

User Needs Assessment – City Report: Kathmandu

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1 Approach

1.1 User Needs Assessment team

In Kathmandu, the user needs assessment (UNA) was carried out through the collaborative efforts of the SOLUTIONSplus team for the Kathmandu demo activities: Technical University of Denmark (DTU), Wuppertal Institute (WI), Sajha Yatayat and Urban Electric Mobility Initiative (UEMI) local staff. The local partners - Bhushan Tuladhar of Sajha Yatayat and Abhisek Karki of UEMI provided the connection to the stakeholders in Kathmandu, while George Panagakos of DTU and Shritu Shrestha of WI conducted the expert interviews combined with the survey and KPI weighting as mentioned below.

1.2 Stakeholders and UNA activities

The UNA team in Kathmandu identified more than 20 experts that could be contacted for soliciting feedback. Until 4 Dec. 2020, interviews were arranged with 13 of these experts. In order to minimize the burden to stakeholders and ensure proper responding to the survey, the Kathmandu team decided to combine the interview questions of the abovementioned Guideline with those of the online survey in a single session (per interviewee) where the stakeholder feedback was fed directly into the online survey by one of the interviewers, while notes were taken on the stakeholder views. In order to ensure transparency, all interviews were recorded with the interviewees' consent.

Furthermore, the interview session described above was extended to include KPI weighting, which is not part of UNA. Instead, it is needed for assessing the scaled-up project, which will be proposed at a later stage of SOLUTIONSplus based on the demo results. However, as this function is conceptually very much related to the stakeholder needs expressed through the UNA, it was decided to include this part of project work in the interviews conducted under UNA.

The online survey was further circulated among additional stakeholders from groups that had already provided sufficient feedback. Three responses were also received through this path until 7 Dec. 2020. The Kathmandu team will continue communicating with the stakeholders throughout project duration. In this sense, the findings of this report cover the period up to Dec. 2020 and should be viewed as preliminary. Important additions will be reported with subsequent project deliverables if necessary.

Table 1 presents in groups the stakeholders who provided input for this report. For anonymity purposes the name, title and affiliation of the respondent are not published here.

Table 1. Respondents by stakeholder group and UNA activity

Stakeholder Group	Organisation	Code	Date	UNA activities		
				Online survey	Interview	KPI weights
Public Transport Operators	Sajha Yatayat	P1	2 Nov. 2020	√	√	√
National Authorities	Ministry of Physical Infrastructure and Transport, Department of Transport Management	N1	2 Dec. 2020	√	√	√
Local Authorities	Lalitpur Metropolitan City	C1	13 Nov. 2020	√	√	√
	Kathmandu Metropolitan City	C2	25 Nov. 2020	√	√	√
Local manufacturing companies	Shree Eco-Visionary/Electric Vehicle Association of Nepal (EVAN)	M1	9 Nov. 2020	√	√	√
	Abhyantri Karmashala	M2	2 Nov. 2020	√	√	√
	Nepal Electric Vehicle Pvt Ltd	M3	24 Nov. 2020	√		
	AGNI ENERGY PVT.LTD.	M4	27 Nov. 2020	√		
Service Providers	Wind Power Nepal Private Limited	S1	2 Dec. 2020	√	√	√
Donors	Global Green Growth Institute, Nepal	D1	12 Nov. 2020	√	√	√
	Asian Development Bank, Nepal	D2	23 Nov. 2020	√	√	√
Academia	Kathmandu University	A1	6 Nov. 2020	√	√	√
	Tribhuvan University	A2	10 Nov. 2020	√	√	√
Environmentalists /NGOs	Clean Energy Nepal	E1	4 Dec. 2020	√	√	√
	Weekly Nepal/Renewable Energy Confederation of Nepal	E2	2 Dec. 2020	√	√	√
	Aeloi Technologies	E3	7 Dec. 2020	√		

Section 2 below presents the survey results on the basis of input received from 16 individuals (13 interviewed plus 3 directly). The feedback received through interview questions is presented in Section 3. The obtained KPI weights are reported in project deliverable D1.6 (Part A).

2 Results – Survey

2.1 City aims

Figures 1 to 4 exhibit the importance that stakeholders assign on a set of potential city aims organized in four groups: usage and user acceptance of e-vehicles; mobility patterns; city environment; and quality of life. Importance is indicated in a scale from -2 (not important at all) to +2 (very important). All possible aims in the first group are scored in the zone of highest importance (between +1 and +2). The need to increase awareness among citizens by showcasing e-vehicles ranks first with the impressive average weighted score of 1,94. An extensive awareness campaign is, thus, required to accompany the demo activities of the project in Kathmandu. The role of the demos in analyzing the cost structure of EVs features as the second most important aim together with the possibility of e-mobility to increase the use of transport means in the city. The issue of affordability is also high in the concerns of the stakeholders.

Among the mobility-related aims, only the one concerning the improved precision of estimating travel time falls below +1 (important) with a score of 0,81. Given that the precision in forecasting the expected time of arrival is influenced by external factors (e.g. congestion) much more than the type of powertrain, the relatively high score of 0,81 can be indicative of a potential bias introduced due to having negative values in the scale of importance. The potential of e-mobility in improving the quality of traveling is the most important aim in this group, providing useful marketing insights for the new services.

In relation to city environment, it is no surprise that the reduction of air pollution and CO₂ emissions feature as the two most important aims (with an equal score of 1,88). Also expected was the appearance of noise reduction in the third place (1,63). These results are consistent with the domineering position of public health improvements in the quality of life category (1,94). It is rather surprising, however, that the second rank in this category is taken by the possibility to enhance economic growth in the transport sector (1,63), a finding that requires further investigation.

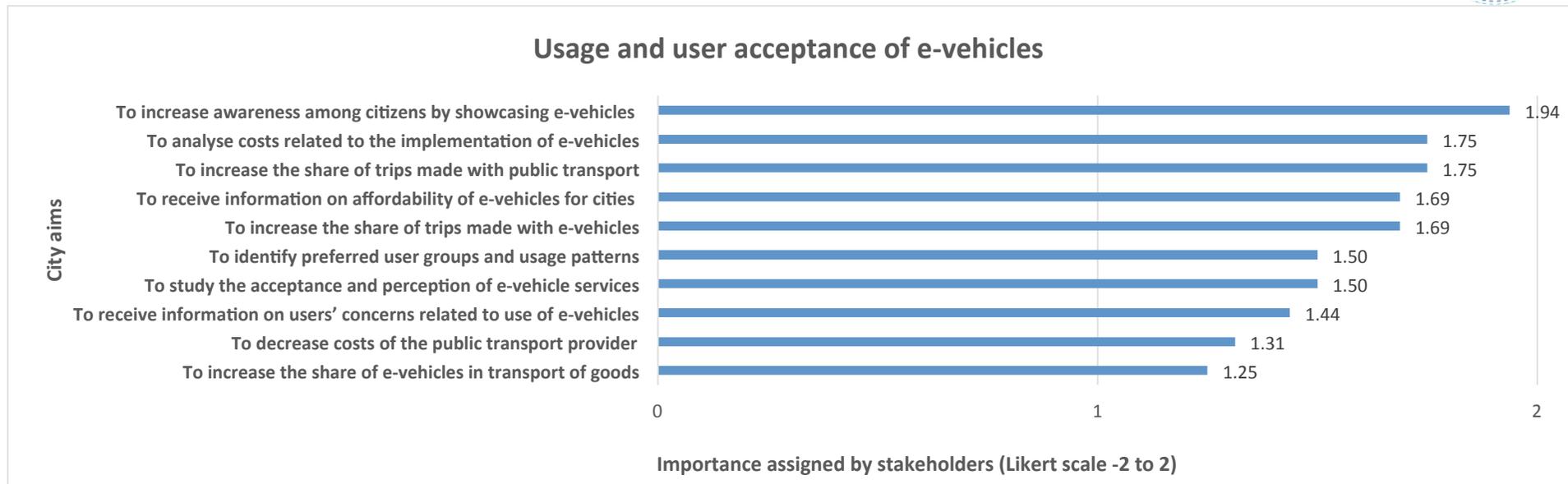


Figure 1. Importance of aims related to the usage and acceptance of e-vehicles

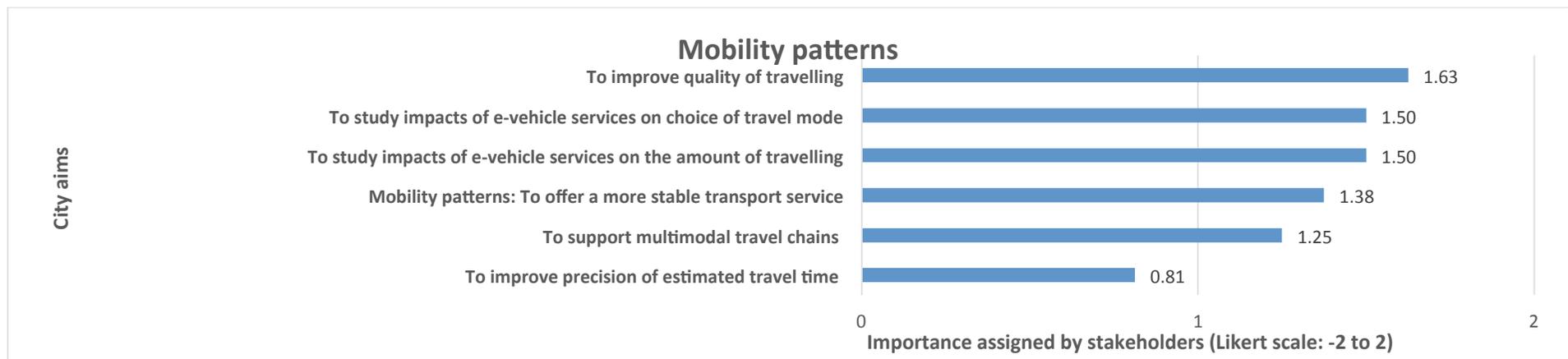


Figure 2. Importance of aims related to mobility patterns

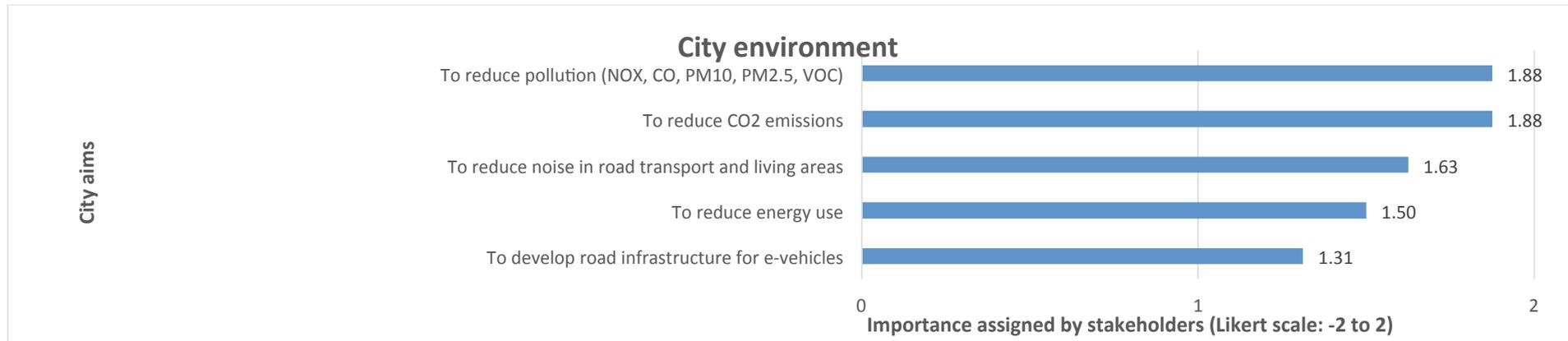


Figure 3. Importance of aims related to the city environment

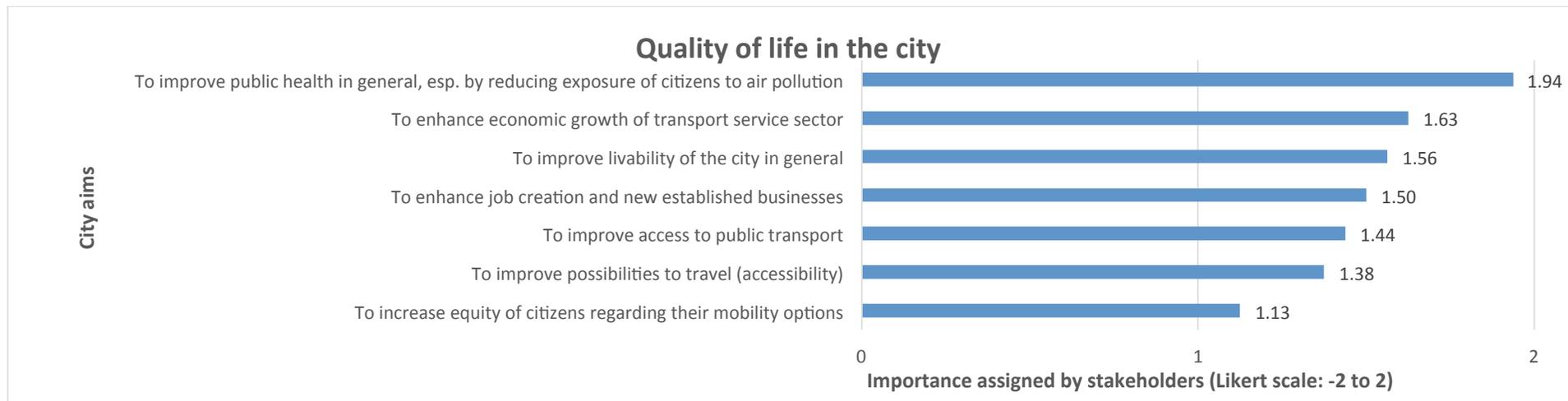


Figure 4. Importance of aims related to the quality of life in the city

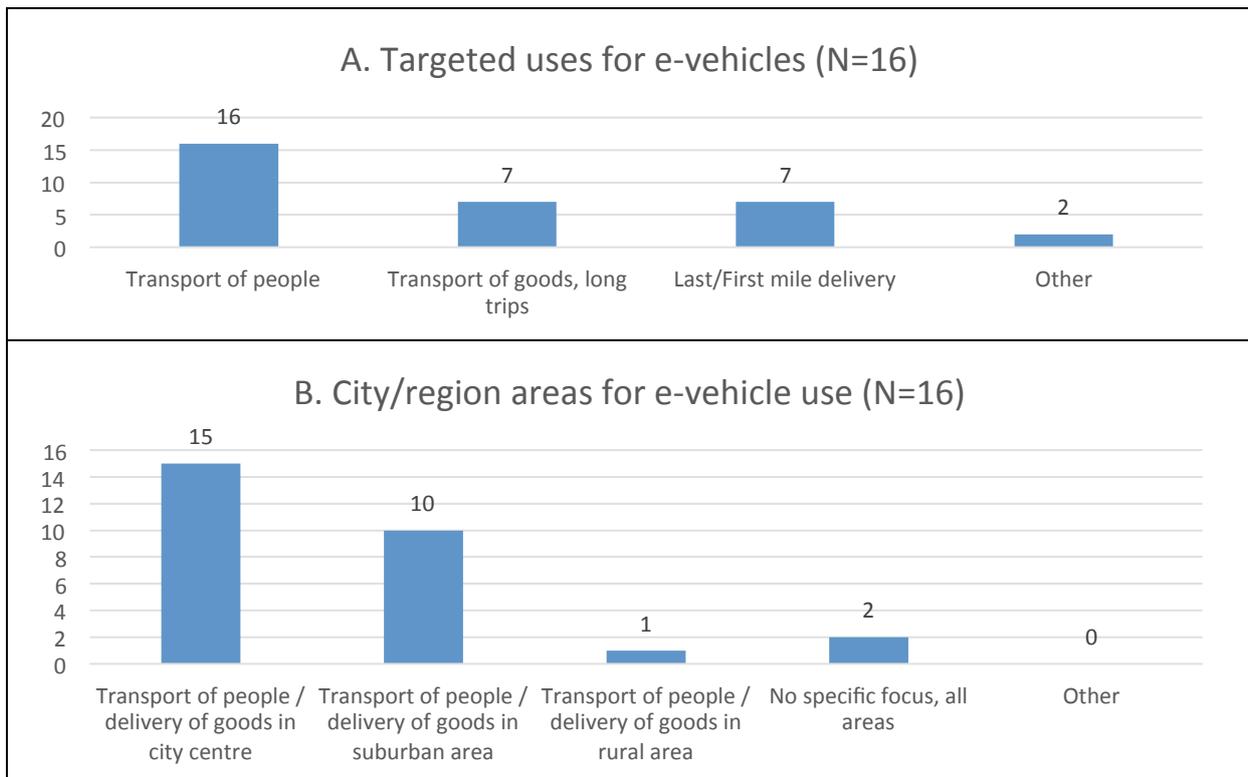
2.2 Implementation

The results concerning intended uses are depicted in the 6 graphs of Figure 5. In terms of targeted uses (Graph A), all 16 respondents selected the option of transporting people, against 7 who also selected one of the two freight transporting options. The two responses appearing as ‘other’ concern vehicle sharing uses for people and cargoes. In terms of geographic coverage (Graph B), it is no surprise that 15 out of 16 respondents selected the city center, followed by 10 answers for the suburban areas.

The clear predominance of ‘all citizens’ among the suggested user groups (Graph C) was also expected. It is worth noting that the two ‘other’ responses concern tourists and women respectively. Commuting is the most frequent type of trip (Graph D), while there is a more or less balanced reaction to all other options.

As for freight (Graph E), private SMEs attract the highest number of responses (15 out of 16) followed by shops and the city itself with 7 selections each. Garbage collection must be the most common use of cargo vehicles by the city authorities.

When it comes to preferences with regard to who should be the main operator of public transport EVs (Graph F), 14 out of 16 respondents select the private sector against only 5 who favor the city. The two ‘other’ responses concern private-public participation schemes.



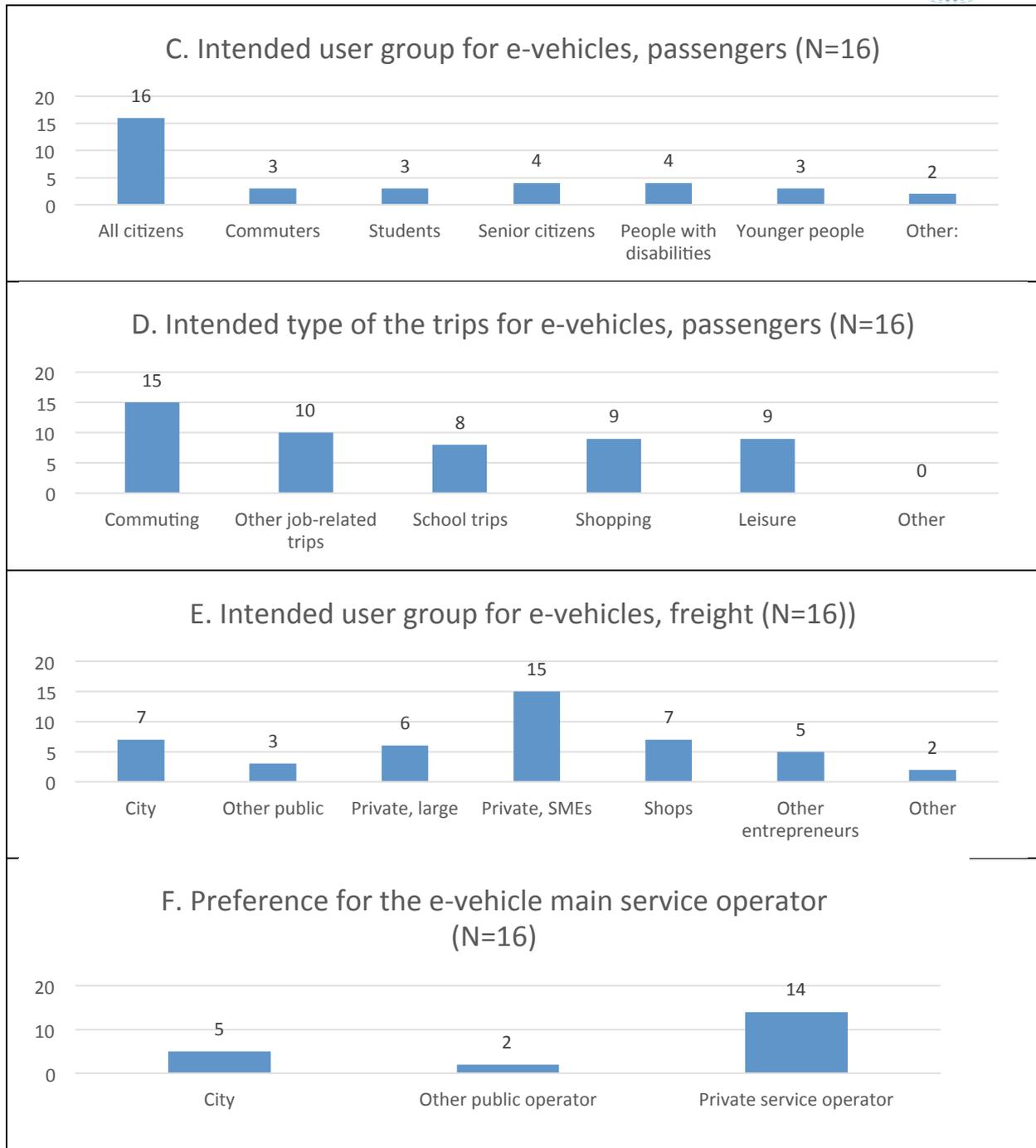


Figure 5. Intended use of e-vehicles

2.3 Obstacles, limitations and barriers

Figure 6 presents the stakeholder responses concerning factors that can challenge the successful implementation of e-mobility in Kathmandu. The lack of enabling policies appears as the most frequent factor having been selected by 14 of the 16 respondents. The lack of financial resources featuring in the second position is not surprising given the high capital requirements of EVs. What is rather surprising, however, is the lack of maintenance services, which ranks even above infrastructural requirements. It is interesting to note that low acceptance of EVs by stakeholders is considered more of a problem than low acceptance by passengers. Among the two 'other' responses,

one concerns the availability of charging facilities (should have been included under infrastructural requirements) and the other the lack of technical skills for manufacturing activities.

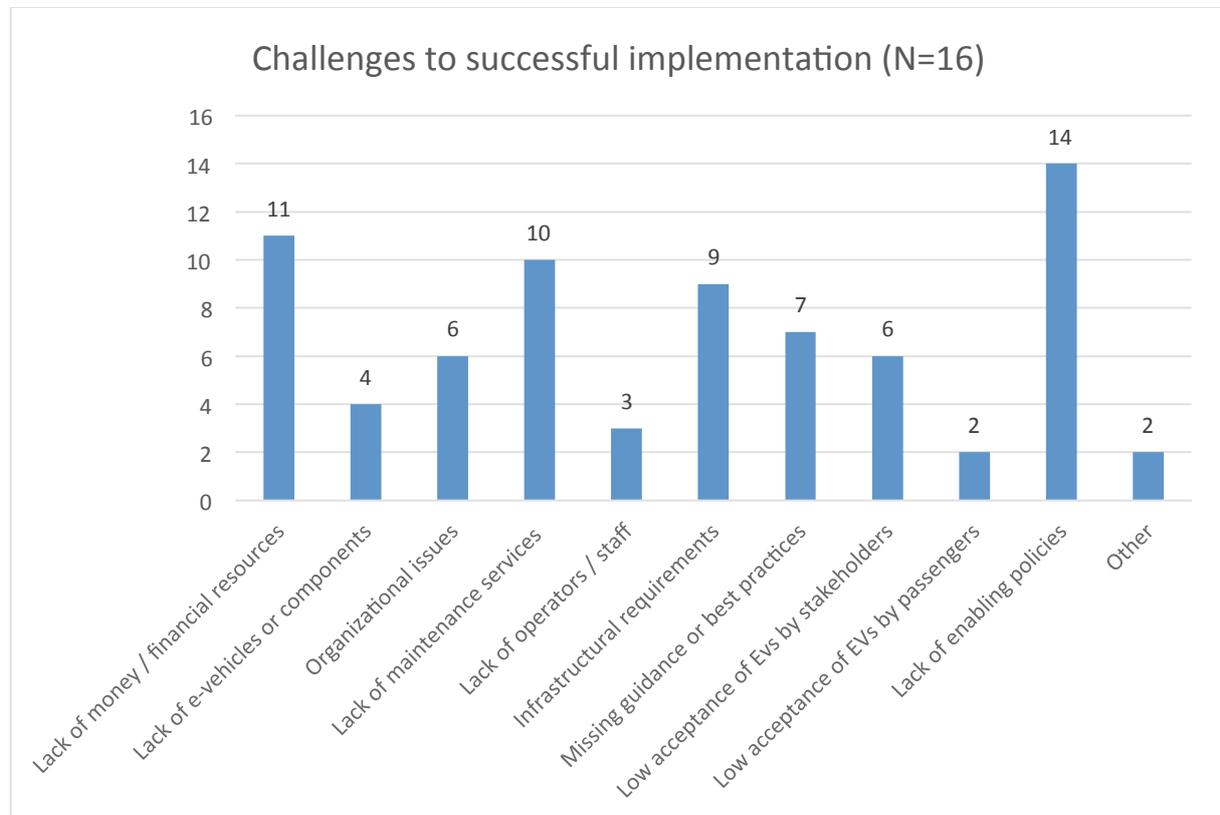


Figure 6. Challenges to successful project implementation

3 Results – Expert Interviews

3.1 Aims of the city and stakeholder expectations

3.1.1 Challenges to be addressed by e-mobility

Air pollution and effects to human health

All interviewees emphasized that the main environmental challenge in Kathmandu is air pollution (which is beyond the threshold of WHO). It is mainly due to the growing number of private vehicles and the resulting vehicle emissions (CO₂, PM_{2.5} and NO_x) that seriously affect public health. Interviewee D2 mentioned that the situation is aggravated by the vehicle condition (old and not maintained), which is not controlled sufficiently. According to public transport operator P1, the number and use of public transport is low in the city (27% of the total trips). About 80% of the vehicle fleet in Kathmandu is 2-wheelers, which is the cheapest option next to public transport. The city needs more ridership in public transport (at least increase by 50%) to reduce vehicle emissions and improve air quality. EVs for public transport are, thus, seen as a solution to this challenge. Therefore, public transport needs to become more effective, efficient and attractive to riders. The public transport operator (P1) is ready to take leadership to use the retrofitted conventional bus to e-bus and bring others along in demonstrating the future (transformation) of mobility.

3.1.2 Long term vision for sustainable transport (e-mobility)

Harness hydropower and decrease fossil fuel import

Nepal does not have fossil fuel reserves, meaning that it is 100% import dependent. On a positive note, the majority of Nepal's electricity is from hydropower generated within the country. In the near future, Nepal will have surplus electricity (mainly in the wet season and during off-peak hours) through new hydropower projects which are in different stages of development and construction. The government is encouraging the substitution of fossil fuels with electricity for cooking (presently) and for transport (in the future). All interviewees agree that EVs constitute a win-win solution protecting the climate in Nepal, and globally, while reducing the external trade deficit. Academia (A1 and A2), local manufacturers (M1 and M2) and donor D1 highlighted that Nepal needs to tap this electricity generation plan and go into the direction of an environmentally friendly transport system.

Lower operating cost and increase comfort

The high upfront cost has been highlighted by the interviewees as a challenge for the deployment of EVs in Nepal. Donor D2 mentioned that currently e-buses are very expensive compared to conventional buses (almost 7-8 times higher). Therefore, the operators are reluctant to invest in this technology. However, when considering the total life cycle cost of the electric vehicles (including the externalities related to the use of fossil fuels), it makes sense to embrace EV technology, a view shared by service provider S1. In addition, P1 states that e-buses will have lower operating costs and will increase the comfort level of the passengers. The improved comfort level could induce additional demand leading to higher revenues or lower total cost.

Support green mobility

EVs have a significant potential in Nepal that supports the transformation to green mobility. Donor D1 expressed the opinion that the country is still at a developing stage or in the path of development. As such, if Nepal plans well and is able to shift from fossil fuel to electricity, the new road infrastructure that is still to be built can incorporate charging facilities along the way in different areas in the country. National authority N1 and both local authorities (C1 and C2) mentioned that the government has a plan to promote EVs in Nepal and are developing plans and policies to support it. Other interviewees still think that the government effort on it is still not enough in adopting supportive policies. The service provider S1 argued that EV for mass transportation is a need but it is difficult to convince the government. However, the government is also planning to purchase 300 e-buses (budget has already been allocated). The procurement and operation responsibility was initially given to Sajha Yatayat but subsequently was revoked (in 2018). The government plans to take action soon. Other stakeholders are also supporting the promotion of EVs. The private sector is undertaking initiatives concerning local manufacturing supported by imports of EV parts, while academia, NGOs and international organisations (e.g. GGGI and ADB) are carrying out EV studies.

Transport authority

Various institutions are involved in planning and development of transport and road management in Kathmandu, but not in a cohesive manner. For example: Department of Road deals with developing road infrastructure; Department of Transport Management deals with regulating the transport system, licensing and managing routes for public transport (for public and private operators); Traffic police regulates and monitors the traffic; and local governments manage small roads in the respective municipalities. The national authority N1 and both local authorities (C1 and C2) pointed

out that this situation obstructs smooth planning and infrastructure development, despite the willingness of local authorities to support sustainable transport (e.g. bicycle lane development, pedestrianisation and charging infrastructure for EVs). In Kathmandu, it is mostly private operators that run public transportation. A recent study released by Donor D2 shows coordination problems resulting in overcrowding of operators in different modes competing on the same routes, adding to traffic congestion.

To address these issues, the government has constituted the ‘Kathmandu valley transport Authority’ through a special legal act. This authority will regulate and provide public transport services within the Kathmandu valley. The plan is to unify the public transport systems of three main metropolitan areas (Kathmandu, Lalitpur and Bhaktapur), identify all routes, integrate ticketing of different service providers into a single (cashless) system, and introduce vehicle standards. It is envisioned as the sole authority responsible for managing the public transport system. Currently, a preparatory committee has been formed to establish this authority. The relevant bill is in the Parliament pending approval, which might take 3-4 months (from the interview date –December 2020). Several of the interviewees (N1, C1, C2 and D2) think that once this institution is established and operationalized, the cohesiveness of transport management will improve. The government’s plan to purchase and operate 300 e-buses might get resumed through this authority. The environmentalist E2 thinks that it would be good if public transport was operated by private operators (as it is now) and the new transport authority provided the necessary policies (framework and financial incentives) for the smooth operation of EVs.

3.1.3 Opinion on SOLUTIONSplus objectives concerning vehicles and activities

Use of SOLUTIONSplus vehicles

The public transport operator P1 mentioned that the transformation of urban mobility requires more than just buses. The entire ecosystem of the city’s e-mobility needs to be considered, including all other vehicles such as 3-wheelers, 2-wheelers and cars. In terms of public transport, SOLUTIONSplus focuses on the conversion of a diesel bus to e-bus, the retrofitting of a mini bus to e-mini bus, the remodeling of e-3 wheelers, and plans to support vehicle integration. Safa tempos have been in operation for the past 25 years, but need redesign or remodeling in terms of comfort. Kathmandu also needs integrated services to promote the public transport system. All interviewees agree that the SOLUTIONSplus prototypes and planned activities in Kathmandu are very useful for promoting public EVs. Specific comments received on SOLUTIONSplus vehicles include:

- **Routing:** Local manufacturer M1 mentioned that Kathmandu has 3 types of routes (primary, secondary and tertiary). Larger vehicles (such as e-bus, e-mini bus and e-vans) could operate on larger routes, while smaller vehicles like Safa Tempos (e-3 wheelers) could be restricted in tertiary routes. This view aligns with the governmental transport plan for the city. The national authority N1 mentioned that the project ‘[Kathmandu Valley sustainable urban transport](#)’ advised the government to promote only large vehicles inside Kathmandu for public transport (mainly to reduce congestion and emissions). Therefore, smaller vehicles such as e-3 wheelers and micro-buses should be gradually discouraged from using the main routes and restricted to secondary and tertiary routes.
- **Vehicle integration:** Local manufacturer M1 pointed out that a mobile application for vehicle integration that provides information on trip plans and real time vehicle arrivals and departures would be useful and urgently needed.

- **Conversion of bus:** Donor D1 highlighted that the conversion of buses is a good idea. The success of the conversion from diesel bus to e-bus is yet to be seen. However if this research project succeeds, it would be very good for Nepal to replicate the concept. P1 and M1 explained that the cost of the converted bus would be one-third of a new one. As the operating cost of e-bus is low, the project would be cost-effective overall in addition to offering increased quality of service. The SOLUTIONSplus e-bus prototype will be a good example for raising awareness on the concept among private operators.
- **Technical standards:** Public transport operator P1 brought up the issue of lacking technical standards and operational guidelines both for e-buses (and EVs in general) and charging stations. SOLUTIONSplus could support the recommendation of such technical standards.
- **Prototypes:** The national authority N1 and the service provider S1 expressed concerns over the rationale of remodeling e-wheelers if the new law will prohibit their use on the city's primary routes. Alternatively, if these prototypes are converted into e-4 wheelers, Safa tempos could be rescued. Such a scheme will make licensing easier. In terms of smaller vehicles, the conversion of minibus or microbus would be very useful in Kathmandu. Some of the public transport operators are keen on this too.

SOLUTIONSplus as a platform for knowledge exchange

All the stakeholder groups acknowledge that the SOLUTIONSplus project with its numerous international partners and its variety of city networks provides a massive platform for knowledge exchange and diffusion. P1 added that learning from each other becomes even more important when it is about a new technology such as EVs. So, knowledge, networking and the demo project are all important for Kathmandu.

3.1.4 Charging solutions and standards

Overnight charging solution

In view of lower public demand for electricity overnight, several stakeholders pointed to the overnight charging as the optimal option for Kathmandu. Given a normal travel range of 120-130 kms per day for public transport in the city, local manufacturer M1 calculated that charging once a day (preferably at night) would be enough. However, in the dense Kathmandu valley, local authority C2 raised the issue of difficulties in finding appropriate locations for the charging system, due to the lack of sufficient public land owned by the government and the higher value of private land. As an alternative, C2 suggests leasing private land on a long-term basis.

Battery swapping

Local manufacturer M1 expressed the view that in the case of e-3 wheelers or e-2 wheelers there could be an option of a charging station or battery swapping system similar to the '[gogoro](#)' in Taiwan that would be sufficient (mainly for e-scooter) to reduce range anxiety. However, it should be noted that for normal usage in Kathmandu, charging the lithium ion battery more than once a day might not be necessary.

Charging infrastructure

The lack of a charging system is one of the main problems to promote EV in Kathmandu, as there are no charging stations in major highways and also inside the city. The charging supply is mainly at the household level and applies the slow charging process. The national authority N1 mentioned that Nepal Electricity Authority (NEA) is planning to provide charging stations. However, the process has been delayed due to COVID and other reasons. NEA is planning to operate its own station network.

They allow private actors to come up with plans for charging stations. The lack of common standards, however, remains a problem as the charging requirements of an EV type might be different to those of other vehicles. The need for SOLUTIONSplus to address this issue is repeated.

3.2 Regulation

3.2.1 Existing policies

Policies highlight e-mobility but implementation has to be improved

Several transport policies in Nepal address e-mobility and have set some targets but various interviewed stakeholder groups pointed out that the target has not been met and policies are not implemented well. As mentioned by the public transport operator P1, policies that concern e-mobility include the 15th 3-year plan by National Planning Commission, the national 5-year development plan, the environment friendly vehicle and transport policy, and the NDC (an enhanced NDC was submitted in December 2020 with stringent targets). The government needs to come up with supporting policies for successful implementation of planned actions. Regarding the vehicle components tax, the local manufacturers M1 and M2 mentioned that the tax for electric vehicle components is lower for them, a fact that supports local manufacturing (the normal import tax of EV components is 15% while for local manufacturing purposes, it drops to 5%).

3.2.2 Existing regulations that need re-thinking

Financial incentives

Given the higher upfront cost of EVs, financial incentives can play a crucial role. The local manufacturer M1 and environmentalist E2 stressed that entrepreneurs and operators should be able to obtain bank loans at suitable interest rates. Without this support, the investment process would not happen. Government can and needs to come up with Green Climate Funds to support investments in EVs. The academia A2 also identified the need for government subsidies and favorable tax treatment, which are crucial for the first few years until the technology matures and market penetration improves.

Fossil fuel tax

The national authority N1 mentioned that the government has accumulated a significant amount of pollution taxes imposed on fossil fuels and conventional vehicles. That fund has been idle for a long time. Government has not been able to utilize the fund to promote EVs until now.

EV tax

The custom duty on public transport vehicles is 1%, both for fossil fueled and electric. As the upfront cost of e-buses is higher than that of conventional ones, transport operators are reluctant to invest in the new technology. Supporting financial incentives are required. The national authority N1 mentioned that in order to promote public transport and/or electrify public transport, the government not only should keep import duties to the low level of 1%, but also needs to consider measures such as annual and/or income tax breaks (currently under discussion).

The very high total tax on fossil-fueled vehicles (248%) comprises a significant source of government revenues. In comparison, the total tax on EVs was much lower (around 30%). However, with the recent budget speech, this tax has been increased to 80%. All interviewees emphasized that the increased government revenues due to higher taxes have discouraged the sale of EVs. The environmentalist E1 stated that a mindset shift is required from the government.

Electricity tariff

Together with other stakeholders who favor the overnight charging option, the national authority N1 supports a reduced night tariff for electricity (under discussion).

Legalization of vehicle conversion

The conversion of existing vehicles to EVs is not clearly legalized. This creates licensing problems to this kind of vehicles. Public transport operator P1 mentioned that the government plans to change the relevant regulation in order to define technical and operational standards. However, for the time being this intention is just a plan.

3.3 Obstacles, limitations and barriers

Electricity Transmission

Nepal can harness the hydropower generated in the country to charge the EVs. However, academia (A2) points to the issue of reliability of electricity supply (transmission lines, distribution network and voltage fluctuations) that needs to be addressed to support the EV market uptake.

Financial resources/upfront cost

The higher upfront cost of EVs is a bottleneck for public transport operators, entrepreneurs and owners, which is intensified by the high interest rates on investment loans. The local manufacturer M1 highlighted the supportive role that lower interest rates on bank loan can have.

Lack of charging infrastructure

EVs are a new transport system in Nepal and the lack of charging infrastructure is an issue. Donor D2 mentioned that the government needs to support a network of charging stations. Unless and until charging infrastructure is in place, it will not be easy for the public to use EVs. Unlike easily accessible refueling stations for conventional vehicles, the number of EV charging stations is very limited. The charging duration is also an issue for the users.

Permission of SOLUTIONSplus prototypes

The SOLUTIONSplus prototypes might have to go through the complex process of getting testing and operation permissions. The service provider S2 is concerned that the conversion is still not legally accepted. However, an amendment draft is being processed. P1 also shared the same concerns and highlighted in addition that the provision of technical assistance and demonstration of good practices by SOLUTIONSplus can enhance the amendment process. In this respect, the project demos can showcase the technical and financial viability of conversions.

Technical expertise

The local capacity for operation and maintenance of EVs is a major concern for all interviewees. Donor D1 mentioned that the transition to EVs is expected to add more jobs on top of replacing existing ones. Qualified technicians are needed and so is the relevant capacity building. Likewise, the role of experts in e-mobility should also be gradually developed. In consideration of this need, academia (A1 and A2) is in the process of developing specific programs on EVs in order to train stakeholders, including public transport drivers. A1 highlighted the need of training curricula for workshop mechanics re-orienting them from maintaining gasoline vehicles to e-vehicles. A 'Train the Trainers program,' delivering knowledge in a simple and practical manner, would be useful to build

local capacity. The local manufacturer M2 identified difficulties in local production due to lack of qualified laboratories equipped with testing facilities.

Awareness

Many stakeholders are not aware of the benefits of EVs and, as such, are not keen to embrace them. The service provider S1 mentioned that the decision makers/policy makers/bureaucrats need to become aware of these benefits. This will support the formulation of the required plans and policies, as well as their implementation.

3.4 Sustainability of the e-mobility solutions to be implemented

All interviewees agree that SOLUTIONSplus has the potential to transform mobility in Nepal. Donor D1 agrees that SOLUTOPNSplus demonstration activities in Kathmandu address all parts of the e-mobility ecosystem – related stakeholders, technical needs and policy support. If SOLUTIONSplus demos are implemented and prove successful, they have the potential of scaling up through local manufacturers. However, this development needs to be combined with sufficient financing. It is necessary to look into who and how will take over the successful examples of converted e-bus and e-3 wheelers, as well as how will they be implemented and scaled up. A plan for developing bankable projects is necessary.

As mentioned earlier, D1 highlighted that although the government has adopted a lot of EV-related policies, their actual implementation is problematic. It is necessary to address this gap and SOLUTIONSplus can assist in this direction with some ideas.

3.5 Impact on existing business models

The public transport operator P1 was well aware of the necessity for extensive future investments on converted e-buses (after the development of a successful SOLUTIONSplus prototype). A new business model will have to accompany the new technology and investments. In preparation for these developments, they are involving technical staff in building the prototype and arranging training for mechanics.

In relation to the necessary investments in public transport, both local authorities (C1 and C2) and the local manufacturer M1 consider public-private partnerships as a good option and promising business case for private operators. In any case, supporting financial incentives are necessary from the government. D1 expressed the view that the current revenue stream determined by the government may not be able to support the necessary transition to e-mobility, signifying the need for external funds or the involvement of the private sector.

3.6 Implications for Planning and Urban Development

Public Transport system

The public transport operator P1 is determined to put in place a full transition to e-mobility in the long-term. However, a stepwise approach needs to be followed. The bus services of today will later be expanded in the tourist area. An integrated system will be needed to connect various public transport services. The local authority C1 is concerned about the need for charging infrastructure, which requires the support of Nepal Electricity Authority. Local government C2 contemplated the potential need to reorganize the assignment of vehicles to lanes according to differentiated priorities (special priority for EVs).

Urban development/planning

D1 pointed to the fact that e-mobility planning is still just on paper. In the future, the requirements imposed by e-mobility would need to be integrated in urban planning and infrastructure development (e.g. shopping malls should be designed to have charging systems in place, proper charging areas should be foreseen for future bus terminals, etc.).

Energy network

The local manufacturer M1 mentioned that the supply of electricity would not be a problem for EVs deployment in Nepal (although detailed calculations are needed). As Nepal does not have industry and the nighttime hydro energy is wasted if not used, there is the potential of using nighttime electricity for charging EVs (the electricity tariff is also low at night). D1 proposed the option of installing a smart metering system that enables electric vehicle users to take advantage of differentiated energy tariffs with the time of day. On the electricity supply system, there is the need for a massive upgrading of the network to bear the additional load on the grid associated with EVs.