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# Feasibility Study – Mobility Service and Car Rental Sector in Rwanda

Implemented by

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## About this study

The feasibility study 'Mobility Service and Car Rental Sector in Rwanda' was commissioned by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH from pluto.M in the context of Invest for Jobs. Assessing the market for mobility services in Kigali, it projects the sector's growth and employment potential. The study provides recommendations for local policymakers, international cooperation agencies and financial institutions interested in supporting Rwanda's transition to an efficient urban transportation system.

## About Invest for Jobs

Under the Invest for Jobs brand, the German Federal Ministry for Economic Cooperation and Development (BMZ) has put together a package of measures to support German, European and African companies engaging in Africa. The Special Initiative "Decent Work for a Just Transition" – the official title – aims to team up with companies to create good jobs and to improve working conditions and social protection in its eight African partner countries: Côte d'Ivoire, Egypt, Ethiopia, Ghana, Morocco, Rwanda, Senegal and Tunisia. The Special Initiative is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH among others. Further information is available at [www.invest-for-jobs.com](http://www.invest-for-jobs.com).

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## List of Abbreviations

BMZ	German Federal Ministry for Economic Cooperation and Development
BRT	Bus Rapid Transit System
CEP	Courier Express Parcel
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
ICT	Information and Communications Technology
IT	Information Technology
KSEZ	Kigali Special Economic Zone
MaaS	Mobility-as-a-Service
NISR	National Institute of Statistics of Rwanda
PTA	Public Transport Authority
RURA	Rwanda Utilities Regulatory Authority
SMEs	Small and Medium Sized Enterprises
SUMP	Sustainable Urban Mobility Plan
TVET	Technical and Vocational Education and Training
VDI	Association of German Engineers (Verein Deutscher Ingenieure e.V.)
VW	Volkswagen



# Feasibility Study – Mobility Service and Car Rental Sector in Rwanda

## 1. Summary

Rwanda's capital Kigali could be a rewarding market for new, digital forms of mobility services and products such as car sharing, ride-hailing, scooter, (e-)bike rental systems and digital travel planning apps that offer various types of travel and serve as mobility marketplaces. In many cities and regions around the world, private companies and/or public institutions have introduced and tested various forms of such services, often grouped under the term Mobility-as-a-Service (MaaS).

For Kigali, services like this can be useful to complement or even replace the existing transport system. New mobility services can improve accessibility and provide an environmentally friendly and energy efficient mode of transport. As business models, these concepts can contribute to economic growth and create jobs in different profiles. MaaS can also be a solution to limit the demand for private cars. It can also help to provide access to an affordable mode of transport without the negative side effects of road transport such as congestion, emissions and noise.

With this study, the Special Initiative "Decent Work for a Just Transition" (Invest for Jobs) aims to describe the market for mobility services in Rwanda and forecast its future development and job potential based on the new concepts of MaaS. For details regarding Invest for Jobs, kindly refer to the Annex. The study will provide a quantitative and qualitative outlook on how MaaS services can benefit the economy of Kigali and Rwanda as a whole. The target groups are different stakeholders ranging from including potential private investors to existing mobility providers and public authorities which regulate the transport sector in Kigali. For private stakeholders, the focus is on specific business models and potential market sizes, while for the public authorities, the study will highlight several aspects of regulating the market for mobility services.

Invest for Jobs teams up with private companies to create more and better jobs in its partner countries, including in Rwanda. This study therefore looks closely at the impact of mobility sector market development on employment opportunities and potential training programmes.

The data for this study was collected through secondary research and scientific literature, studies and papers provided by local authorities and international institutions. Several interviews were also conducted in Kigali at the end of November 2022 (see the Appendix for the list of interviews) and an estimate of the future demand for Mobility-as-a-Service solutions was calculated based on the data from the literature and on the insights from the interviewees.



## 2. Macroeconomic background and its impact on the transport sector in Kigali

Transport demand is usually dependent on economic development, and vice versa:

- Firstly, new modes of transport must satisfy the demand of a large part of the population to be profitable, or at least sustainable, from a macroeconomic perspective.
- Secondly, a transport system also enables economic growth by providing access to jobs, educational institutions, etc.
- Thirdly, the transport system itself is part of a country's economy, employing people and generating a significant amount of investment. This leads to economic growth.

Based on the above, it can be concluded that investing wisely in transport will bring multiple economic benefits. To highlight the types of transport modes that could be relevant in the car rental and MaaS sector, it is important to briefly describe the macroeconomic situation of Rwanda and Kigali, together with recent and upcoming developments and their impact on the country's passenger transport industry.

### 2.1. Rwanda's promising economic development

Rwanda is a small, landlocked and mountainous country in central sub-Saharan Africa. The country is densely populated, with most of the 13 million inhabitants living in rural areas or cities. The capital Kigali is the country's largest city with 1.7 million inhabitants. 5-6 million people live in the capital region, including Kigali's suburbs. The country is in tropical Africa, so there are two rainy seasons with heavy rainfall every year.

Rwanda used to be one of the poorest countries in Africa and today, almost 50% of GDP (gross domestic product) and employment still depend on agriculture and food production. However, the country's economy has grown strongly over the past 20 years (5-15% per year). The political system stabilised after 1994 and since then, many (according to the World Bank, "impressive") improvements have been made, particularly in the areas of health care and gender equality. Although the government's Vision 2020 strategy to become a middle-income country by 2020 has not yet been achieved, many improvements have been made to the population's quality of life and the economy, and the path to economic growth is being consistently pursued.<sup>1</sup>

Six pillars relevant to market design in the transport sector underpin this development:

- Good governance and an efficient state;
- human resource development and a knowledge-based economy;
- a private, sector-led economy;
- infrastructure development;
- productive and market-oriented agriculture;
- and regional and international economic integration.

The government has pursued a policy of strong investment in the public sector, including infrastructure. This has indeed led to economic growth, but also to high levels of public debt. State institutions are described as

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<sup>1</sup> World Bank (2023): Rwanda Economic Update - Making the Most of Nature Based Tourism in Rwanda.



being well-established, trustworthy and efficient. Security in Rwanda is high. Strong public institutions and public investment have been a 'cornerstone' of the country's recovery over the past 20 years<sup>2</sup>.

The above six pillars also describe the political and economic framework for market development in Rwanda, especially for public services such as transport. Strong institutions on the one hand and private sector participation on the other are guard rails for concepts and proposals for market development in the transport sector.

## 2.2. Transport sector in Rwanda with focus on Kigali

Rwanda's economic situation shapes its transport system. The employment situation with its strong anchoring in agriculture and small business, the settlement structure and the limited household income continue to have a strong influence on transport demand. Today, most journeys are made on foot or by bicycle over short distances<sup>3</sup>. Although it is not immediately obvious when looking at Kigali's streets and public spaces, survey data and expert observations show that walking is still the predominant mode of transport. Most journeys are made within the city's neighbourhoods. Many citizens of Kigali reside on one of the hills in the city. The average distance travelled is still low.<sup>4</sup>

The main roads are in good condition and have been equipped with four lanes, street lighting and pavements in recent years. Important intersections are equipped with modern, demand-oriented traffic lights. Numerous speed cameras mean that drivers consistently observe the speed limit, which is mostly 60 km/h, 40 km/h on smaller roads and 80 km/h on some interurban roads. Many trucks also pass through the city, since the supra-regional and international road network runs through Kigali's city centre. There are no bicycle or bus lanes. The steep hills of Kigali combined with the tropical sun and humid climate probably limit the popularity of cycling.

At rush hour, the main roads are crowded, but not overly congested. Massive traffic jams, familiar in other African cities, are not (yet) a problem in Kigali. However, when we consider that the country's economy is moving towards a middle-income society, these patterns of transport demand are likely to change. As seen in other emerging economies, it is expected that:

- Jobs and job profiles will become more diverse and skills profiles will consequently become more occupation-specific. Workers with higher qualifications are less likely to find suitable jobs close to home. This will lead to longer average journey times.
- As society becomes more diversified, similar effects will occur for trips to shopping, leisure facilities and educational institutions. This will also lead to longer journey times.
- These increasing distances will lead to changes in the transport types used: The share of non-motorised modes will decrease.
- Growing incomes will lead to a demand for greater comfort in transport.

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<sup>2</sup> Bertelsmann Stiftung (2022): BTI 2022 - Country Report Rwanda.

<sup>3</sup> City of Kigali (2020): Transport Plan – Kigali Master Plan 2050.

<sup>4</sup> Ministry of Infrastructure (2021): National Transport Policy and Strategy for Rwanda.





In many emerging countries, the development briefly described above has led to an increase in car ownership and to massive problems with congestion, air pollution and other disadvantages of private motorised transport in other regions and cities.

In Rwanda, the positive socio-economic development can also be an opportunity to redesign the transport system – and not to repeat the mistakes made in many other regions of the world. By developing Kigali’s transport system towards sustainability goals in accessibility, cost, energy and spatial efficiency. MaaS solutions can play an important role in the future transport system.

Today, Rwanda has neither a railway nor a light railway system. All means of land transport are based on the road network. This also applies to the connections to neighbouring countries, for both passenger and freight transport. The road network is well maintained, and asphalted roads have been built for the most important connections. The network of asphalted roads has been improved in recent years and will be continuously expanded in the future.

Overall, the fleet of cars, motorbikes and other vehicles is not yet very large. Nevertheless: Before the corona pandemic, a steady increase was measured in the country (see Table 1 here below).

Table 1: Number of vehicles in Rwanda<sup>5</sup>

Category	Cumulative up to 31/12/2018	Cumulative MV reg. at 31/12/2019	Cumulative MV reg. at 31/12/2020
Caterpillar	145	154	167
Bus	1,576	1,706	1,965
Trucks	7,694	8,273	9,680
Pick-up	18,618	17,026	18,685
Special Engine	2,856	3,504	4,139
Jeeps	26,715	25,771	30,156
Microbus	1,466	1,536	1,937
Minibus	6,411	6,096	6,405
Cars	36,951	34,555	38,938
Motors	112,404	117,199	130,326
Trailers	976	1,055	1,166
Semi-trailers	316	-	-
Tricycle	73	73	73
Unknown	3	-	-
FORKLIFT	-	28	41
HALF-TRAILER	-	325	434
<b>Total</b>	<b>216,204</b>	<b>217,301</b>	<b>244,221</b>

<sup>5</sup> National Institute of Statistics NISR (2020): Statistical Yearbook 2020.



In the Kigali Transport Master Plan released in 2020, some household survey data provides information on the transport demand of the population in Kigali and the capital region. Most trips to work by the employed population in the Kigali region are shorter than 2 km, with about 75% of all trips being shorter than 5 km. Many people obviously live within walking distance of their workplace.

### Private cars play a subordinate role

Private car ownership is very low. In total, less than 100,000 cars, jeeps and pickups were registered in the country (source: National Institute of Statistics of Rwanda (NISR), see above). Most of the registered vehicles are used for commercial passenger transport, either as licensed buses, motorbikes, minibuses or taxis, or they are operated informally.

Due to import taxes and high operating costs (fuel has to be imported by road transport from the ports on the Indian Ocean coast), cars are remarkably expensive.

The national policy tries to keep the number of car owners low. To accelerate the modernisation of the vehicle fleet, Rwanda imposes high import taxes on used cars and is even discussing an import ban. This inevitably means that car ownership will only continue to be affordable for a very small segment of the upper class.



*Illustration 1: This must not be underestimated: Walking is one of the most important means of transport in Kigali*



*Illustration 2: Almost a traffic jam: the morning rush hour: commuters on their way to Central Kigali*

### Public transport

More than 80 % of the population in the capital region use public transport regularly or frequently. Public transport as defined in the Kigali Transport Master Plan<sup>6</sup> includes not only bus routes, but also motorbikes and taxi services.

Public transport in Kigali with city buses is a publicly planned and organised service (public service obligation). The city of Kigali is the responsible authority for public transport and awards bus services through public

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<sup>6</sup> City of Kigali (2020): Transport Plan - Kigali Master Plan 2050.



tenders. In Kigali, three bus companies have been contracted by the municipality and offer an integrated route network.<sup>7</sup> The three bus companies in Kigali have their roots in the minibus sector and were organised (with the help of the authorities) as cooperatives of the former minibus operators before the first tenders for city bus services were issued in 2011.

Ticket sales are highly digitalised and based on chip cards known as ‘Tap&Go’. The system is operated by the contracted payment service provider AC Group. It is not possible to use the buses without this chip card. Payment in cash is not possible.

The public transport system is provided in a network of public authorities (Rwanda Utilities Regulatory Authority (RURA), City of Kigali), contracted bus operators and the payment platform. However, from the passengers’ perspective, the system does not appear to be an integrated brand with a unified marketing presence. For example, it lacks maps of the bus network, a timetable information app and a system that provides information on real-time data.

### Future developments in public transport

Experts interviewed for this study told us there are some plans for modernising the bus system in Kigali. In the short term, these plans include strengthening the city as a public transport authority (PTA), changes in the way bus services are tendered, and the creation of a data platform and a customer app. In the long term, bus lanes are being considered as an entry point for a Bus Rapid Transit system (BRT). Several ideas about light rail or gondola lift systems also exist, but they are still very vague.

### Motos are almost MaaS

Motorbike pick-ups play an important role in motorised road transport in Kigali. Passengers are carried on the pillion seat of motorbikes, and the driver is required by law to provide the passenger with a helmet. Services are available throughout the city. Drivers actively look for passengers or wait for customers at intersections



Illustration 3: Tap&Go system (Source: AC Group)



Illustration 4: Motorbikes are the backbone of public transport in Kigali

<sup>7</sup> Institute for Transportation and Development Policy (2021): Bus reforms in Kigali.



and landmarks. According to official statistics and local experts, there are about 30,000 motorbikes in use in the Kigali area. The drivers are usually self-employed. The motorbikes are mostly imported motorbikes, some of which belong to the drivers and are often leased or rented. To start a motorbike business, loans can be obtained from specialised microfinance agencies, although interest rates can be quite high.

A small but growing number of bikes are now electrically powered. Some local start-ups are either converting bikes' internal combustion engine bikes and electrifying them, or even building new bikes in small local factories. One example here is the start-up company Ampersand Solar. Their system is based on replaceable batteries. A growing network of battery exchange stations makes it possible to change batteries. The batteries are normally rented by the riders.



*Illustration 5: An Ampersand battery exchange station in Kigali*

The electrification of the vehicle fleet is a fundamental change in the industry that is already underway. It has implications for business models and the role of different players in the transport ecosystem. It also affects the profitability of the driver business and creates macroeconomic and environmental benefits. This is why this study will highlight this development in the following Chapters and suggest some ideas for policy makers and international development agencies.

### **High price for moto transport**

Commercial passenger transport on motorbikes has a serious disadvantage when it comes to road safety, regardless of the drivetrain technology: on average, two people die in accidents every day in Kigali. Motorbikes are involved in 71% of all accidents<sup>8</sup>. This is a very high price to pay. Although some efforts like compulsory helmet use have been made to improve safety, motorbikes inevitably remain dangerous due to their physical characteristics. Nevertheless, the fit of the helmets worn by the riders is poor, which limits the protective effect. A safer but less practical solution would be for passengers to bring their own helmets. The experts' point of view is that this form of commercial passenger transport should be reduced and minimised, despite the motorbikes' obvious market success and the enormous impact on employment this would have.<sup>9</sup>

### **The taxi market shifts to ride-hailing**

Taxis are also common in the city. The authorities regulate the service, which means that taxis have to be equipped with meters. In 2018, the national regulator RURA commissioned the private, Indian-owned company Yego to equip all vehicles with smartphone-based meters that also include tracking features. The rates will be set by RURA. Taxi drivers have to pay a commission for the use of these meters, and the authorities are obliged to have them. There is also a Yego app for passengers to book and pay for rides. The commissions charged by the operator of the Yego business platform are strongly criticised by drivers, who complain that

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<sup>8</sup> Sylvain H Muzungu for *The Chronicles* (2019): Ten Golden Rules To Survive Moto Accidents In Kigali; Vissoci et al. (2020): Road traffic crash experience among commercial motorcyclists in Kigali, Rwanda.

<sup>9</sup> Anjni Patel et al. (2016): The epidemiology of road traffic injury hotspots in Kigali, Rwanda from police data.



they are making a low-profit business even less profitable. The fares set by RURA are also not very well accepted – drivers usually try to negotiate a price and cash payment with passengers.

Taxi drivers are usually self-employed, but rarely own their own vehicles. The vehicles, often old models such as Toyota Corollas or similar vehicles, are often rented or leased from local businessmen.

In 2019, Move, a subsidiary of the German car manufacturer Volkswagen (VW), entered the ride-hailing market in Rwanda. This business model differs from Yego’s asset-light approach. Volkswagen Move employs drivers and provides the locally assembled, relatively new vehicles (VW Polo).

In 2018, a small vehicle assembly plant was opened in the Kigali Special Economic Zone (KSEZ). The plant reassembles new cars that have been dismantled at the VW plant in South Africa. This avoids import taxes on new cars. The vehicles are sold as used cars after their use in the ride-hailing service.

According to personal observations, Move drivers use the app platform for customer interaction more often than taxi drivers connected to the Yego system.

These modes possess some key characteristics of MaaS solutions. Users of these services give up ownership of their mobility resources and take up mobility services instead.

### Very small bike-sharing system

In Kigali, a station-based bike-sharing system is operated by Gura Ride, a local company founded in 2017. The distances and elevation differences between the stations are large and the network is not yet very dense. According to Gura’s homepage, the app has only been downloaded 6,000 times (December 2022), so the system is hardly being used as expected. The bikes can be located, collected and paid for via a smartphone app.

Gura’s management plans to adapt the fleet and soon offer electrically powered bicycles and scooters. The app and the back-end system are already prepared to offer further services.

The lack of adequate infrastructure is still a problem for cycling. There are usually no cycle lanes and the relatively high speed limit (60 km/h) on main roads makes the use of bicycles, e-bikes or scooters risky or at least inconvenient.

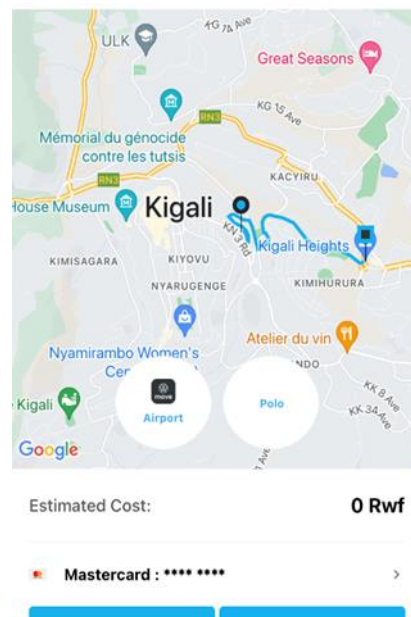
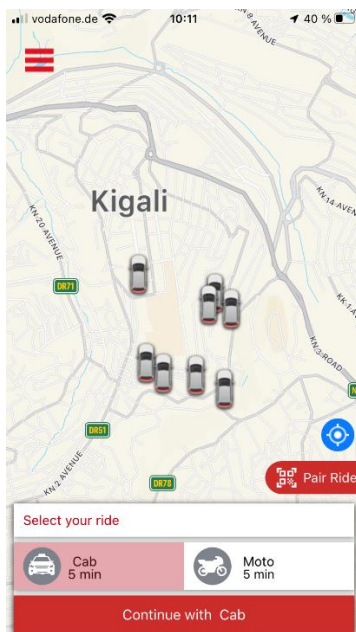


Illustration 6: Ride-hailing apps in Kigali: Yego (left) and Move by Volkswagen (right)

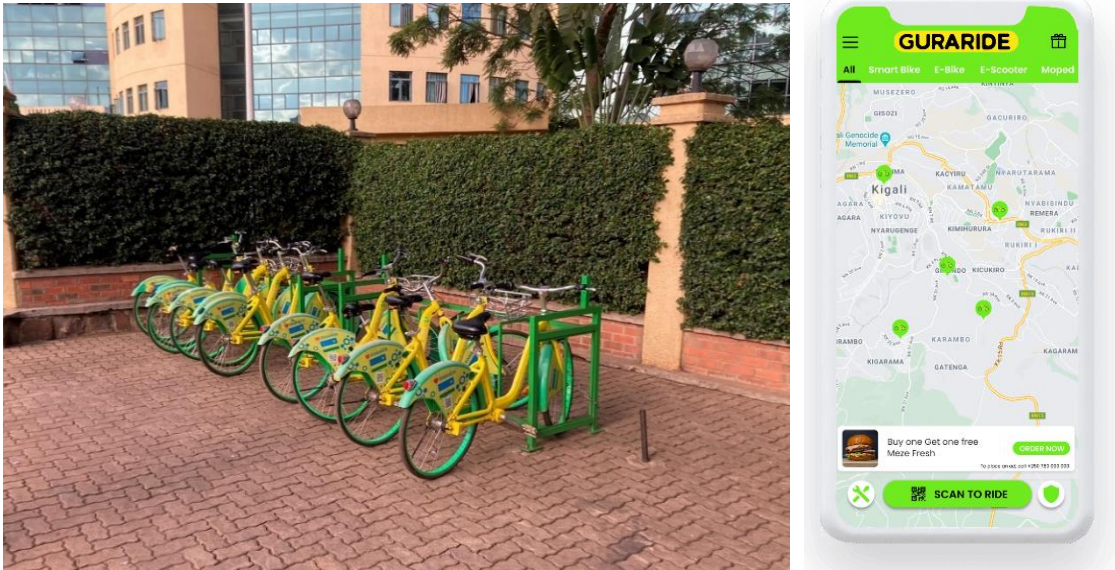


Illustration 7: Gura Ride bike rental station and app, showing the limited network of such stations in Kigali

### Car sharing

Car-sharing services (station-based or free-floating) do not exist in Kigali. Companies with a background in the automotive industry, start-ups or grassroots initiatives are currently experimenting with different business models in many developed countries, car sharing services are unlikely to be viable in Kigali for the following reasons:

- Not many are allowed to drive a car (due to driving licences), which limits demand;
- The services are not affordable for a large proportion of potential users, and
- car sharing has no cost advantage over taxi rides, as labour costs in Rwanda are very low.

However, the last aspect is the most important: since cars with drivers can be allocated according to demand, the utilisation of taxis is higher. This compensates for the relatively low labour costs of taxi drivers and makes taxis a direct and more cost-effective means of transport than car sharing schemes.

### Car rental

Car rental companies (without drivers) only play a minor role in Kigali. As a rule, small companies with few vehicles offer services with drivers. A large part of the business is reserved for peak tourism times (e.g. gorilla safaris, etc.). There are also a few informal car rental companies without drivers.

The market in Rwanda seems to be too small for larger, international car rental companies. These business models usually depend on incoming tourists and business travellers. However, passenger numbers are too low (less than 30 flights at Kigali airport per day). This could change when the new Kigali airport opens and tourism continues to recover and grow after the pandemic.



### 3. Opportunities and risks for MaaS in a city like Kigali

In this study, MaaS is understood as a collective term for mobility services for passengers, which are usually accessed via the internet or smartphone-based applications and more or less satisfy individual transport needs. The role of digital technology is relevant for the market success of such solutions. In recent years, the MaaS industry has grown on a global scale. New venture capital-backed companies have entered the mobility market and new services such as free-floating car sharing and on-demand ride pooling have been introduced. Nevertheless, the market is very volatile: the first companies could not prove the viability of their business models, mergers led to market concentration and the mechanisms of the platform economy play an important role in market development. If MaaS is to become a more significant part of the transport system in Kigali, these aspects must be taken into account.

#### 3.1. The MaaS concept

The term 'MaaS' stands for 'Mobility-as-a-Service'. The 'as-a-service' part of the term originally comes from the software industry, where as-a-service business models have become common in the past few years. Many software users no longer buy software licences, but use them via subscription models. Streaming services like Spotify and Netflix work according to this principle. Instead of putting CDs or films on the shelf, film series and music are streamed from cloud-based servers. The advantage for users is that they neither have to invest in the physical storage of their music, software, etc. nor do they have to tie up any of their capital. In this way, providers generate recurring revenue.

Companies like the Finnish start-up MaaS-Global have adapted this principle for mobility and thus coined the term 'Mobility-as-a-Service'. They developed market subscription models that allow users to put together different mobility offers such as car, bike or scooter sharing, taxi or public transport via apps.<sup>10</sup>

MaaS providers have a remarkably car-centric view of mobility. For users, an as-a-service aspect only seems innovative in contrast to the private cars they buy and keep ready at all times. Public transport users have always used mobility as a service. Today, public transport and the use of taxis or motorcycles can be conceived of in the same way as Mobility-as-a-Service.

MaaS therefore represents no innovative distribution or pricing model compared to traditional public transit season tickets. The addition of new providers such as car or bike-sharing to public transport, i.e. the attractive extension of further mobility options from the customer's point of view, is inadequately described by the term 'as-a-service' - the innovation of MaaS lies in the digitalisation of the service.

#### 3.2. Digitalisation and mobility services as part of the platform economy

The mobility market is often referred to as the 'next big thing' in digitalisation. While the book and media trade, the hotel industry and the retail trade have already been structurally changed to a much greater extent by digitalisation, the transport market is still in its digital infancy – however, the transition has just begun.

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<sup>10</sup> David A. Hensher & Sampo Hietanan (2022): Mobility as a feature (MaaF): rethinking the focus of the second generation of mobility as a service (MaaS).



Car sharing, bike rental and ride-hailing services are not particularly new. The massive growth of business models with such services in recent years is directly linked to technologies:

- Smartphones can be used as a customer interface.
- Vehicles and drivers can be contacted via the mobile network.
- Smartphones can replace special on-board systems (such as meters in taxis or on-board computers in buses).
- Cloud-based systems can be used for planning and scheduling, including data collection and optimisation.
- Services are usually scalable: Cloud-based services can be easily scaled according to demand and can also be easily copied and adapted to new markets.
- Payment can be handled securely and reliably via specialised service providers.

All these technological innovations help to reduce the costs of providing transport services. They mainly have an impact on transaction costs, but also on productivity. This is important because the market for urban transport services is characterised by low revenues per transaction and low profit margins. If digital technology helps to reduce costs, previously unsustainable business models could become profitable.

On the other hand, technology providers are trying to establish business models in this market and to occupy parts of the value chain. This is especially true in aspects of marketing, sales, dispatching and transport planning. They often try to generate commission-based revenues. This takes money away from the industry's (already low-profit) margin business models. The Kigali's taxi drivers' resistance to the commissions payable to Yego suggests possible conflicts in connection with this structural change.

### 3.3. Job creation and platform economies

When it comes to the central aspects of this study, job creation and working conditions, the impact of digitalisation and platform-based business models must also be briefly considered. The economics of digitalisation harmonise with standardisation and scalability, meaning that key processes in a particular industry are automated by software, which is usually hosted in the cloud and is highly standardised.

Digital platforms also offer opportunities for small entrepreneurs, who can market and distribute their services more efficiently and tap into a larger customer base. Examples of this are in the hospitality industry for platforms like Booking.com or in retail for Amazon Marketplace. In the mobility market, the best-known example is the (mostly) self-employed Uber drivers.

However, risks are involved here: The platforms themselves bear hardly any entrepreneurial risks and leave these to the providers, who monopolise the channels to the customers and gain exclusive insights into demand data.

This creates a risk of exploitative dependency relationships, especially if the connected service providers are micro-entrepreneurs. The potential for job creation in the MaaS market should therefore be critically evaluated in terms of the quality of the jobs to be created. Another problem with job creation in the transport sector is that many jobs tend to be male-dominated (drivers, maintenance, etc.). A job creation approach in the sector must find measures to create attractive jobs for all genders.

To summarise: MaaS is a relatively young innovation in the transport industry. Both the industry and the municipalities are having their first experiences with such services, and this leads to a continuous learning process. Cities often play a reactive role. In the past, new services were often introduced by service providers





without consultation with local authorities. However, this approach is about to change: cities and regulators have developed an initial tool kit of measures to govern MaaS services. Legislators at state level are also developing legal frameworks for the new service and MaaS providers are beginning to adopt their business models – but this is still an ongoing process and both Rwanda and Kigali need to find their own ways to deal with this innovation.

### 3.4. Gender aspects of MaaS and MaaS-oriented workplaces

The design of transport systems and their impact on accessibility generally have a strong impact on living conditions, access to jobs and earning opportunities for all genders. One well-described example of good practice is the benefits women gain from improved public transport systems (rapid buses or cable cars) in South American cities. Transport systems must enable self-determined living and reduce dependence on men who control access to transport.

MaaS could help to make a transport system more friendly to women. Some relevant improvements, for example, would be:

- Digitalised access to means of transport such as motorbikes or taxis enables safety to be improved. Drivers can be tracked; customers can give feedback on the quality of transport services and their experience with drivers.
- Access to shared mobility resources reduces the need to invest in their own vehicles. This can improve accessibility for low-income groups.
- Specific services for female drivers and riders could be developed and distributed through digital channels. MaaS can therefore help to provide employment opportunities for women in the traditionally male-dominated transport industry.

To achieve these gender benefits of MaaS services, these aspects must be considered during the design and planning process.

### 3.5. MaaS between public service obligation and free market initiative

Transport services have always been subject to political regulation everywhere where such services exist. The degree of government intervention and the instruments used vary from country to country, driven by:

- political objectives
- spatial structure
- the degree of user financing
- available technology.

Since the 1990s, different models for rail and public transport have been developed in many regions of the world under the umbrella of liberalisation policies. These models range from market-driven transport with minimal public sector influence to contracting models where the public sector determines the scope of services. Table 2 gives an overview with examples of procurement models in the transport sector, focusing on established forms in Germany and Europe.



Table 2: Types of public service obligations

Procurement modes	(Regional) rail	Public transport	Other industries	New Mobility Modes
<b>Market initiated services (Companies can provide service in own responsibility and risk)</b>	<i>Not existent: [Long distance rail (in GER)]</i>	Some regional bus networks; Long distance bus (in GER)	Drivers	
<b>Own positioning by a public body (State City owns service providing company)</b>	State Railway Company	Public Transport Company owned by municipality	Public libraries, swimming pools, ...	
<b>Subsidy based model (State / City set rules for access to service, price etc.)</b>	Subsidies for rolling stock, workshops, tax benefits, funding for infrastructure	Subsidies for rolling stock, workshops, tax benefits	Post service	
<b>Regulated Services (State / City set rules for access to service, price etc.)</b>	Market regulation by public agencies, technical supervision	Market regulation by public agencies, technical supervision	Telco and energy industries	All forms of can be observed
<b>Contracted Services (State / City contracts a service provider and defines service level)</b>	Tenders in regional rail networks (GER, DK, NL, ...)	Tenders in Bus, Tram or Metro Systems (Line contracts for regional bus services in GER, Metro Stockholm, Network Contracts in French Cities)	Public bodies are contracting private companies for various services	
<b>Concessions (State / City procures exclusive rights for operator and limits competitive pressure)</b>	Franchises in UK rail market, Switzerland	German, Austrian regional bus market, licensed cabs	Mining industry, Cell phone frequencies, pharmacies	

Before defining the rules governing MaaS services, transport policy objectives must be established. These objectives will vary depending on how the transport system is to be developed. They are typically social (accessibility, affordability), environmental (emission reduction) and economic (cost to the taxpayer). In the following Chapter, we highlight the challenges for the transport system in Kigali and outline a possible role for MaaS in a future transport system for Kigali.



## 4. Feasibility of mobility and car rental services in Rwanda

### 4.1. At the crossroads

As described in Chapter 2, Rwanda’s economic development is promising. According to the World Bank, the country is on its way to becoming a middle-income society. From the perspective of a transport planner, this has a bitter taste. In all countries that have already gone through this development, the results have been the same: No city or region has been able to fully absorb the increase in transport demand with sustainable modes, but an increase in road traffic and huge fleets of private cars can be observed almost everywhere. The driver of this development is not only a modal shift away from walking and cycling (today, about 50% of all trips in Kigali are made by these modes), but also an increase in driving distances. These are usually the factors that lead to higher traffic volumes and typical problems such as congestion, space consumption and emissions.

According to the Kigali Transport Strategy, one of the objectives of the transport policy is to limit this development by providing alternative means of transport. MaaS such as ride-hailing with motorbikes or taxis, on-demand shuttle services, bike and car sharing can only be one element of the future transport system. It is not realistic to believe that MaaS solutions alone will be able to meet the growing demand, because of:

- the limited capacity of the roads,
- the relatively high prices of MaaS,
- the high demand for drivers and
- the ecological distortions.

However, MaaS can play a key role in an integrated transport system – not as the only solution, but as part of an effective strategy to address the challenges.

The core element of a future-integrated transport system (see Illustration 8) must therefore have a mass transport system as its anchor. Only a public transport system with high capacities can meet the demands that arise with increasing passenger numbers and longer journeys. The lower fares of public transport compared

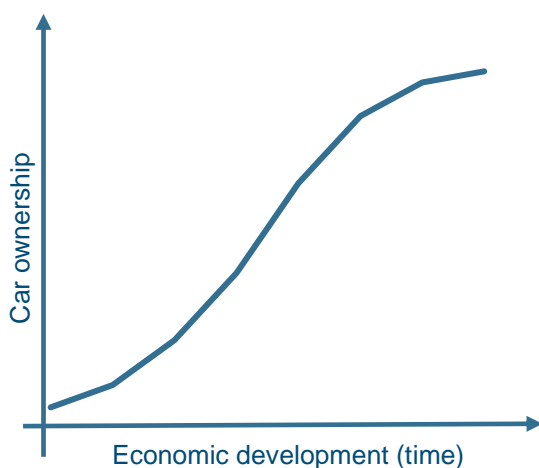


Illustration 8: Typical effects of economic growth on car ownership

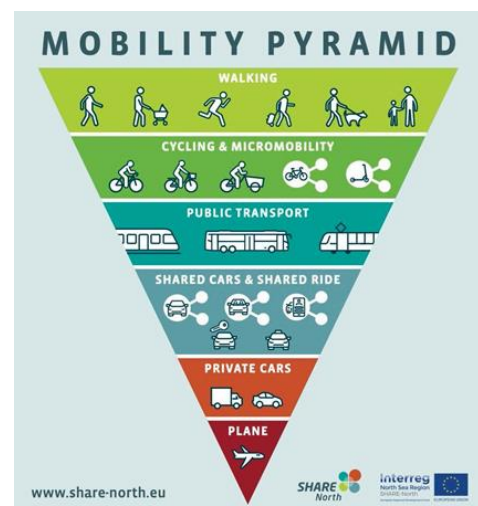


Illustration 9: Role of the different transport modes in a sustainable integrated transport system (Source: the planners guide from the European Union’s SHARE North project)



to MaaS fares ensure that mobility is affordable for a larger part of the population. This is particularly important in emerging economies such as Rwanda: the remoteness of neighbourhoods with low-income populations limits these residents' abilities to find jobs. If a transport system provides affordable access to (better paid) jobs, it can bring benefits to residents, an economic boost and an upgrading of entire neighbourhoods.

The role of MaaS in such a transport system must be as a substitute for private cars. Besides all the advantages of public transport from the perspective of the common good, there are also some key disadvantages from the perspective of the individual user. Cars offer privacy, individuality and a different level of comfort. Some routes with low passenger demand cannot be covered by public transport systems for economic reasons, so there are usage scenarios where public transport cannot satisfy the needs of passengers.

In addition to the status aspect for many people of owning a car as soon as they can afford it, these usage scenarios are often the reason for buying one's own car, so even trips that could potentially be made with more sustainable modes of transport are made by car. This is due to the specific cost structure of private cars: high fixed costs for investing in a vehicle are followed by relatively low variable costs for using the car.

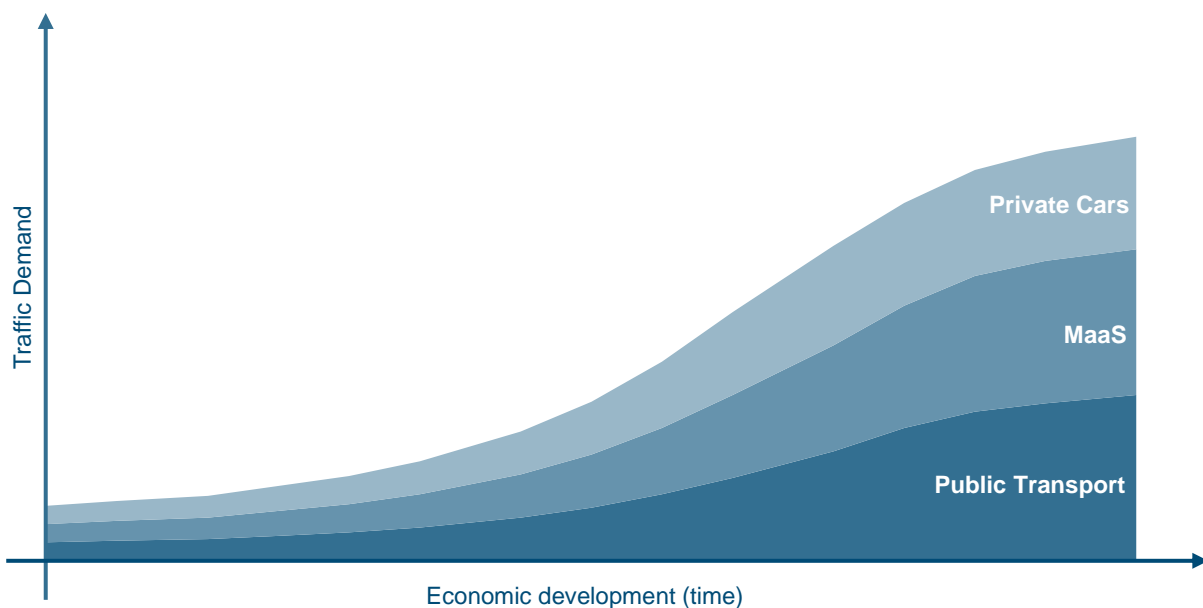


Illustration 10: Combining MaaS and public transport can limit the increase in car ownership.

Seen from this perspective, MaaS should cover the following usage scenarios:

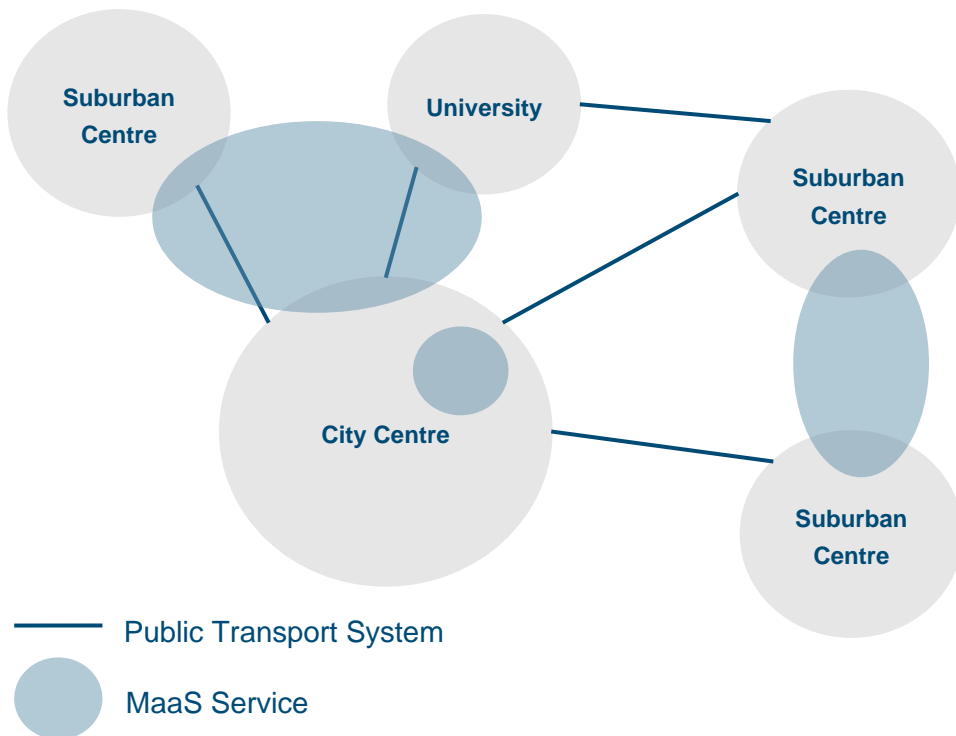
- First and last mile: While local transport systems usually focus on high-demand routes, MaaS can, for example, offer services from bus stops into residential areas.
- Low demand routes: In cities, routes from one suburb to another suburb are often less in demand than routes from the outskirts to the city centre and vice versa). MaaS solutions can complement a public transport network in these cases:



- Journeys with higher requirements for safety or comfort: Sometimes consumers need a level of comfort or safety that public transport cannot usually provide. In these cases, MaaS solutions can bridge the gap.
- Sensitive customer segments such as disabled people and small children.
- Business travellers and tourists.

In societies with high levels of private car ownership, the cost of private car ownership is one of the biggest challenges to changing to more sustainable transport. Rwanda and Kigali are currently in a situation where they can set a course for a different development path. The relatively new concept of MaaS and its portfolio of services are a great opportunity which other cities that are more advanced in the development of their transport system have not yet had.

The strategy for a sustainable transport system can be summarised in one sentence: Kigali should develop reliable and high-quality public transport and MaaS transport as alternatives to the private car before a large part of society can afford a private car.



*Illustration 11: Public transport must be the anchor and backbone of an integrated transport system*

#### 4.2. Recommendation for investments based on the SWOT analysis

For an evaluation of investment opportunities, a SWOT analysis is helpful. The services typically grouped under the term MaaS have very specific characteristics. This is why they are each evaluated in a short SWOT analysis.



MaaS Service	Strength	Weakness	Possibilities	Threats
<b>Ride-hailing (taxi service with digital customer interface and cloud-based dispatching)</b>	<p>A large number of drivers are available and already in business.</p> <p>Established companies with digital apps and back-end systems such as Yego and VW Move are active in Kigali.</p> <p>Secure payment methods via app.</p> <p>The status quo of digitalisation provides insights into demand behaviour.</p>	<p>Fleet with internal combustion engines. Very old vehicles (Yego).</p> <p>Low quality of vehicles (Yego taxis).</p> <p>High commissions from platform companies.</p> <p>High costs for the use of the platforms by the drivers (commissions).</p> <p>Control of the Yego platform acts as a quasi-monopolist.</p>	<p>More demand due to the growing number of middle-class households.</p> <p>Electrification of the fleet could improve service quality, environmental impact and operating costs.</p> <p>More efficient planning and allocation through MaaS algorithms.</p> <p>Demand data could be used for transport planning and optimisation.</p>	<p>Today only affordable for a small part of the population. Taxis are the cause and victim of traffic congestion.</p> <p>Not a very efficient means of transport, although better than a private car.</p> <p>Energy prices are threatening profitability.</p> <p>Financing of fleet modernisation (electrification) unclear.</p> <p>The infrastructure capacity is not sufficient for the increasing demand.</p> <p>Increasing power of the platform provider can lead to monopolistic structures (winner-takes-it-all effect).</p>
<b>Carpooling (Motos)</b>	<p>More demand due to the growing number of middle-class households.</p> <p>Very affordable as prices are low compared to car-hailing.</p> <p>Creation of 50,000 jobs in Rwanda.</p> <p>Low market entry barriers for drivers. Well-established financing structures for vehicles.</p>	<p>Largest share of the fleet with combustion engines. Some very old vehicles.</p> <p>The risk of accidents for drivers and passengers is very high.</p> <p>The service is inconvenient for some passengers.</p> <p>Noise and pollution from internal combustion engine vehicles.</p> <p>Vehicle financing is a high economic risk for motorists.</p> <p>Rising fuel costs reduce profitability with tariffs unchanged.</p>	<p>Domestic industry for vehicle modernisation and electrification with battery replacement concept.</p> <p>Young but growing domestic industry builds vehicles (Ampersand).</p> <p>Creating an innovative vehicle financing ecosystem for drivers.</p> <p>Established but little-used digital information and sales channel (Yego app).</p>	<p>Today, it is only affordable for a small part of the population.</p> <p>Energy prices threaten profitability.</p> <p>The vehicle industry may not be able to cope with rising demand.</p> <p>Passengers' growing need for comfort.</p>
<b>Bike-sharing</b>	<p>Gura Ride has some bike rental stations, there is a working app and an established</p>	<p>Topography and climatic conditions not optimal for cycling (with heavy rental bikes)</p> <p>No cycling infrastructure (cycle paths)</p>	<p>The existing infrastructure (stations and digital platform) can be used or adopted for other forms of shared mobility</p>	<p>Inadequate infrastructure for cycling</p> <p>High acceptance, if not popularity, of cycling</p>



MaaS Service	Strength	Weakness	Possibilities	Threats
	institutional framework. Space available for bicycle rental stations.	Too few bicycle rental stations Car traffic on city streets is dangerous for cyclists – one reason for this is that the speed limit is far too high.	such as scooter or e-bike-sharing.	Unclear business case, problems with financing / investment Perhaps dependent on subsidies.
<b>Car sharing</b>		Not yet available.	Could improve accessibility and mobility without having a car Existing digital platforms can be used for this service.	Too few people with driving licences Not competitive with taxi or motor services due to low labour costs.
<b>Car rental</b>	Some early international players at Air (Europcar)	Only a small sector of the economy, focusing on inbound tourists and international organisations and companies	With the growing demand from tourism, existing businesses can easily be scaled up	Low demand due to limited number of international visitors
<b>Scooter / E-bike (without driving licences)</b>		Not yet available.	Improved accessibility and low costs for users. No driving licence required. Realisable in the short term (compared to infrastructure projects). Existing digital platforms can be used for this service. The potential market can be very large.	Inadequate infrastructure (no space, no lanes, etc. for slow modes of mobility). Low traffic safety due to car traffic. High market launch costs (fleet setup, stations, marketing, customer acquisition costs, etc.) Regulatory risks.
<b>Multi-modal (offering several types of transport) journey planner (MaaS platform)</b>	First attempts are being made by various stakeholders (e.g. Gura, Move, Yego, AC Group) Functioning and established e-payment systems The city and RURA are strong stakeholders that might be able to create and maintain the facilities needed	Status quo: Only monomodal (one type of transport), no multi-modal (several types of transport) customer apps. No app for public transport timetable information. No technical integration of the back-end systems of existing services. Insufficient legal/regulatory/contractual framework.	Digital integration of services can be established through available software systems Will be a necessary tool for system integration.	Business case of the MaaS platform unclear. The logic of the routing may not fit the business cases of the service providers. Service providers may not be interested in being integrated into a MaaS app. Competition between different MaaS apps can lead to fragmentation of



MaaS Service	Strength	Weakness	Possibilities	Threats
	for a MaaS platform.			services and inefficiencies in the transport system if an integrated MaaS app is not created. Inconvenient or inadequate services (MaaS and public transport).

This SWOT analysis shows that in the short term, new jobs are more likely to be created outside the MaaS segment. Since as-a-service mobility offers already exist in the strongly developed taxi and moto markets, the digitalisation of the industry is more likely to lead to job relocations. Other segments such as car sharing will not remain relevant in the foreseeable future.

E-bike or scooter sharing could offer some potential. However, such offers are still (almost) completely lacking today. In contrast, vehicle electrification and new vehicle concepts in the field of e-mobility seem to have the greatest potential. The development and expansion of the bus system was not considered in the SWOT analysis, as public transport is not the focus of the project. There is of course considerable job potential in the bus system, but it requires significant investment.





## 5. Potential for job creation in the sector

Job creation in the transport sector depends directly on the size of the market for transport services, so the number of passengers seeking transport must be estimated. The number of trips per citizen per day in Kigali is a suitable statistic to get an idea of the actual market size. However, all estimates of market development in this study are based on assumptions about the number of journeys by the different modes of transport. For simplicity, trip distances are not included in the calculation.

Unfortunately, data on transport demand is very limited. A transport model has recently been produced by a consultancy, but no systematic household surveys with journey books have been carried out. So there is no information on the current use of transport types, modes of transport (i.e. availability of bicycles, motorbikes, cars) or trip purposes in combination with demographic data that could be used for calculations and forecasts.

Yet another challenge is the dynamic development of the market. Economic development will lead to a growing middle class with completely different mobility patterns and needs. This development will be accompanied by additionally available mobility resources. Growing mobility needs (including longer travel distances) and more bicycles, motorbikes or cars per household will consequently have an impact on the mobility market and a strong influence on the demand for Mobility-as-a-Service solutions.

Overall, however, it can be said that the mobility market in Kigali will grow strongly and that there are various opportunities for new forms of mobility.

### 5.1. Transport demand assumptions

As mentioned above, data on transport demand is very limited. The assumptions used to calculate a potential market size for MaaS in Kigali are based on interviews with experts in the city in November 2022. The experts were asked (differentiated by demographic characteristics) which share of trips would possibly be made by which mode of transport. One assumption was that MaaS services are more likely to be demanded by middle-class adults. This allows the market size to be estimated with a simple formula:

$$(MaaS \text{ trips per day}) \times (\text{number of middleclass citizens}) = \text{marketsize [trips per day]}.$$

The number of trips per head is usually more or less constant. 3.5 to 4 trips per day is an empirical value observed worldwide and in different time periods. In Kigali, the current walking and cycling routes therefore represent the addressable market potential for MaaS.

Expert estimates<sup>11</sup> of the number of daily trips made with MaaS vary between 0.6 and 1.5 trips per day for middle-class citizens. The variance imposed by gender and income class is very small. Basically, the experts assume that low- to middle-income citizens use MaaS for purposes such as shopping, leisure or personal appointments, while customers who earn more tend to use MaaS for commuting to work.

The biggest lever for market size assumptions is of course the number of potential customers who can afford to use MaaS for their mobility needs. All the experts pointed out that today only a few middle-class inhabitants could afford these services on a regular basis.

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<sup>11</sup> These estimates were discussed in the expert interviews in November 2023. Middle class is defined in this context as a monthly income between 500.00 and 600.00 USD per person.



The market potential shown in Table 3 below is based on very simple assumptions. Many uncertain factors have to be taken into account. Nevertheless, the total potential demand for MaaS services in the current socio-economic situation (only about 10% middle class) can be estimated at 40,000 (conservative) to 100,000 (very optimistic) booked trips per day. The additional demand from other customer segments (e.g., children, elderly, domestic and foreign visitors) must be added to this calculation. The total market for MaaS services would consequently be much larger, so the above calculation is very conservative.

Since the existing transport business, consisting of motorcycles and taxis, is obviously in demand by customers, these figures seem realistic. In total, between 15 and 30 million MaaS trips per year can be assumed. Depending on the average revenue per trip (US\$ 0.5 to US\$ 4), the turnover of the MaaS industry in Kigali can therefore be estimated at up to US\$ 100 million.

This forecast gives an idea of how much market growth is possible. The drivers of market growth are population growth and the rise of the middle-income classes. Again: Demand for MaaS will also depend heavily on the quality and availability of competing modes of transport. If public transport is expanded and/or cars become affordable, 1.3 MaaS trips per person per day may be too optimistic.

Table 3: Market potential for MaaS in Kigali in thousands of trips per day

	Adult population in Kigali <sup>12</sup>	10% middleclass of the total population		30% middleclass of the total population	
		Total trips (at 0.6 MaaS trips/day)	Total trips (with 1.3 MaaS <sup>13</sup> trips/day)	Total trips (with 0.6 MaaS trips/day)	Total trips (with 1.3 MaaS trips/day)
<b>2022</b>	700	42	91	126	342
<b>2025</b>	772	46	100	139	377
<b>2030</b>	908	54	118	162	440
<b>2035</b>	1068	64	139	188	510

The relationship between MaaS and public transport also needs to be balanced. Both will gain passengers through the potential of today’s walking and cycling routes. As described in Chapter 3, a well-designed, high-quality public transport system will be the necessary backbone for the success of MaaS. Only if most journeys can be made by reliable and affordable public transport will people potentially give up their own means of mobility, such as cars or motorcycles, and use MaaS for some occasional journeys.

On the other hand, MaaS could cannibalise public transport and vice versa. It is not possible to forecast these intermodal interdependencies using the very simple methodological approach of this study. A complete transport demand model is needed to model these complex interdependencies.

<sup>12</sup> The estimated demographic development is based on data from the National Institute of Statistics of Rwanda (NISR).

<sup>13</sup> Although the experts assume up to 1.5 potential MaaS trips, a more conservative figure is used in this calculation.



## 5.2. Job creation potential

The concept of MaaS has its roots in digital technology (see Chapter 4). In general, new forms of mobility services have not created new demand but have cannibalised existing modes of transport by using digital technologies to increase efficiency and automate processes. In major US cities, for example, services such as Uber and Lyft have led to a decline in the use of public transport and the disappearance of the traditional taxi industry. So while MaaS business models may indeed create new jobs, other parts of the transport industry will be disrupted and some jobs will disappear. This effect may occur in the taxi or car services sector and must be considered when discussing the job creation potential of the different MaaS business models below.

### **Moderate job creation potential through ride-hailing services (taxi and moto)**

As described in Chapter 1.2, the ride-hailing sector is already well developed. There are many taxis and motorbikes in Kigali. First steps towards digitalisation have already been taken (Yego app, Move app). In the short term, digitalisation could improve the quality of service and efficiency of these services through better fleet allocation. It could even have the opposite effect and reduce the demand for drivers – so new jobs in the ride-hailing industry on a significant scale are not generally expected in the short term. The demand for drivers may increase slightly over the next decade. However, regulators should limit this growth because of the limited road capacity, high energy demand and negative environmental impacts.

### **Hardly relevant: car rental sharing**

Car sharing and car rental customers drive themselves, which limits the employment potential of this industry to service personnel and overhead costs. However, as already mentioned in Chapter 1.2.6, the low cost of labour in Rwanda makes it economically non-feasible to rent out cars without drivers and this is compounded by the low ownership of driving licences. The result is that business models in this sector will only be profitable in niches.

### **Some potential in e-bike and scooter sharing**

Bike-sharing is almost non-existent in Kigali today. Gura only offers a few stations and bikes that are not suitable for pedalling up the many hills in Kigali. Electrification could change that and add value for customers. However, operating a larger fleet of e-bikes or scooters requires more complex technology and more services (charging, maintenance...), which in turn requires skilled labour such as mechanics (with spare parts for repair), drivers to pick up and replace bikes/scooters, electricians to maintain the vehicles, a charging infrastructure with batteries and marketing & planning specialists.

Setting up this type of MaaS service is risky, because a fleet of several thousand bicycles is needed to provide a sufficient level of service – and that is a high investment for a service that has not yet proved its viability in Kigali. Only a publicly funded or venture capital-funded player could initiate this kind of service.

### **Job creation through electrification of the fleet**

Work is underway on fleet electrification, but this is limited to cars. Start-up companies have developed business models and products that have successfully passed the market test. According to experts, there is a high demand and consequently a long waiting list for new machines/conversions, since their products/services (e.g., building or converting motorcycles and battery rental) are beneficial to motorcyclists. These businesses would be able to expand, but they would find it difficult to recruit qualified staff.



So potential jobs in fleet electrification can be easily created today. However, the need for electric vehicle experts, mechanics and electronics/IT specialists is acute – and as the electrification trend spreads to cars and buses, the demand for skilled workers is likely to increase even more.

#### **Job creation through new vehicle concepts**

If we take a broader, more creative view of the future, another possibility for job creation is conceivable. Cars are oversized for most journeys in Kigali, but bicycles and motorbikes are not ideal comfort-wise. In between these, there could be a segment for small electric vehicles that carry passengers and luggage. They could be driven at limited speeds without a licence and offered with or without a driver, i.e. as taxis or car sharing.

There have been attempts to develop such vehicles around the world, but they have not had any market success so far. Rwanda does not have a significant vehicle industry yet, in fact, the first electric motorcycles were successfully built in Kigali only very recently. In the future, small electric vehicles could be produced locally. Their low degree of complexity could be an opportunity with significant employment potential. However, this segment would involve high risks for investors and may even have a longer-term impact on the labour market.

#### **Hardly any job creation in the provision of information platforms with multi-types of travel**

A single interface application for smartphones is essential to create an integrated transport system that allows passengers to combine different modes of transport according to their needs. MaaS applications like this are currently being developed by various software companies around the world. However, it does not make sense to develop a specific solution for Kigali – it would be easier to adapt the capital's existing systems.

So even if a multi-trip journey planner in Kigali existed in Kigali in the future, it is unlikely to be hosted and maintained in Kigali. In summary, there is no potential for job creation in the information technology (IT) development of MaaS software.



## 6. Recommendation for policy makers and Invest for Jobs

Invest for Jobs supports local and international companies in creating more and better jobs in partner countries, one of which is Rwanda. Their development projects usually last 1-2 years. However, the transport system in Kigali will not change within that timeframe, since the demand for transport services depends on economic development. Jobs in the MaaS and public transport sectors, in the development and improvement of public and private infrastructure and, to a lesser extent, in the vehicle industry will mainly be created in the long term, especially when an integrated transport system has been established in Kigali.

Occupational profiles will range from unskilled workers to trained professionals and academics (e.g., engineers). There will be a high demand for construction, vehicle maintenance and repair, especially with a strong focus on electrical and IT technology. Service occupations will also be needed, including drivers for buses, cars and possibly future vehicles such as light vehicles or trams – and of course, there will also be job potential in overhead functions such as marketing, transport planning and human resource management.

The changes in the transport system must be carefully managed, otherwise the foreseeable increase in demand will lead to traffic problems and an unsustainable transport system. That is why this Chapter starts with recommendations for the Kigali municipality, followed by concrete ideas on how GIZ, more generally, can support this transition with labour market-relevant measures, including projects to develop MaaS services.

### 6.1. Recommendations for local policy makers

Rwanda and Kigali have well-established institutions and experience in transport market regulation. Ideas abound on how to develop the transport system towards sustainability and how to ensure that Kigali remains a habitable city. Today, however, it is important to develop a vision and a plan on how to achieve these goals.

There is no time to lose, given the rapid economic growth and rising household incomes in Kigali. There is likely to be some pressure from potential investors and technology providers, but these could be short-term solutions. The development of the transport sector is an ongoing process that needs to be managed by the city administration and guided and supported by city policies. At a national level, a legal framework must be established, one that allows the city to use regulatory instruments (e.g., a passenger transport law that covers aspects of MaaS or shared mobility). There will be many new business opportunities for the private sector in the transport industry, but the risks must be calculable. Clear plans and statements from the city will enable and encourage investment. Since the scope of this study is somewhat different, the following recommendations can only be headings, but they can be seen as launching points for further study or initial action.

There is a need for better data on transport demand to be collected and made available to the public and to investors. Household surveys are the main source of data on transport demand, so survey modelling is essential. This data would make it possible to link socio-economic aspects with travel behaviour and transport demand.

A complete transport demand model for Kigali and the capital region should be created. Only a model like this will make it possible to forecast transport demand, to draw conclusions on the interdependencies between the different types of transport, to assess the impact of infrastructure and settlement development, plus many other helpful functions. A matrix of the origin and destination of trips helps to focus on relevant measures. The profitability of new infrastructure or business models can also be better calculated with such a tool.



A Sustainable Urban Mobility Plan (SUMP) helps to follow a systematic planning process. Policy makers should be consulted at different stages and can decide on objectives, guard rails and ultimately on the measures themselves. It will help all the stakeholders if they all commit to common goals.

More policy measures should be considered to prevent an increase in private car ownership. Examples here would be import or luxury taxes or an import ban on (too old) vehicles with combustion engines.

However, the previous recommendation only works if a good alternative system is in place. So it is important to improve public transport and MaaS quantitatively and qualitatively.

Improving the walking and cycling network in Kigali is essential. Here too, planning processes, surveys and analyses are needed to provide citizens with these alternative types of transport.

In this context, road safety measures also need to be considered. A general speed limit and measures to improve motorbike safety are essential.

Gender-specific aspects of transport planning must be considered at all stages of the design and planning process. A women-friendly transport system improves accessibility for women and enables a more self-determined life, which will have a positive impact on the economic and social development of society.

Explore funding opportunities and technical support for the necessary investments in public transport and the pedestrian and cycling infrastructures. International financial institutions could be approached.

Regulatory instruments for the MaaS market must be found soon. These instruments can take many possible forms. There is no need to provide the services as a municipality or state, nor should they be left entirely to market-initiated services. Concessions, tendering or forms of quality contracting can be used. Again, it is important to develop these regulatory measures from overarching transport policy objectives.

## 6.2. Recommendations for Invest for Jobs in Rwanda

There are initial MaaS services in Kigali and it is likely that the sector will grow along with the general economic development. However, the transport sector is a complex industry with long cycles from innovation to product launch and project implementation. There are more dynamic sectors with lower risks and with a higher chance of creating relevant jobs within the narrow timeframe of Invest for Jobs. Nevertheless, GIZ should not ignore the transport sector because of its importance for sustainable development. In Kigali, there is a great opportunity to prevent the disadvantages of car transport before the capital's society becomes car-dependent.

Rwanda is well placed to become a blueprint for breaking the link between economic development and the growth of (road) transport. The solidly developed institutions and their prudent officials with vision, an active and creative private sector, and emerging technologies (e.g., electrification) should be seen as an opportunity for GIZ to support local and state government in managing the process (see the recommendations presented in Chapter 6.1).

For short-term job creation, the focus should be shifted from MaaS to electrification. In this market segment, more conditions are fulfilled that are required under Invest for Jobs. There are active private sector companies with resilient business models and a real need for skilled personnel. Three possible concepts to support job development in the electrification of the transport sector are described below.



## 7. Concept Ideas

### 7.1. E-vehicle expert training programme: concept idea I

#### General idea

The number of electric vehicles in Rwanda is set to grow. To accelerate the transition to electric mobility and create jobs in this sector, Invest for Jobs could support local stakeholders to train new employees through on-the-job training programmes. The following scheme could also be adopted for training at polytechnics or within the Rwanda technical and vocational education and training (TVET) framework.

#### Target group

Employees of the companies listed below who enter the profession without any vocational training (but with at least a high school diploma) should become skilled workers in the e-vehicle industry.

#### Local stakeholders

Companies like Ampersand and Rwanda Electric Motors now need skilled mechanics to either convert existing bikes to electric models or even build new ones. The bike-sharing operator Gura Ride will convert its fleet to electric bikes and scooters, so maintenance experts will also be in demand here. The three bus companies with public transport concessions will soon face challenges related to electrification. Delivery services and general courier express parcel (CEP) services will also need similarly qualified staff as they gradually convert their fleets to electric propulsion.

#### Curriculum design

The training programme should combine on-the-job training with tutorials and self-study modules and it should last for one year. The tutorials can be conducted on site in Kigali or online. Depending on the specific training concept, e-learning elements such as blended learning and videos can also be used. The lessons and the self-learning modules should cover about two days per week. The employees are available to the companies three days per week and the workload will be calculated accordingly.

The aim is not to train participants for a specific job in the companies participating in the programme. The graduates should be able to familiarise themselves with various professions in the electromobility industry, including those that are not yet relevant or are not yet known today.

Table 4: Curriculum for the training of electric vehicle experts

Module	Content	Workload
<b>Basics of Electricity</b>	Knowledge of the physical background of electricity, and practical application of these principles.	80 hours classroom / 80 hours independent study.
<b>Vehicle Mechanics</b>	Basic overview of how road vehicles are constructed, what the typical components are and how they interact. History of	40 hours classroom / 40 hours independent study.



Module	Content	Workload
	the vehicle and outlook on vehicle concepts. Aspects of the life cycle of vehicles.	
<b>IT Basics</b>	Basics of electronics, programming, interfaces and architectures. This module will focus strongly on aspects relevant to working on and with electric vehicles.	40 hours classroom / 40 hours independent study.
<b>Electric Drive Trains</b>	Learning how mechanics, electrical components and electronics interact in different electric powertrain concepts. Discussing use cases for powertrain concepts.	60 hours classroom / 60 hours independent study.
<b>Batteries and Charging Systems</b>	Battery concepts for vehicles, different battery types, charging systems and electronic control units. Battery life cycle.	60 hours classroom / 60 hours independent study.
<b>Car and Vehicle IT</b>	Overview of various IT systems installed in cars and other road vehicles.	60 hours classroom / 60 hours independent study.
<b>Occupational Safety and Environmental Protection</b>	Knowledge of how to behave in workshops to avoid accidents or health risks and to deal with hazardous substances.	20 hours classroom / 20 hours independent study.
<b>Project</b>	A project (e.g., development of a process, an innovative component or a product) is to be developed in a small group and presented to a college of lecturers and representatives of the participating companies.	10 hours of teaching / 80 hours of group work.
<b>Communication, Presentation, and Project Management</b>	Basic presentation and communication skills (e.g., writing a professional email) and basic software skills (Office).	10 hours classroom / 10 hours independent study.
<b>Learning to Learn</b>	Soft skills in the areas of self-organisation, information gathering and perception.	10 hours classroom / 10 hours independent study.

This curriculum is a draft that must be further discussed with both employers and lecturers who have a deeper knowledge of the relevant trends and technologies in the field of electric vehicles.

### Lecturers

Teachers with the skills described in the curriculum can be difficult to find due to the high demand. GIZ, through its network, can assist in identifying, approaching and recruiting instructors to teach the programme. It is also





worth considering contacting the Association of German Engineers (Verein Deutscher Ingenieure e.V., VDI), which has developed a similar programme, albeit for a different target group.

### **Costs**

Overall, costs of about 100,000 to 150,000 euros per class can be expected. The costs of this one-year, in-service training with 30 to 50 participants greatly depend on the costs for the teaching staff, for whom one lesson probably requires two hours of lesson preparation, plus general organisational work (e.g., communication with pupils, checking homework, etc.). All in all, about 600 hours (i.e., 75 expert days) are realistic. There is also the effort for project management, the preparation of a detailed curriculum, the supervision of the students and other overhead tasks, which must be calculated as full-time equivalents. Further costs are incurred for renting seminar rooms, an e-learning system and teaching materials (e.g., books, paper, copies, etc.).

## **7.2. Training concept for the power supply and charging infrastructure: concept idea II**

### **General idea**

Electricity is needed to power the growing number of electric vehicles in Rwanda. To promote the transition to electric mobility and create jobs, it would be helpful to provide support to local stakeholders for qualifying employees through training-on-the-job programmes.

### **Target group**

Employees of the companies listed below who start work without vocational training (but with at least a school-leaving certificate) and who are to become skilled workers in the e-vehicle industry.

### **Local stakeholders**

Companies like Ampersand and Rwanda Electric Motors not only sell or modify motorbikes, they also offer a battery swap system. The bike-sharing operator Gura Ride will be converting its fleet to electric bikes and scooters and has to provide battery charging infrastructure. The three bus operators with public transport concessions in Kigali face electrification challenges and they also need charging infrastructure for their buses either in the depots or along the routes.

Electricity grid operators will also be confronted with new, decentralised electricity consumers and a general increase in demand. This will require changes in the design of the grids.

### **Curriculum design**

Lasting for one year, the training programme should combine on-the-job training with tutorials and independent learning sessions. The tutorials can take place in Kigali or online. Depending on the teaching concept, e-learning elements such as blended learning or videos can also be used. Lessons and independent units should comprise about two days per week. Employees will be available to the companies three days a week and the workload will be calculated accordingly.

The aim is not to train participants for a specific job in the companies participating in the programme. The graduates should be able to familiarise themselves with various professions in the electromobility industry, including professions that are not yet relevant or as yet unknown today.



Table 5: Curriculum for the training of charging infrastructure expert

Module	Content	Workload
<b>Basics of Electricity</b>	Knowledge of the physical principles of electricity, practical application of these principles.	80 hours classroom / 80 hours independent study.
<b>Power Grids</b>	Design and structures of electricity grids. Challenges in maintaining grid stability. Intelligent power grid concepts.	40 hours classroom / 40 hours independent study.
<b>IT Basics</b>	Basic principles of electronics, programming, interfaces and architectures. This module will focus strongly on aspects relevant to working on and with electrical networks.	40 hours classroom / 40 hours independent study.
<b>Renewable Energies</b>	Concepts for electricity generation with different types of power plants. Concepts for small-scale and decentralised power generation with mini solar or wind power plants.	60 hours classroom / 60 hours independent study.
<b>Batteries and Charging Systems</b>	Battery concepts for vehicles, different battery types, charging systems and electronic control units. Energy storage concepts.	60 hours classroom / 60 hours independent study.
<b>Energy Network IT</b>	Overview of the different IT systems used for energy networks.	60 hours classroom / 60 hours independent study.
<b>Occupational Safety and Environmental Protection</b>	Knowledge of how to behave in workshops to avoid accidents or health risks and to deal with hazardous substances.	20 hours classroom / 20 hours independent study.
<b>Project</b>	A project (e.g. development of a process, an innovative component or a product) is to be developed in a small group and presented to a college of lecturers and representatives of the participating companies.	10 hours of teaching / 80 hours of group work
<b>Communication, Presentation, and Project Management</b>	Basic presentation and communication skills (e.g. writing a professional email) and basic software skills (Office).	10 hours of teaching / 80 hours of group work
<b>Learning to Learn</b>	Soft skills in the areas of self-organisation, information gathering and perception.	10 hours classroom / 10 hours independent study.



This curriculum is only a draft. Further discussion with both employers and lecturers who have a deeper knowledge of the relevant trends and technologies in the field of electric vehicles is needed.

### **Tutor**

There is a high demand worldwide for people with the skills described in the curriculum, so it will not be easy to find lecturers. GIZ can provide support through its network, search for, approach and acquire lecturers for the programme. It is also worth considering contacting the Association of German Engineers (VDI), which has developed a similar programme, although it is aimed at a different target group.

### **Costs**

Again, the cost of this in-service training for a one-year class with a group of 30 to 50 participants is highly dependent on the cost of the teaching staff. Two hours per lesson must be assumed for lesson preparation and general organisation (communication with pupils, checking homework, etc.). In total, about 600 hours (75 expert days) are realistic. In addition, there is the effort for project management, the detailed conception of the curriculum, the supervision of the students and further overhead tasks, which have to be calculated with one full-time equivalent. Further costs are incurred for renting seminar rooms, an e-learning system and teaching materials (books, paper, copies, etc.). In total, costs of 100,000 to 150,000 euros per course must be estimated.

There may be some synergies with the electric vehicle expert during the job training programme.

## **7.3. Accelerator for start-ups in the field of light electric vehicles: concept idea III**

### **General idea**

As mentioned above, vehicle concepts that offer more comfort than motorcycles but are lighter, slower, simpler, take up less space, are more environmentally friendly and are cheaper than cars could find a niche in the ride-hailing market. Some concepts for such vehicles have recently been presented by start-ups and the automotive industry. Examples include Citroen's Ami (Stellantis), Scheffler's discontinued bio-hybrid, various e-rickshaw and e-tuk-tuk manufacturers in South Asia and the Evetta and Xbus from German start-up Electric Brands.<sup>14</sup> (see **Error! Reference source not found.**). None of these vehicle concepts has yet been able to demonstrate market success, and the market for such vehicles is extremely dynamic. Since companies like Ampersand have proven that it is possible to design and assemble electric motorbikes in Rwanda, it is worth investigating whether more complex vehicles could also be built in Rwanda.

It is unlikely that these companies have usage scenarios like the ride-hailing market in Kigali. However, that could change with some support. The idea proposed here is an accelerator programme where start-ups from Rwanda, Africa and other countries are given the opportunity to develop business models and concepts for Kigali.

The programme should take place in the city centre of Kigali and provide office space and workshops. Participating teams or young companies will receive a grant to cover their costs for six months as a start-up investment. They can also use offices and other facilities free of charge and get access to stakeholders in Rwanda, business angels as advisers and potential investors.

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<sup>14</sup> Further information: [The x-bus concept from Electric Brands](#), [Biohybrid by Scheffler](#), [Ami from Stellantis](#).



More mature start-ups (level 2 or 3) or start-ups owned by established companies should also be able to participate in the programme if they develop a service or product specifically for the needs of the ride-hailing market in African cities. After a period of six months, the companies can submit their concept and apply to receive further funding to set up a production facility and go live with a first viable product.

After this first accelerator phase, the participating teams/start-ups will present their ideas and try to convince investors to provide further funding to expand the business.

### Target groups

The offer is initially aimed at young founders from all parts of the world, but preferably from Africa. Should a company emerge from one of the business ideas, there is the chance of a large number of jobs in production, development, marketing and service at different qualification levels. However, concrete numbers cannot yet be quantified.

### Interested parties

It will be necessary to involve local and state authorities to support these founders with contacts, expertise and administrative issues. Venture capitalists should also be involved at an early stage. GIZ already has some experience in supporting start-ups in Kigali. These resources should be used for the accelerator programme.

### Costs and funding

The cost of such a programme depends on its scale. We propose a design-to-budget approach and limit overhead costs as much as possible to enable the investment of most of the budget in the companies. To have a relevant impact and be attractive to founders, the programme needs to be funded with a few hundred thousand to over a million euros. Partnerships with other institutions will help to fund such a budget.



*Illustration 12: Some examples of light electric vehicles: Rickshaws in Nepal, Ami-Car by Stellantis and the outgoing Bio-Hybrid by Scheffler. (Source: Creative Commons – Wikimedia).*



## 8. Conclusion and outlook

The aim of this study was to identify job-intensive investment opportunities for Invest for Jobs in the Rwandan MaaS industry. Three proposals were identified to support the MaaS industry in Kigali. During the research process, the focus shifted from mobility services to vehicle technologies, due to the promising developments in vehicle electrification in the Rwandan motorbike industry on the one hand and the time and financial constraints of the Invest for Jobs on the other.

One important finding of this study is that the Rwandan transport sector is facing an interesting growth and transformation process. In the future, MaaS can play a key role and create a significant number of new jobs in an integrated transport system. More importantly, Rwanda now has the chance to design a sustainable transport system and avoid transport-related problems which plague other regions of the world.

However, it is important to a) develop a plan and b) find both financial and technical support for the necessary investments in infrastructure and vehicles. The list of recommendations in Chapter 5.1 is meant for local policy makers. The list also contains pointers for international cooperation agencies or international financial institutions that can support Rwanda in its transition to an efficient urban transport system.

During the research and contact with local experts, it became clear that there is sufficient know-how, ambitious visions and some outstanding ideas for action in Rwanda. Nevertheless, support is needed in financing, technology, stakeholder management and impact assessment.



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## 10. Appendix

### 10.1. List of interview partners

Interview partner	Organisation	Date	Location
Mbaye Ba	Sixt Senegal	02/11/2022	Online
Denis Paz	Truffi	19/10/2022	Online
Emile Kinuma	Watu Africa	21/11/2022	Kigali City Centre
Jerry Ndayishimiye	Guru Ride	22/11/2022	Kigali City Centre
Brady Grimes	Ampersand Solar	22/11/2022	Kigali City Centre
Jones Kizihira	AC Group	23/11/2022	Kigali Nyarutarama
Knut Westerberg	GIZ Rwanda (Expert for Tourism)	23/11/2022	Kigali City Centre
Francois Zirikana	City of Kigali	24/11/2022	Kigali City Hall
Serge Kamuhinda	Volkswagen Rwanda	24/11/2022	Kigali Special Economic Zone

### 10.2. Invest for Jobs: the Special Initiative “Decent Work for a Just Transition”

Under the Invest for Jobs brand, the German Federal Ministry for Economic Cooperation and Development (BMZ) has put together a package of measures to support German, European and African companies engaging in Africa. The Special Initiative "Decent Work for a Just Transition" – the official title – offers comprehensive advice, contacts and financial support through its implementing organisations to overcome investment barriers. The development objective is to work together with companies to create up to 100,000 good jobs and to improve working conditions in its eight African partner countries: Côte d'Ivoire, Egypt, Ethiopia, Ghana, Morocco, Rwanda, Senegal and Tunisia. The Special Initiative is making a targeted contribution to shaping the socio-ecological transformation of the private sector in line with a just transition, and to creating more and better jobs for women.

#### Teaming up with companies to remove barriers to investment

We work with companies to overcome possible barriers to investment in our partner countries. If there are specific barriers to investment or trade – for example a local shortage of skilled labour, insufficient capacity within the local supply industry or poor infrastructure – we examine how they can be dismantled to pave the



way for investment. In addition, we promote cooperation between German, European and African businesses. The overarching goal of all these efforts is always to create sustainable employment.

**Promoting small and medium-sized enterprises (SMEs)**

SMEs are a driver of job creation on the African continent. To enhance the competitiveness of SMEs in Africa, we support them in reducing obstacles to investment and in tapping into new markets. At the same time, we promote collaboration between European (particularly German) and African SMEs, for example to strengthen cooperation and supply structures, to make value chains more international and to connect companies in Germany and Africa.

**Investing in up-and-coming clusters and industries**

We specifically promote attractive business locations and growth industries that promise long-term success in the partner countries, including industrial estates and business parks. These include the automotive and aviation sector in Tunisia, the textiles industry and the agricultural sector in Ethiopia, and the information and communications technology (ICT) sector in Senegal, although our support is not limited to these industries.