and the financial resources were available. Because of that, the availability and capacity of the grid was already better suited for large scale adoption of electric vehicles. It is worth noting that in comparison to other regions, such as Latin America or some East-African countries, the electricity mix in Europe is still highly dependent on fossil fuels.

4) Vehicle use cases. Use for private purposes or as for-hire (taxi) services will influence the intensity of the use and need for frequent charging, hence influencing charging solutions adopted.

5) Road network and infrastructure. In many of the demonstration cities, road networks and infrastructure are in worse conditions than in Europe. For example, in Asia, the streets network is very dense and often has parked vehicles blocking parts of it.

6) Modal split. Given the limited purchasing power in Asia, Africa and Latin America, the primary mobility modes are still walking, two- and three wheelers and public transport, while in European cities, the primary mobility mode is private cars. Thus, while in Europe e-mobility has been focusing on cars, in other regions the electrification process has two and three wheelers and buses at the center.

The income levels can vary quite substantially among countries, which highly affects mobility patterns and services. For example, in most low- and middle-income countries a large proportion of urban passenger transport is covered by two- and three-wheeler vehicles. These vehicles are mainly tailor-made solutions. For example, the electric Safa Tempo from Kathmandu (Nepal), shown in figure 3, is a smaller and highly resource efficient e-3 wheeler that provides a feeder service for the larger public transport system. In cities such as Hanoi (Vietnam) and Kigali

(Rwanda), motorcycles are used often in urban transport. Latin American cities, such as Quito (Ecuador) and Montevideo (Uruguay), despite having more consolidated bus-based public transport networks, have witnessed a significant increase in the use of motorcycles for commuting, but mainly for deliveries with the widespread of food delivery companies in the region.

Figure 4 Safa Tempo in Kathmandu

Figure 3 Urban mobility in Hanoi

In European cities, motorized two- and three-wheelers have a comparatively smaller modal share. The passenger car is the most frequently used mode of transportation in European cities (Eurostat, 2021). This creates a different dynamic of urban mobility in the European cities compared to the demonstrator cities in the SOLUTIONSplus program.

The faster uptake of larger electric vehicles (mostly passenger cars and busses) in European cities created a higher need for charging infrastructure. This in turn caused the technological development on recharging infrastructure to be more diverse. An important development is the standard for charging infrastructure, like the CCS standard for DC charging. The CCS standard increased the potential range of services that can be offered through the charging infrastructure. Such standards are complex but do enable higher performance and services. Examples of such services are: 1) Vehicle-2-Grid, 2) auto plug & charge payments, and 3) dynamic load management and smart charging.

When a standard is selected, all vehicles use the same connector type for charging. This means that all e-vehicles sold can charge at all charging points using that standard. Standards for charging infrastructure constitutes a significant difference between the context in Europe and the context in the SOLUTIONSplus demo cities.

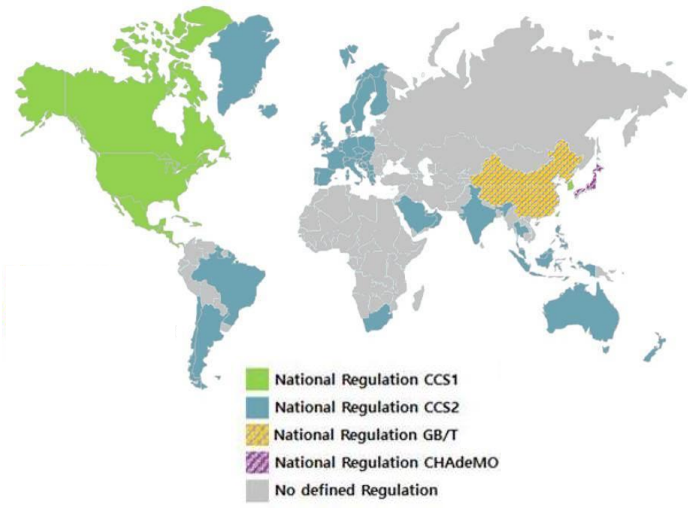

Figure 5 Charging standards around the world

Figure 5 shows the different standards for (DC) charging infrastructure. When there are no standards for recharging infrastructure. Vehicles with different connector types cannot recharge at the same charging station. In many of the SOLUTIONSplus regions, besides Latin America where CCS2 is often the standard, no standard has been established. The standard for DC charging is only one of the standards in recharging. For AC charging, with different voltages and 'phases', and communication protocols the situation is often more unclear. Without standards in place, there is uncertainty on the possibilities for recharging. This uncertainty will hamper the investments in recharging infrastructure and thus in electric vehicles.

The difference between the European- and the SOLUTIONSplus demo city context is also shown in parking policies. Because the uptake of electric vehicles and charging infrastructure is more advanced in Europe, parking and charging policies have also been amended. In certain European cities it was a very common incentive to have reduced parking rates for electric cars. Later, this incentive for electric cars was reduced, and policies were changed to ensure high utilization of the charging infrastructure. In a specific example, problems occurred parking at recharging locations. People were occupying recharging stations for a long period of time, often without recharging. Regulations was put in place to ensure the high utilization of the charging station and make sure that these charging stations are not used as parking spots.

Figure 6 Parking policies to ensure recharging at recharging locations

For these policies to be effective, paid parking must already be used a can, therefore, not always be implemented effectively. Of course, you cannot give advantages to something that isn't a burden otherwise. Similar cases are import tariffs and exemptions for electric vehicles. When these tariffs are low to begin with, the benefit given will have no real effect.

Electric mobility relies on charging infrastructure which, of course, is dependent on the infrastructure of the electricity grid. Limited grid availability and capacity may hinder the uptake of E-mobility because it hinders the ability to charge and use electric vehicles. In low- and middle-income countries grid availability and capacity can be limited, even if in regions such as Latin America the lion share of the electricity mix are renewable sources, whereas European countries, in general, have a more solid electricity network in place.

Although no SOLUTIONSplus demo city or European city is the same, the differences as described between the European context and the local context in the SOLUTIONSplus demo cities is significant. Because of these differences, it is not recommended to replicate solutions from other geographical contexts including Europe in terms of vehicles, charging solutions and policies in the SOLUTIONSplus demo cities. Rather, solutions well adapted to the urban modal splits, use cases, city socio-economic and characteristics are needed. The regional teams that are formed in SOLUTIONSplus are crucial to design these solutions and create room for knowledge exchange between European partners and the demonstrator cities.

3. Similarities

Despite the differences between EU- and low- and middle-income countries, the challenges for e-mobility solutions are largely the same, this is due to the similarities. Some important challenges that both EU- and low- and middle-income countries encounter:

1) Higher upfront investment costs of e-mobility and the lack of private funding, compared to conventional modes of mobility

2) Lack of appropriate and available electric vehicles and recharging equipment, compared to conventional powered vehicles. This also leads to an opportunity for conversion of vehicles into electric, alongside with the prevalence of used vehicles in many countries

3) The risk of vendor lock-in through proprietary hard- and software solutions and hence the need for public policy and regulations to overcome this risk

4) Planning, standardization, and realization of the appropriate charging infrastructure

5) The trade-off between overnight charging, with lower investments but also lower vehicle utilization, and high-power fast charging with a higher investment and higher vehicles utilization. This trade-off is relevant for large business fleets and light- and heavy-duty vehicles.

The higher upfront investment costs are a good example of an area where EU countries are still struggling with. Many governments in the EU offer subsidies and/or tax advantages to lower the investment and make E-Mobility more accessible for the masses. The same measures, although of a different magnitude, are implemented in the SOLUTIONSplus-countries. A good example is Rwanda. In Rwanda, the government has adopted goals for reducing greenhouse gas emissions via EVs, as part of the national climate mitigation strategy (Updated NDC, 2020). To address the challenge of high investment costs in vehicles and charging infrastructure, the Rwandan government introduced fiscal and non-fiscal incentives. These include reduced energy tariffs for charging stations, full exempting of vehicles, spare parts, batteries, and recharging equipment from VAT, import and excise duties, as well as rent-free land for recharging stations on land owned by the government (Ministry of Infrastructure Rwanda, 2021). A similar case can be found in Uruguay, a country that given the cleanliness of its electricity mix (almost 100% renewable energy) and the transport sector being responsible for 65% of GHG emissions has established a national programme for the promotion of electric mobility. One of the highlights of the programme is the refocus of the existing public transport subsidy to cover the difference in the upfront investment costs of e-busses, allowing PTOs to start electrifying their fleets (Falconi, 2021).

Another good example of similarities between challenges encountered in the European context as well as in the SOLUTIONSplus demo cities is the planning of infrastructure. In Europe, the role out is already further along, and aimed at different vehicles, mostly passenger cars, the challenges are very similar. In both situations it is important to find the most efficient locations where vehicles can charge and to have all vehicles able to charge at all charging stations. Within SOLUTIONSplus research was done specifically for the city of Kigali. SOLUTIONSplus partners provided policy advice on EV charging solutions, standards, selection of adequate locations for charging points and a strategy for priority modes to electrify in Rwanda, which was presented to the Ministry of Infrastructure. The EU knowledge and experience on important issues regarding charging infrastructure provided critical for this policy advice with, for example, the importance of open standards and interoperability for large vehicles, possible procurement models and methods to decide on the localization of charging points. Concrete findings were that the electrification of the bus fleet has priority. A preferred business model in the form of a service contract is identified, and recharging facilities at bus depots are required, which should be publicly owned. SOLUTIONSplus has facilitated the exchange of knowledge and experience about PT electrification between the Municipal Transport Enterprise of Madrid (EMT), one of the cities leading the way with regards to e-busses in Europe, and other partners involved in these transitions in Latin America with Kigali, Quito and Montevideo. In addition, the electrification of last mile connectivity facilitating the integration with public transport must be supported. This can be done via promoting electric bikesharing solutions, which suit the hilly terrain in Kigali, and via the electrification of motorcycle-taxis, since this is an often use mobility mode. Similar last-mile connectivity approaches are being adopted in the demo cities of Hanoi, Dar Es Salaam, Quito, but also in Hamburg.

Moreover, the different market characteristics and different (labor) costs can result in viable business cases for (ICE to electric) vehicle conversions, which would not be economically viable in the European market conditions. These opportunities for conversion may lead to solutions for getting older ICE cars, busses and trucks from the road and can also create local employment and innovation. Such retrofitting experiments are being conducted in Kathmandu with a minibus and in Montevideo with a garbage truck.

4. Creative electric mobility solutions

The knowledge exchange between European actors and local innovators, combined with the remarkable local creativity and the local market insights can be used as an asset for accelerating the uptake of E-mobility solutions in low- and middle-income countries. For this reason, the regional teams that have been established integrate insights from European research and industry as well as knowledge about the local context. A good example of this was given in chapter three,

the policy paper on the charging infrastructure for the City of Kigali. The knowledge on the local situation was combined with the technical knowledge and experience from European partners. The regional and local coordinators play a crucial role in building a bridge between the local contexts, stakeholders and innovation processes in Asia, Africa and Latin America and the knowledge that can be shared by European research and industry partners.

The creativity and capability to utilise advanced charging and e-vehicle technologies to create low cost and fit-for-purpose E-mobility solutions can best be demonstrated by some examples like (1) the Safa Tempo, (2) two- and three-wheeler taxis, (3) charging infrastructure policy in Kigali, and (4) e-BRT in Latin America.

4.1 Safa Tempo

The Safa Tempo is an example from Kathmandu. E-mobility in Kathmandu has a relatively long history with the implementation of trolley busses already back in 1975 on a 13-kilometer-long route. The Safa Tempo itself was introduced 20 years ago as a paratransit service, meaning that it functions as a 'feeder' to larger public transport lines. The Safa Tempo was originally introduced in Kathmandu to ban and replace the city's worst polluting three-wheelers. With the support from Global Resources institute (GRI) from the USA, the Safa Tempos were manufactured in Kathmandu by assembling imported components. Nowadays, still more than 700 Safa Tempos are operational in Kathmandu. Interesting fact, more than 50% of the Safa Tempos are operated by women. In recent years, the success of the Safa Tempo has been declining by the introduction of micro busses powered by fossil fuels. These newer micro busses were faster and more comfortable. As a result, 5 of the 7 manufacturing plants were closed, as were 10 out of the 38 recharging locations.

In Europe, we are not familiar with a vehicle like the Safa Tempo nor with the function of it as a paratransit feeder line. This creative local solution, tailored to the situation in Kathmandu, was the reason why the electric powered Safa Tempo was already largely implemented 20 years ago. Eventually, the technique used in these vehicles became obsolete compared to the fossil-fuel powered micro busses. This local situation offers a chance to implement and accelerate E-mobility.

Within SOLUTIONSplus, two local innovators are supported in their effort to remodel and improve the Safa Tempo. The goal is to make the Safa Tempo comparable with the micro busses on comfort and performance. Not only is strived for passenger transport, also a cargo- and a waste collection version is being developed. The SOLUTIONSplus consortium members are aiding via powertrains and have setup a contract with a German supplier of 2nd life batteries that will be utilized in the vehicles.

4.2 Battery swapping for two- and three-wheelers

In many of the SOLUTIONSplus regions, two- and three-wheelers are used as taxis. Either for transportation directly to the destination, or as transportation to- or from the larger public transport system. Good examples for this are Kigali (Rwanda) and Dar es Salaam (Tanzania), in Kigali the motorcycle taxis are popular while in Dar es Salaam the 3-wheelers (named "Bajajs") are more prevalent. The motorcycle taxis represent 16% of all mobility movements in Kigali.

The difference with Europe is significant. Motorcycles are used in Europe, but fairly infrequent (mostly as a leisure activity) and not as a taxi (Weiss, Dekker, Moro, Scholz, & Patel, 2015). This offers a new situation; thus, solutions must be found for this more intensive use of the vehicle. An electric moto-taxi has a higher utilization and, therefore, needs different recharging. The focus in Europe has not been on such applications and neither have the recharging needs of it. The SOLUTIONSplus team has seen business cases like for electric motor-taxis which have very short pay-back times and would be a financial "no-brainer" if not hindered by a lack of funds and by the required system-changes.

The e-moto-taxis are beginning to gain traction East Africa. This has a lot to do with the charging system, as most of the companies make use of battery swapping. Examples are Ampersand and REM in Rwanda, Zembo in Uganda, Ecobodaa and Stima Mobility in Kenya. Swapping batteries involves exchanging a depleted battery for a fully charged one at a charging station, instead of plug-in charging. Swappable batteries bring the advantage of not immobilizing the vehicle since swapping the battery only takes a couple of minutes. Long charging times are a typical hurdle for the uptake of electric mobility, especially in situations of high usage intensity of vehicles used for taxi services. In addition, charging the batteries at the swap station enables controlling the charging conditions and may mitigate the challenge of access to reliable electricity at the driver's home. Lastly, swapping is mostly coupled with a Battery-as-a-Service scheme, where swappable batteries are not sold but only leased to the driver. The company remains the owner of the battery and the

entity in charge of maintenance and repairs. This scheme shifts the upfront investment cost is shifted from the driver to the mobility or energy provider. This is a key advantage as the transition can be financially interesting for the driver from day one, in contexts of limited individual purchase capacity.

The use of battery swapping is innovative as this solution is less widespread worldwide, except a few cases such as some electric three-wheeler pilots in India. This innovative aspect is linked to challenges related to investment costs – larger pool of batteries needed for the swaps, investment in a swapping facilities, staff responsible for swapping - and a lack of standardization (Eccarius & Lu, 2020; UNEP, 2020). Therefore, the landscape of swapping and corresponding standards is less defined than charging, potentially creating a juxtaposition of swapping solutions adoptd. An important reason why battery swapping is less widespread is that in Europe, arguably the standard for electric mobility, has a less intensive use of light vehicles and, therefore, doesn't have the same use for battery swapping as other parts of the world. Because in Europe Light Electric Vehicles (LEVs) are used less intensively and the focus is on the electric passenger cars, charging is more logical than battery swapping. Battery swapping is easier in LEVs because the batteries are much lighter.

4.3 E-quads in Pasig

At the national level, there has not yet been a significant uptake of e-vehicles, in 2020 only 468 electric vehicles were registered. This, however, does not reflect the smaller e-mopeds, which are not yet mandated to be registered. E-mobility is expected to take off as the government has just issued the Electric Vehicle Industry Development Act in April 2022. This policy aims to promote the industry by combining incentives – tariff-free import of vehicles and components - and relevant mandates, like a 5% EV quota for company fleets. There are ride hailing and sharing services, but these don't encompass electric vehicles.

Figure 7 Modular e-quad design

Pasig is a very densely populated (65 thousand people/sq. kilometer) area with a lot of people- and cargo traffic and is deemed to be one of the worst congested cities in the Metropolitan Manila area. This problem is acerbated by the narrow streets in Pasig. There is, therefore, a strong need for space efficient people- and cargo transport.

The solutions that are being developed to cope with the high need for cargo- and people transport in the densely populated and 'narrow' city, are the 'e-quad' and 'Flexible Light Electric Van (FLEV)'. These are relatively small, modular, space efficient vehicles that can carry high loads of cargo or people in a relatively small vehicle. To make these vehicles as efficient as possible, applications are being designed for passengers to share a ride and provide optimal routing. The way the vehicle is being designed reflects the difference of the needs in Pasig as opposed to Europe. For example, the electric motor needed to be coupled with auxiliary fans and need to be IP67 complaint (can be submerged under water – to account for flooding incidences). Additional safety considerations (e.g., for cargo) are being built-in, as the local consultations with delivery companies had revealed that the threats of theft and vandalism are operational challenges that they face every day.

4.4 BRT in Quito

Bus rapid transit (BRT), a cost-effective and efficient bus-based transport system innovation that originated in Latin America, specifically in the Brazilian city of Curitiba in the 1970s, is now present in more than 150 cities worldwide, including European ones. Moreover, due to the dependency on buses of most public transport systems and the contribution to GHG emissions of urban transport in large Latin American cities, the electrification of PT fleets has become a priority. Thus, Latin America is the region outside of China with the largest fleet of e-busses in the world, with more than 3,000 in total (including trolleybuses) and with Santiago de Chile (819) and Bogotá (1061) leading the way (E-BUS RADAR, 2022). In order to scale up projects that started as pilots, there has been important innovation in business models, ownership schemes, incentives, subsidies, etc. However, despite the successful examples in the region, there are still several cities that are still struggling to overcome the challenges of electrification.

Quito, one of SOLUTIONSplus demo cities, was the second city in Latin America to have implemented a BRT system, which has been expanded over time, serving a greater area and number of passengers. At present, the system is composed of 4 BRT lines, which cover 136 km with exclusive lanes that cross the city in a north-south direction, completing almost 1 million trips

every day (42% of total trips). Currently, the BRT system counts on 397 articulated (18m) and biarticulated (26m) buses (incl. 40 trolleybuses) from which 87 are 20 years old or older and 37 are 15 years old. These represent 38% of the total fleet of the BRT system. The system also counts with 796 feeder buses (12m). The old age of the fleet, together with the new national regulations and the local policies to decarbonize transport, by which starting in 2025 all new PT units must be zero emissions, have increased the need to act with regards to the electrification of the fleet. Moreover, understanding that the transport sector is responsible for 40% of the GHG total emissions of the city, one of the goals set to reduce emissions by 30% by 2030 and become climate neutral by 2050 is zero emissions public transport by 2030.

Besides the existing BRT system, the Municipality of Quito is in the planning process of a new fully electric BRT corridor, the Labrador-Carapungo Corridor aimed at connecting the first subway line to be launched end of 2022 and ensuring the necessary ridership of the subway (400,000 pax/day). The first phase of the corridor (Labrador-Carcelén), planned to start operations also by end of 2022, will have a length of 6 km, 14 bi-directional stations and 2 transfer terminals. It will count on 25 electric biarticulated buses, a demand of 250,000 passengers / day and 15 feeder lines. Despite the important progress done by Quito in the planning process, there are still important knowledge gaps related to the electric component of it. Hence, the SOLUTIONSplus project put together an expert advisory board aimed at providing guidance to the Municipality on how to address the main gaps identified. The expert advisory board shared insights on the necessary infrastructure, a comparison between different e-bus technologies, business models and financial mechanisms, focusing mainly on the experiences of Madrid, Santiago de Chile and Bogotá. Although Madrid was able to provide very relevant inputs regarding the infrastructure for e-busses, the similar characteristics and challenges of the BRT systems of Santiago and Bogotá were crucial to inform about the key elements on the business models and financial mechanisms for the electrification of PT systems such as the one in Quito.

5. Conclusion

Important progress has been made and relevant lessons learnt have been generated in Europe with regards to e-mobility. Due to the differences in socio-economic-, mobility patterns, vehicle types, grid capacity, and other contextual factors, the European solutions can, in general, not be copied one-on-one. There are instances where the developments and the technological needs will be very much in line, for instance, on busses and, in the long term, on heavy duty and passenger vehicles.

However, as all regions often face similar challenges, a proper knowledge exchange between them and the establishment of a collaboration process between European and local actors could very well help accelerate the uptake of e-mobility in the SOLUTIONSplus demo cities, regions, and beyond. There, putting the local knowledge and the innovative solutions developed to address the local needs at the center is key. The examples given in this paper show that the local stakeholders in Asia, Africa and Latin America could profit from the European knowledge and lessons learned to accelerate the transition to e-mobility, and vice versa.

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7. Presenter Biography

Harm Weken is since 1995 managing Partner of FIER Automotive, a business development company in the international automotive sector, with a focus on sustainable and electric mobility. Harm is co-founder and co-owner of GoodMoovs.com, the largest all electric business-to-business car sharing program in the Netherlands and part of a EU network of electric car sharing programs.
Moreover Harm, supports electric mobility initiatives and the academic sector as board member, advisory council member and in scientific reviewing committees at universities and electric mobility foundations, in Europe and abroad.
The core of the work of Harm and his company FIER, is (EU and national) project initiation and business development in electric mobility for private companies, public authorities and consortia. During recent years, the focus has been on: Stimulating electric vehicle (EV) uptake in fleet; Effectiveness of national EV incentives and policies; Stimulating electric trucks in distribution and inner-city freight and; Electric car sharing and smart charging infrastructure.

Oliver Lah heads a joint research group at the Technical University Berlin and the Wuppertal Institute for Climate Environment and Energy. He coordinates the Urban Electric Mobility Initiative, a UN-Habitat Action Platform, and is a Research Affiliate at the MIT Energy Initiative and an Adjunct Professor at the Blekinge Institute of Technology (BTH). Prior to that Oliver worked with UN-Habitat, UN Environment, UNDP, OECD/ITF and GIZ on urban mobility and climate change issues. He was a lead author for the Fifth IPCC Assessment Report, was a member of the Habitat III Policy Unit on Urban Services and Technology and worked at the Ministry of Transport of New Zealand and the Minister of State to the German Federal Chancellor.