VREF | VOLVO RESEARCH AND EDUCATIONAL FOUNDATIONS

INFORMAL AND SHARED MOBILITY IN LOW- AND MIDDLE-INCOME COUNTRIES

A Road Map for Program Implementation 2023 – 2029

June 2022

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CoE	Centers of Excellence
CoL	Community of Learning
FUT	Future of Urban Transport
IRP	International Research Program
HIC	High Income Country
ISM	Informal and Shared Mobiility
LIC	Low Income Country
LMIC	Low and Middle Income Countries
MaaS	Mobility-as-a-Service
MAC	Mobility and Access in African Cities
NUA	New Urban Agenda
NxtGen	Next Generation Scholar Program
SDG	Sustainable Development Goal
VREF	Volvo Research and Educational Foundations

1 Introduction

In 2001 the Volvo Research and Educational Foundations (VREF) launched the program *Future Urban Transport – How to deal with the complexity of urban transport (FUT).* Since then the program has functioned as an overarching framework for VREF initiatives such as Centers of Excellence (CoE), research programs and projects, events, publications, networking activities and other initiatives.

The vision of VREF is *Equitable access and sustainable transport in urban areas,* with the general mission to:

- Support the development of new knowledge relating to ideas and solutions that can contribute to equitable access and sustainable urban transport;
- Support the development of educational and outreach programs in the area of equitable access and sustainable urban transport;
- Contribute to the dissemination and implementation of research findings among university researchers, practitioners, decision-makers and other relevant stakeholders;
- Support demonstrative examples and change processes.

Through the FUT Program, VREF has initiated 10+ CoEs and larger programs, including the current program *Mobility and Access in African Cities* (MAC). VREF has also hosted and co-organized numerous events, including CoE Workshops, international research conferences and the Mobilize Summit.

The FUT Program has undergone several evaluations and strategic reviews over its twenty years of operation. The program has gradually become more thematically focused, where the goal of achieving on the one hand, research of high international standing and on the other hand, societal impact has been further emphasized over time.

During 2019, VREF initiated preparations for new research programs under the FUT Program. The first phase included a broad consultation process with seminars, workshops and interviews with key individuals in VREF's network of researchers, international organizations, and other actors within the FUT area. This process resulted in a selection of three themes for further investigation:

- Non-Motorized Transport (NMT): Scaling walking and cycling design/planning/financing
- Future of paratransit and informal transport services (paratransit)
- Leadership, politics, power and corruption in the transformation of urban mobility

In 2020 VREF started preparations for the paratransit theme. First VREF commissioned the Institute for Transport and Development Policy (ITDP) to prepare a background report whose purpose was to inform VREF on the current state of research and knowledge on paratransit and shared mobility. The report, along with ongoing consultations and internal discussions, provided the basis for the VREF Board to make a formal decision in December 2020 to initiate a VREF program for supporting research and education in the area of *Informal public transport* (IPT[1]). The program started with an initial phase in 2021-2022 that consisted of both external and internal activities to strengthen the motivation and direction for the program, formulate concrete goals, and develop the program's "architecture".

During the preparatory work and the initial phase, VREF has commissioned five preparatory studies that have been carried out by leading scholars and experts in the field, as well as hosted several workshops with both researchers and non-academic experts. In parallel, VREF has had frequent internal discussions which in a cumulative way have led to this Road Map.

The following preparatory studies[2] were carried out:

[1] The program title was later changed to Informal and shared mobility in low- and middle-income countries, see also chapter 2.

[2] Publishing status of the reports by June 2022 : The studies by the University of Cape Town, ITDP, Berkeley and WRI China have been published and are available on VREF's website. The Data study report is an internal document only.

- **VREF Background report on paratransit and shared mobility:**
  The future of paratransit & shared mobility – mapping report (2021) by Sarah Cassius, Nour El Deeb, Mariam Sorour and Stanford Turner, ITDP, Washington/Singapore. ITDP, Washington/Singapore.
- **Bibliometric study**
  Informal and shared mobility: a bibliometric analysis and researcher network mapping (2022) by Roger Roger Behrens, Alexandra Newlands, Tamzyn Suliaman, Awot Gebregziabher and Dianne Steele, University of Cape Town, South Africa.
- **Think piece (reflective study)**
  Future of Informal Public Transit and Shared Mobility: Across Cultures and Latitudes (Think Piece) (2022) by Susan Shaheen and Adam Cohen, University of California, Berkeley, US.
- **Special study on China**
  Future of Informal Public Transit and Shared Mobility (2022) by Su Song, Andi Liu and Jiahui Ma, World Resources Institute China, Beijing.
- **Data study**
  Memo to VREF on data collection efforts in informal transportation and shared mobility (2022) by Agile City Partners.

In addition to these publications, several external online workshops and other events were carried out:

- Digital launch of the program (June 2021)
- Webinar on the bibliometric study (November 2021)
- Two expert workshops as part of the think piece (February/March 2022)

While there is a growing share of informal and shared mobility around the globe, services such as ride-hailing in High Income Countries (HICs)[3] have not necessarily led to progress towards more sustainability in cities. As will be described more in depth in chapter 2 and 4, the preparatory studies showed the increasing relevance of informal and shared mobility as a key part of the transport system while at the same time there were clear indications of insufficient knowledge about measures that might be taken to guide this sector toward becoming more sustainable and equitable. The studies also showed substantial gaps in research themes such as impact, governance, and integration of informal and shared mobility, particularly in Lower and Middle Income Countries (LMICs). While there is an increase in research activities as indicated by published scientific papers, there seems to be no established international research network or any dedicated global event for focused exchange of knowledge and ideas in these areas.

This Road Map sets out the broader frame and approach of the *Informal and shared mobility in low- and middle-income countries* Program (ISM program). The document consists of eight chapters. After the introduction, chapter 2 provides the rationale for setting up the new program, also summarising the main findings of the commissioned studies. The key objectives of the program are described in chapter 3. Chapter 4 focuses on future research themes, while chapter 5 lays out the different activities and phases of the program and its operational implementation. All references are listed in footnotes, so therefore there is no separate reference list.

The Road Map has been written by Holger Dalkmann and Henrik Nolmark with support from Jane Summerton, Mats Jarnhammer, Karin Henriksson and David Lindelöw. Mattias Höjer, as representative of the VREF Scientific Council, gave feedback on an early draft version, and the Scientific Council then provided comments on a draft version at its meeting in April 2022. The Road Map was formally adopted by the VREF Board in June 2022.

2 Background and context

This chapter provides the rationale for setting up the new ISM Program. As already highlighted in chapter 1, the thinking around the terminology used and the title of the Program evolved with the growing

[3] This roadmap uses the commonly applied concepts of Low, Middle and High Income Countries based on World Bank's classification. The World Bank classifies the world's economies into four income groups: high, upper-middle, lower-middle, and low. This classification is based on Gross National Income (GNI) per capita (current US$) calculated using the Atlas method. The classification is updated on July 1 each year. The latest classification can be found here: https://data.worldbank.org/indicator/NY.GNP.PCAP.CD

knowledge gathered and the interaction with leading experts in the field. In an excursus at the beginning of the chapter, key information used by the study authors will be shared and a rationale for calling the Program "Informal and Shared Mobility in Low- and Middle-Income Countries" will be presented.

Afterwards, the growing relevance of shared mobility and informal transport as part of urban transport systems in different parts of the world with a focus on LMICs will be briefly summarised.

It will be followed by describing the research landscape based on the bibliometric study by University of Cape Town (Behrens et. al. 2022) to share some initial considerations for the design of the ISM Program. Further insights to shape the program from a geographical perspective will be provided. This will finally lead to a brief summary outlining key elements of the future ISM program. More details related to the specific thematic foci will be shared in chapter 4 after the description of the key objectives and outcomes in chapter 3.

This chapter is based on the key findings of the commissioned studies, other key recent publications listed in the reference list, a wide range of expert calls and further online activities as described in chapter 1.

2.1 Definition, terminologies and service taxonomy

As already described in chapter 1, the name of the program evolved over the last 1.5 years of shaping the content and scope of the program. To better understand the rationale, this chapter reflects on some of the definitions shared and describes some of the challenges to identify the right terminology.

There is no globally agreed terminology with regard to informal transport, shared mobility or paratransit. These are the most commonly used terms for a wide range of mobility services in the context of flexible, less regulated, shared vehicles used, demand driven passenger services with no or minimal infrastructure and to a very large extent private ownership. The vehicles used for such mobility services vary from an electric scooter to midi-buses.

In the context of Lower and Middle Income Countries (LMICs), informal transport, often also called paratransit or semi-formal transit, characterized by unscheduled services, operating along quasi fixed routes (which regularly change) and low level of regulations. The type of vehicles used varies from 2/3-wheelers to buses though in most countries minibuses or other types of adjusted vehicles with 12 to 18 seaters are most common. The term informal is not entirely accurate as in most countries there is some form of national or local regulation, either through vehicle safety standards and/or permits for operating.

One of the challenges using the terminologies above to describe the services, is that there is a different understanding of the same term in different parts of the world. For example, while paratransit in Africa and Asia is often described as above, in North America it is used "for a service that supplements fixed-route mass transit by providing individualized rides to vulnerable populations (e.g., elderly or disabled people)" (Cassius et. al. 2021). Another example is the different service associated with car-sharing in UK vs the US (Behrens et. al. 2022). Furthermore, authors are even using different terms in different publications. Finally, a wide set of typologies were created as we have seen in the diversity of the commissioned studies. Behrens identifies paratransit as the overarching term divided into sup-types of flexible, informal, shared mobility and for-hire services.

Shaheen and Cohen (2022) in their paper used shared mobility as the overarching term, which in their perspective includes informal transport, fleet sharing, ride and delivery services and aerial services.

In the US in the 1970s informal service vehicles such as jeepneys were used and called paratransit (Behrens 2021). However, these services were closed by the government. Cassius et. al. (2021) define shared mobility as an umbrella term that encompasses various transportation modes, including car-sharing, bike-sharing, peer-to-peer ride-sharing, on-demand ride services, micro-transit, and other modes. It typically operates outside the purview of public transit and is often privately operated (Finger & Audouin, 2018[4]). Shared

[4] Finger & Audouin (2018): The Governance of Smart Transportation Systems: Towards New Organizational Structures for the Development of Shared, Automated, Electric and Integrated Mobility.

vehicles (cars and bikes) started to evolve on a low scale already in the 1980s in Europe. Only through digitalisation and involvement from investment and mobility companies, starting in the 2010s, shared mobility services became more popular and a key part of the urban transport system. Particular the introduction of ebikes and escooters and further diversification of services such as ride hailing and dockless bike were increased the relevance of shared mobility services.

While the main drivers for increased uptake between informal transport in LMICs and shared mobility differ substantially, innovation diffusion has occurred bi-directionally (Behrens et. al. 2022). De Penja (2022) described that while digital technology is integral to shared mobility, digital technology platforms are grafted on to existing informal transportation services already in operations. As an example, he refers to boda bodas in East Africa, which are an existing motorbike two wheeler taxi service which are now increasing in prevalence due to ride hailing apps like Safe Boda or Gokada.

Behrens created an ancestor tree to share the development of the different services (see

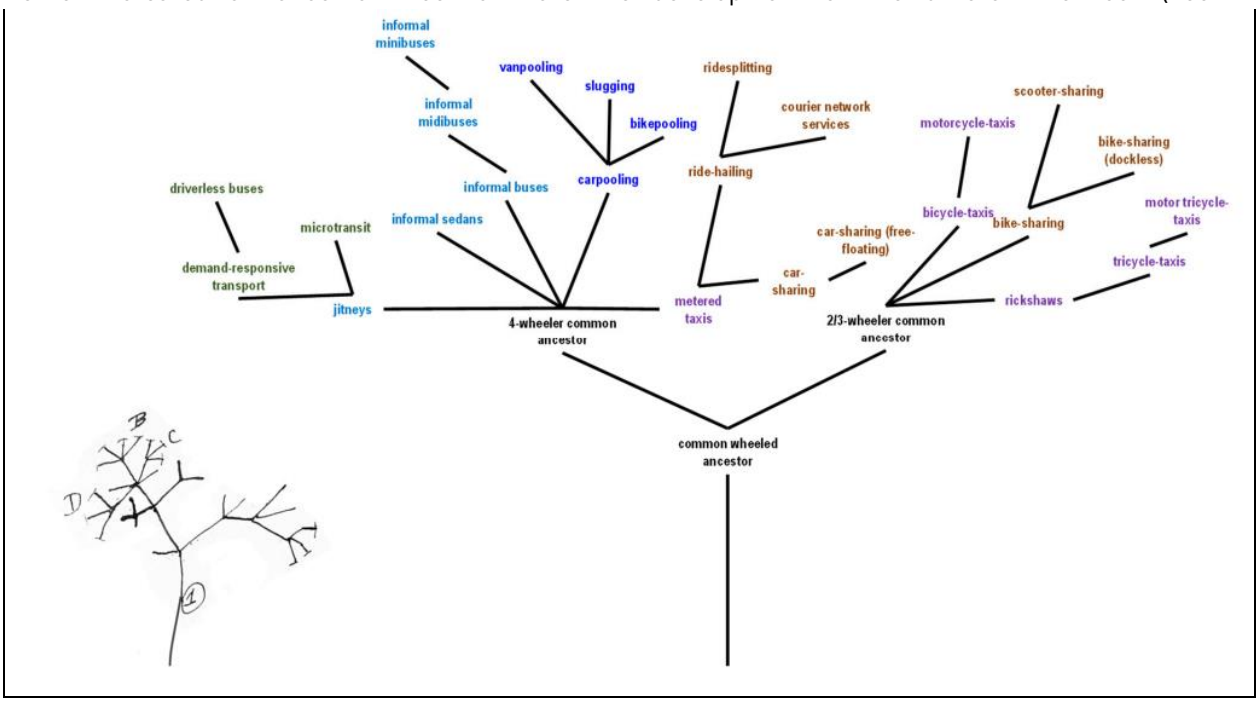

Figure 1).//KARIN: när det finns tid till det (behöver inte göras innan vi öppnar utlysningarna) kan du kolla med författarna om vi kan få tillgång till deras originalfigurer Like de Penja, he sees that due to recent technology and capital investment the latest innovation had been concentrated in Higher Income Countries. A major exception in that respect is China, by World Bank definition a Low Income Country, where thanks to large scale investment new services like ride-hailing and bikesharing was developed at scale as will be discussed later in this chapter (Song 2022).

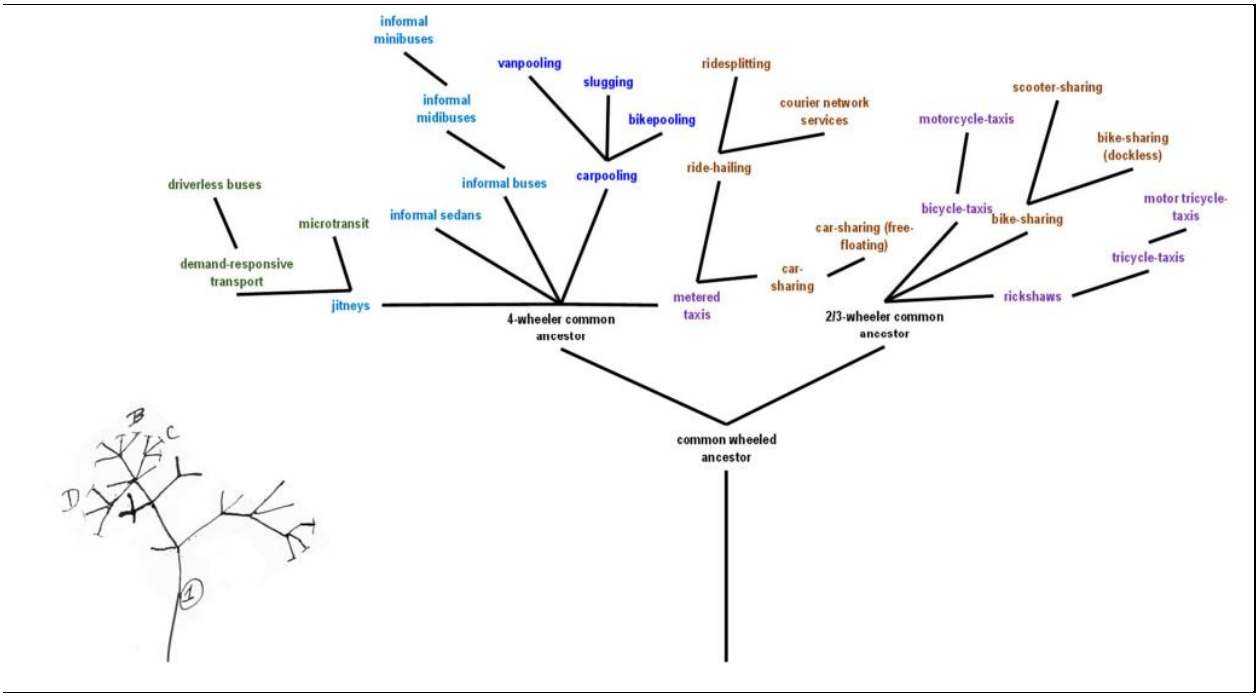

Figure 1 Evolution metaphor in transport services (Behrens et. al. 2021)

As a consequence of the inconsistent terminology, Behrens et.al. (2022) created a taxonomy matrix, which shows the service characteristics and the vehicles, which is a helpful tool to define the scope of the Program. For the bibliometric study, he included all vehicles with similar characteristics which substantially differ to public transport services.

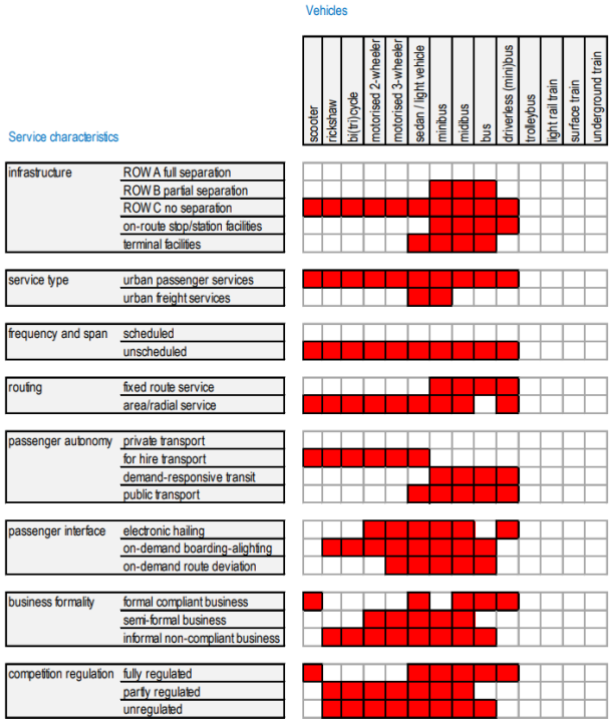

Figure 2 Service Taxonomy Matrix (Behrens 2022)

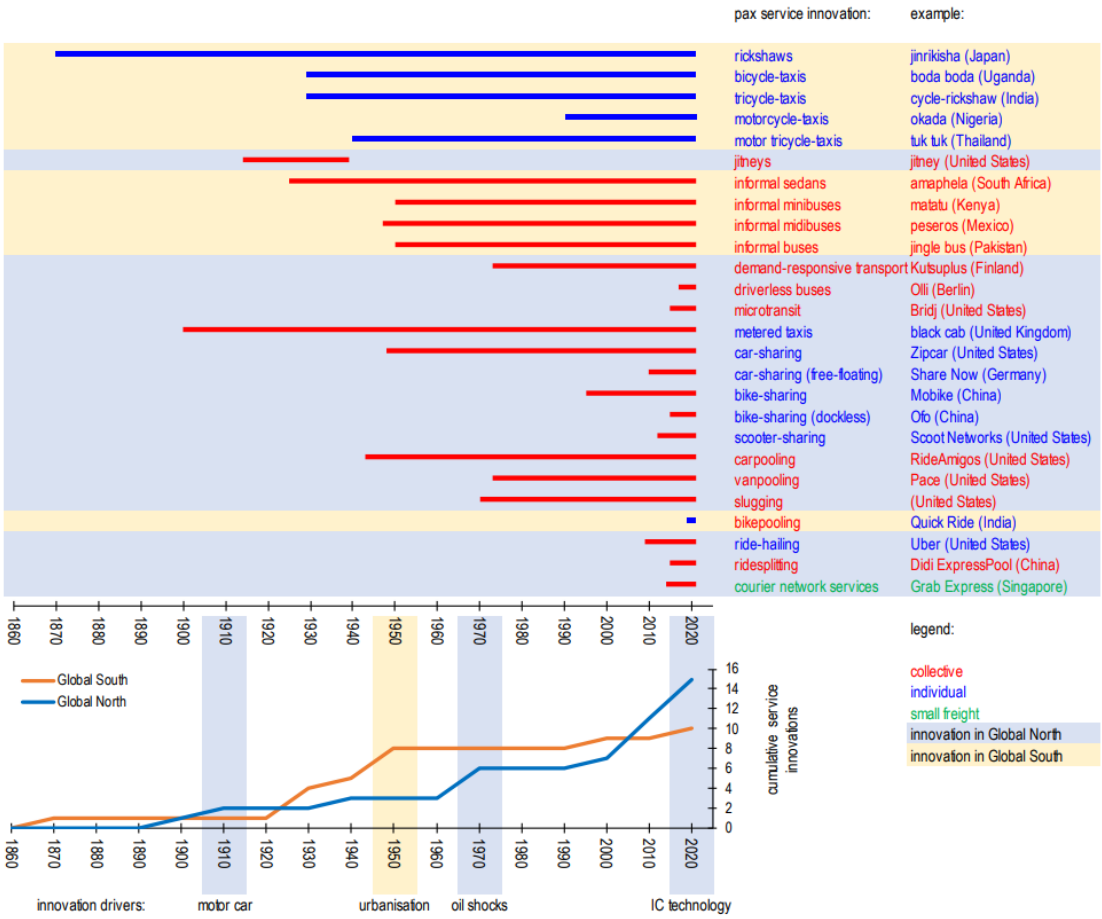

Figure 3 Transport service innovations in the Global North and South 1860-2020)(Behrens 2022)

The rows of the matrix in Figure 3 are selected service characteristics relevant to how the scope of informal public transport and shared mobility concepts and terms have been defined in the literature (Behrens et. al. 2022)

With many of the service characteristics and vehicles used shown in Figure 3 in all parts of the world and with innovation observed in LMICs as well as HICs lead the to the question if a comparison of the different solutions in different parts of the world and the related ecosystems including tech solutions, governance and role would be a helpful research perspective. The paper from Shaheen and Cohen (2022) compared shared mobility and informal transport status and trends in Low-Middle and High Income Countries. Like the other authors they highlighted the initially different roles of technology as part of the mobility services.

However, there are also many similarities between HIC and LMICs, such as the growth of attempts to integrate different mobility services through concepts like Mobility-as-a-Service (MaaS) in Europe or Super-Apps in Africa and Asia aiming for similar integrated solutions enabled by technology. Another similarity seems to be of the user groups of tech-based services in all parts of the world. While more traditional services like rikshaws seem to have a wider user base. An unknown particular in LMICs is the impact of those services from economic, social and environmental perspectives. A key question in that context is, if LMICs will be able to leapfrog toward better integrated mobility platforms. They conclude: "*More research is needed to understand variations across regions, nations, and built environments; travel behavior and environmental impacts; social equity and culture considerations; economic and labor impacts; and other policy issues such as safety, infrastructure, pricing. Finally, there is a need for cross-cutting policy research that identifies policy gaps and strategies to leverage shared mobility and informal transport for sustainable and equitable outcomes.*" (Shaheen and Cohen 2022, p 26)

There are ongoing efforts to reach a common understanding of the terminology used. In the last year VREF participated in working group meetings ("informal transport") of UITP.

For using a term for the program, the following criteria were considered:

- Easy to communicate
- Understood in a global context (in all regions)
- Not too technical
- Avoid abbreviations

With the later discussed geographical focus on LMICs, the term informal or paratransit seems most common to use. As mentioned before, paratransit is not understood globally, the term informal (also used in recent UITP, World Bank and IDB publications[5]) therefore seems a good option.

A term used in most HIC countries is shared mobility though "new mobility" is often used as an alternative including China (NUMO 2020, Song 2022). Even in the LMIC context, shared mobility is used mostly to describe the tech-based mobility services rather than the more traditional transport offers such as minibuses or two-three wheeler taxis.

To sum up, as there is no clarity provided by research nor practice, the future research program will use the terms *informal* and *shared* as these define best the core offers, hence the title of the program is **Informal and Shared Mobility in Low- and Middle-Income Countries.**

In chapter 4 the more detailed boundaries of the research Program will be defined building on the taxonomy developed by Behrens et. al. (2022).

2.2 The role of shared mobility and informal transport for the urban transport system in LMICs

Informal and shared mobility systems play a key role as part of urban transport systems. While the data on those transport solutions are limited, there is sufficient evidence of their growth around the world in the last decade (Cassius et. al. 2021, Shaheen and Cohen 2022, Behrens et. al. 2022, de Pena 2022). Though the importance of specific services varies enormously, informal and shared mobility plays a fast growing role in all regions of the world, enabling access to goods and services for the local population. However, research on social, environmental and equity impact indicates that shared mobility impact is rather mixed (Shaheen and Cohen 2022). One of the reasons for a rather mixed performance is in many cases the lack of integration into the wider transport system in cities, e.g. as feeder services for mass transit transport.

While there are questions about the individual impact of the mobility services, shared and informal mobility have the potential to contribute to the achievement of the most important international agreements such as the Agenda 2030 with its 17 Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change and the New Urban Agenda (NUA). Most relevant is the dedicated goal SDG 11 for the achievement of sustainable cities and communities, though many other 2030 Agenda goals and targets refer, however indirectly, to the need for more sustainable, accessible, inclusive and efficient urban transportation (UITP 2021[6]).

This subchapter briefly highlights some observations based particularly on the studies by Cassius et. al. (2021), Shaheen and Cohen (2022) and Song (2022) for China. The focus of the overview is Low and Middle Income Countries based on the selected focus of the future ISM program.

[5] Informal and Semiformal Services in Latin America: An Overview of Public Transportation Reforms | Publications (iadb.org)
Myths and Realities of "Informal" Public Transport in Developing Countries: Approaches for Improving the Sector | SSATP
Knowledge-Brief-Informal-transport.pdf (uitp.org)

[6] https://cms.uitp.org/wp/wp-content/uploads/2021/04/190520-UITP-UCLG_on_Mobility_and_SDGs.pdf

There are a growing amount of consumers who are linking modes to optimize routing, travel time, and cost. Furthermore, fare and digital information integration has the potential to enhance consumer convenience, increase transparency, and reduce friction in transferring between modes (Shaheen and Cohen 2022).

While informal transport in Africa already existed during colonial times, the main growth of particular minibus services started in the 90s with substantial growth of urbanisation charaterised by low densities and informal settlements. Informal transport, particularly minibuses are, besides walking, the dominating mode of transport in most countries in Africa. However, there is a substantial lack of data on the operation of minibus services. For example, in Kenya in 2017, the were about 53,000 matatu licenses issued, although some experts estimate that up to 100,000 are actually operating (Shaheen and Cohen 2022). At the same time, there are only a few formal transport services in place, with introduction of BRT in places like Addis Ababa, Dakar, Johannesburg, Lagos and Cape Town amongst others.

In recent years, new app-based services have been introduced. For example, more than 60 ride and delivery services operating in 33 countries are using a variety of mobility services such as: auto rickshaws, motorcycle taxis, private for-hire vehicles, vehicle taxis, and e-Hail. For example, Taxify, which launched in Africa in 2013, claimed 2.4 million active riders as of September 2018 (Shaheen and Cohen 2022).

Latin America is famous for the widespread use of Bus Rapid Transit (BRT). However, the role of the informal transport service is still crucial particularly outside city centres. The vehicles vary from passenger cars to full scale buses, the service is allowed by the authorities but running under informal rules such as not applying any labour laws, no defined tariffs and no scheduled services (Hidalgo 2021).

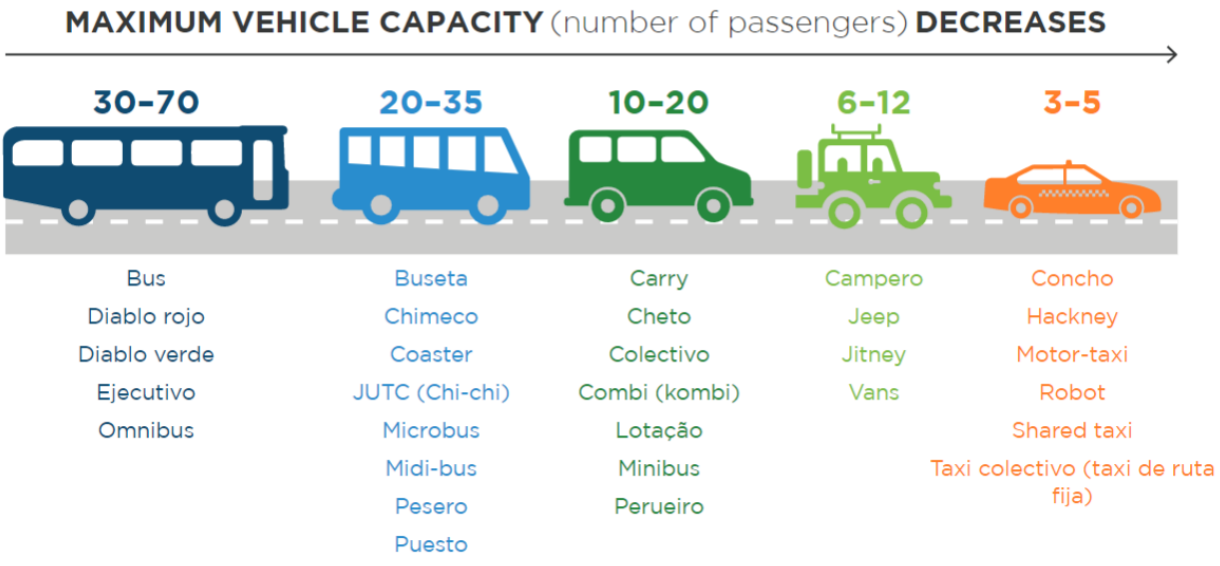

Figure 4 Maximum vehicle capacity for informal transport vehicles in Latin America (Hidalgo 2021)

Similar to Africa, there are no reliable data available due to the nature of the services. More data exists on the growing shared mobility modes such as bike sharing. In 2019, there were 92 bikesharing systems operating in 11 Latin American countries (Binatti, Batalha, & Decastro, 2020)[7]. There is also a substantial growth in ride-hailing services mostly running with their own fleet (Shaheen and Cohen 2022).

A number of informal transport services operate in Southeast Asia including: bajas, beaks, jeepneys, microbuses, minibuses, and tuktuks. With the exception of tuktuks, these modes typically operate along a fixed route. However, a few operators offer a door-to-door service. Due to the smaller vehicle size, these

[7] Binatti, Batalha, & Decastro (2020): Bike Sharing Systems in Latin America. DOI:10.13140/RG.2.2.12526.84800

informal modes can typically operate in areas where larger public transit vehicles are too large to navigate. Research has found that the areas of Southeast Asia with the least amount of road capacity per capita tend to have the largest variety of informal transportation options (vehicle type and seating capacities) (Cervero, 2007).

Car and motorcycle sharing are also key sharing modes with 22 million users in Asia, while bike sharing and scooter sharing are rare (Shaheen and Cohen 2022). Similarly to many places, ride hailing apps are becoming more popular. The Gojek app is a key player with a reported 190 million downloads and 2 million drivers providing ride hailing services. The app primarily operates in Indonesia, the Philippines, Singapore, Thailand, and Vietnam and integrates shared mobility, parcel and food delivery, moving services, telemedicine, streaming video, mobile payment, and business services into a single platform (Shaheen and Cohen 2022).

The urban transport system in China has changed most dramatically in the last decade. Shared mobility services, often called "new mobility services" in China, which are based on internet technologies mushroomed in the last decade and met growing transport demand. In China, shared mobility (new mobility services) includes: bike-sharing, e-bike sharing, ride sharing, ride hailing, car sharing, carpooling, car rental services, demand-responsive transport, and courier network services (Song 2022). The services are offered in more than 300 cities (Song 2022). For example, enabled by capital from large tech giants like Alibaba, dockless bike sharing reinvented the bicycle in China. This led to a peak in the number of dockless bikes in 2017, where in Beijing alone more than 2.3 million bikes were offered. While the service was utilised, the amount of bikes substantially outgrew the demand. In the following years the number of bikes in Beijing and many other cities reduced aligned with better regulation and management (see figure 5). In China in total in 2020 almost 20 million dockless bikes are available and over 280 million users are registered. Following on from this success the latest phenomena is the growth of e-bikes with more than one million bikes available across China in 2021.

City	Peak fleet size (thousands)	Date	Most current fleet size (thousands)	Date	Fleet decreased
Beijing	2,350	8/2017	900	11/2019	62%
Shanghai	1,700	9/2017	500	1/2019	71%
Guangzhou	1,000	2017	400	2/2019	60%
Shenzhen	890	12/2017	480	6/2019	46%
Wuhan	1,030	6/2018	750	4/2019	27%
Hangzhou	770	3/2018	390	1/2019	49%
Xiamen	460	12/2017	150	2/2019	67%
Xi'an	730	11/2017	450	3/2019	38%
Chengdu	1,800	9/2017	700	1/2019	61%
Nanjing	638	3/2018	317	4/2019	50%
Jinan	180	1/2018	–	–	–
Lanzhou	290	12/2018	–	–	–

Note: Lanzhou and Jinan have not shown a decrease in DBS fleet size based on available sources.
– = Not applicable
Sources: Bicycle Fan 2019; Yu 2019; Jiang 2018; Wu 2019; Wuhan Broadcasting Station 2018; Zhejiang News Broadcasting 2019; Qianzhan Industry Research Institute 2019; Xiao and Zhang 2018; *Xinmin Evening News* 2019; Xi Wang 2019; Hbspcar 2018; J. Xu 2018; Ministry of Housing and Urban-Rural Development of China 2017; P. Yin and Zhou 2016; *CCTV News* 2019; *Xinhua News* 2019; Xia 2019.

Figure 5 Comparison of current and peak fleet sizes in Chinese cities (Song 2022)

The other main change to the urban mobility system was the introduction of app based ride hailing. Didi is the dominating company with a market share of almost 90% and 56 million rides per months.

While the use of different vehicles with different service characteristics substantially differs from region to region, the overview shows the relevance of informal and shared mobility as part of the urban transport system. At the same time, information about the mobility services is limited due to private ownership (from individual vehicle owner to large tech companies). This also leads to a high level of uncertainty as to the equity, environmental, safety and economic impacts of the services.

2.3 Research landscape

After acknowledging the importance of shared and informal mobility services, the following chapter summarises the current research landscape based on the commissioned study by Behrens et. al. (2022). Behrens et. al. (2022) carried out a bibliometric study on informal public transport and shared mobility. The team of librarians initially identified about 15,000 articles (English language) based on a set of 34 related search generic terms and 38 additional common service brands and colloquial names (e.g. Bolt, Uber, jeepneys) . After several processes to identify duplicate articles and articles out of the scope, the final analysis included more than 3,295 articles including 114 additional articles identified through google scholar. The analysis helped to identify the current key topics, the geographical distribution of researchers and their collaborations (through common published articles). The bibliometric study also allowed identification of key research gaps in both topics and geographies.

Similar to the growth of shared mobility services, the number of research papers published globally has doubled every four years in the last decade (see Figure 6). While the overall difference between publications in HIC (2080 publications) vs LMIC (1215) countries were not substantial, China, defined as a LMIC country, had a share of 55% of all the publications in LMICs.

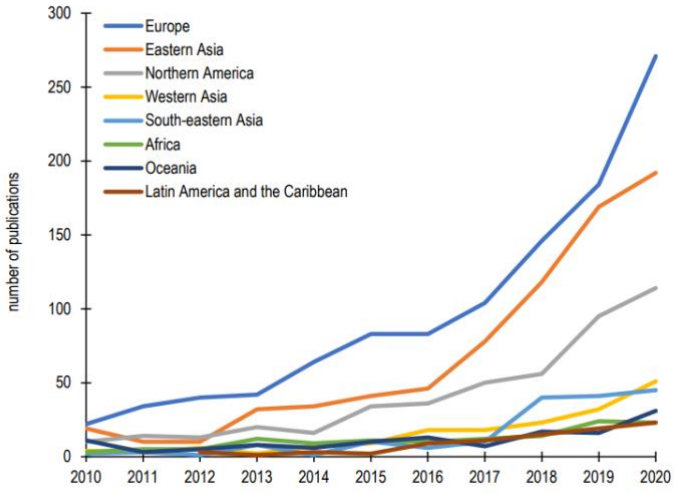

Figure 6 Annual publications, by global region (N=2 961, 2010-2020)(Behrens 2022)

The countries with the most publications between 2010 and 2022 were China, followed by the US, Germany, United Kingdom and Italy. The only other LMIC countries in the top 10 were India (8th) and South Africa (10th). The literature is therefore dominated by researchers from Europe, China and North America. While there has been a substantial growth in research, there remains a substantial difference between the regions.

When considering topics, the largest number of publications in the last decade were on bike-sharing, followed by ride-hailing, car-sharing and car pooling (see Figure 6). While the prevalence of bike share in different part of the regions has undoubtedly increased, the attention to bike share in research seems out of proportion given its relatively minor role in the wider urban transport system. At the same time, the number of publications on informal transport grew, but to a far lower extent than publications on tech-based shared mobility services like bike-sharing and ride hailing. In total, over the last decade, only 10% of the publications were on informal transport while 62% were in the research field of shared mobility. The remaining 28% covered for hire transport 17%, flexible transport 10% and 11% informal transport.

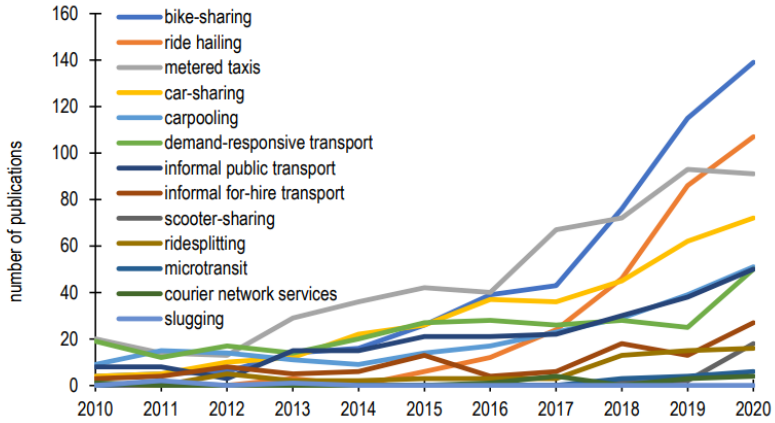

Figure 7 Annual publications by research fields, 2010 – 2020 (Behrens 2022)

Another analysis compared the lead author affiliation and the research context country as shown geographically in Figure 7Figure 7. Given the dominance of China and the US when considering county of publication, the research context country analysis also shows domination by these two countries. The maps shows very clearly the disparity in the research capacity (lead author affiliate country) and countries where research is focused and that there is a particular lack of attention in most parts of Africa with some countries not covered by a single publication.

The analysis also highlighted that that in the US and Africa, the share of publications focusing outside their own region is about one third, while in all other regions the share is substantially lower. The only region where informal transport was the dominating subject was unsurprisingly in Africa, but with an overall low number of publications.

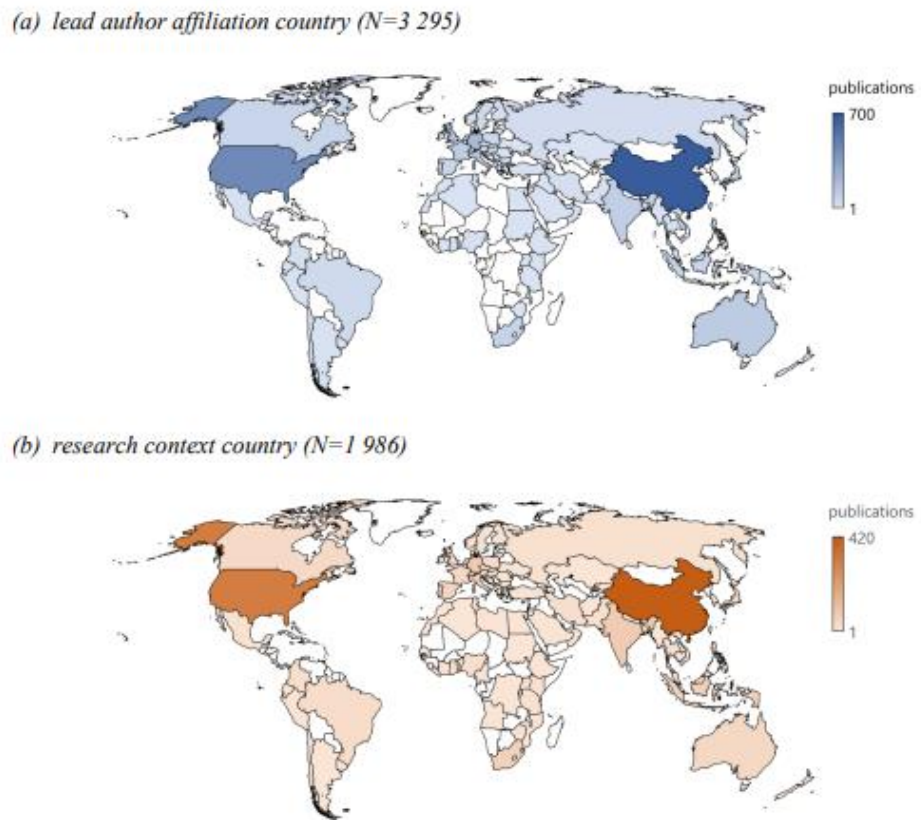

Figure 8 Global distribution of research activities, 2010-2020 (Behrens 2022)

Data on collaborations in the form of common publications shows the strongest links between China and the US and within Europe.

Finally, there seems to be a large number of individual researchers publishing on informal and shared mobility, though there are some universities dominating the space (see Figure 9Figure 8). Again no university from LMICs with the exception of China is in the list of the top 20.

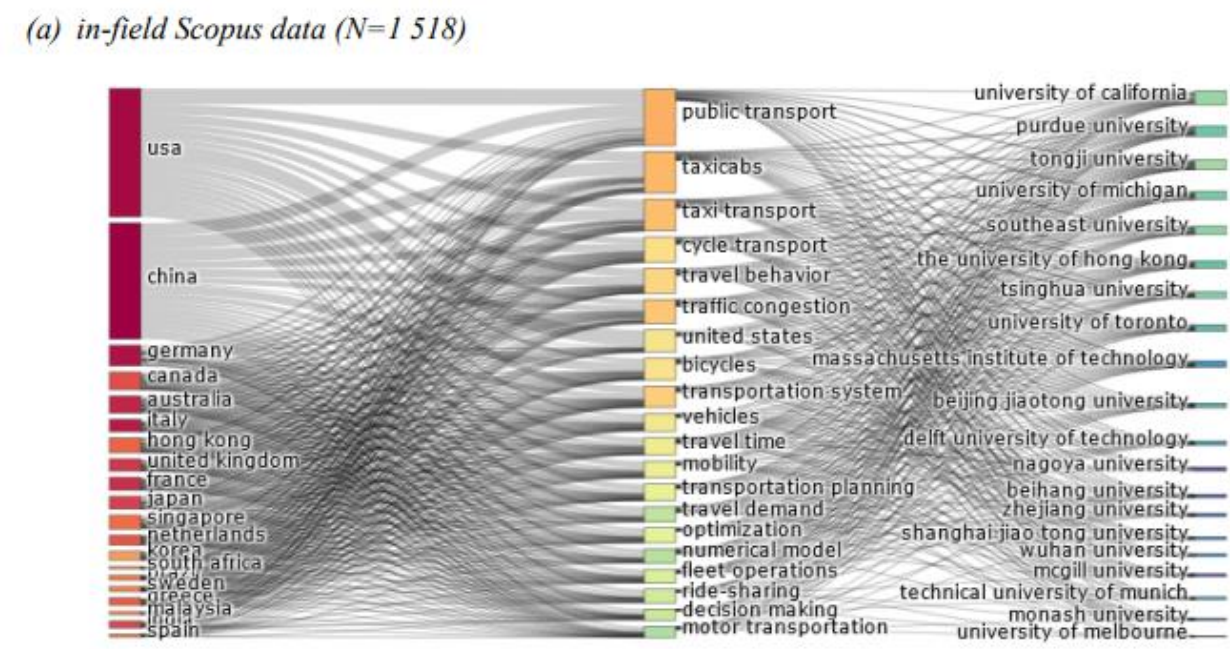

Figure 9 Three-field plot: top 20 countries; keywords; and lead author affiliations, 2010-2020 (Behrens 2022)

To sum up, the Behrens study showed the dominating research field is shared mobility led by research undertaken in China and the US. Informal transport receives far less attention with only a limited amount of researchers publishing, particularly in Africa and to a certain extent South East Asia. The collaboration in the form of common papers is rather limited and multi-country collaboration and research is very rare.

China, US as well as Europe provide substantial national and regional resources for their researchers. That explains the stronger collaboration within Europe as well as in the US and China. There is a very low number of multi-country collaboration and hardly any substantial collaboration with universities in Africa with the exception of South Africa. Therefore, the future ISM programme aims to exclude funding for shared mobility in HIC by universities in those regions. Instead HIC universities can contribute through multi-country comparative studies and receive support for international collaboration, which is often excluded from national program funding. The role of universities in China in the programme needs to be further reviewed. While defined by World Bank indicators as an LMIC, the leadership role in terms of technological development of mobility services and substantial research activities on the technical elements of new mobility services, indicates that universities in China rather should be classified together with HIC universities in the context of this VREF program. The call for the international research programme (see chapter 5.2.) will describe in more details the role of Chinese universities and if there will be research on mobility services in China.

3 Objectives and Expected Outcomes

Based on the overall vision and mission of the FUT Program described in chapter 1, and the challenges, opportunities and knowledge and capacity needs described in chapter 2 and 4, this chapter presents the primary and secondary objectives of the ISM Program and the expected outcomes and their potential impact.

3.1 ISM Program objectives

As highlighted in chapter 2, the integration of informal and shared mobility solutions can lead to a more equitable, efficient and affordable transport system, which could improve access to services and goods for all urban inhabitants. Informal transport in LMICs is often the only option for the poorer part of the population to access their jobs and education. Research on informal and shared mobility can provide a better understanding on how to improve the services as part of urban transport solutions.

Primary objective of the ISM program:

Contribute to more equity and sustainability[8] in the urban transport system by supporting research which creates new knowledge to better inform stakeholders to govern, design and/or develop shared and informal mobility and contribue to better access to goods and services for all.

The Program also aims to strengthen the research capacity on informal and shared mobility in LMICs. By creating a new international research program substantial resources will be provided to create opportunities for creating new knowledge, particularly focusing on the comparison of informal transport services and its impact. With more researchers having the opportunity to focus on informal and shared mobility, the program will strengthen the capacity in the research field.

Secondly, new collaborations will be encouraged by providing a range of opportunities for researchers to meet and exchange their findings and create new ideas (see chapter 5 and 6, Community of Learning (CoL), Research Forum, events with international partners).

Finally, the objectives of the ISM also include to scale funding for research on ISM. The VREF secretariat will work closely with its research partners and other international actors to identify further funding opportunities. At the same time, it is foreseen, that through strengthening the profile of the program, more (co-)funding opportunities will arise to scale the impact of the Program.

Secondary objectives of the ISM: program

- *Strengthen capacity in the research field – in particular in LMICs*
- *Establish a global network to strengthen international and interdisciplinary collaboration*
- *Scale further research investment through drawing more attention to the research subjects (enable co-funding opportunities)*

3.2 Expected Program outcomes

The expected Program outcomes build on the described objectives above. The following five outcomes are core to assess the impact and success of the Program:

1. Contribute to creating new knowledge on research in informal and shared mobility in LMICs based on interdisciplinary research in multiple geographies.
2. The key identified research themes "impact, governance and integration" will help to improve shared mobility and informal transport service to become more sustainable and equitable (see chapter 4).

[8] The term sustainability refers here to the broader understanding of the three dimensions (environmental, social and economic). As informal and shared mobility has a very high relevance for people in LMICs accessing goods and services and providing jobs, equity is explicitely highlighted though it is also part of the sustainability concept.

3. Build global research networks (research forum, CoL) recognized as the "go to place" for cutting edge knowledge exchange.
4. Increase capacity and resources for research and education with a particular focus on LMICs. Capacity in this context is related to more university staff dedicated to research on informal and shared mobility, from junior to senior. As the international research program is expected to grow beyond the VREF funding, further resource allocation to support research in the field is envisaged.
5. More capacity for cross-country research and international collaboration including support for young researchers through the Next generation scholars Program.

4 Research profile

Chapter 2 has highlighted the growing relevance of shared mobility services and the fast technological development enabling their development as well as reflected on the research landscape. This chapter focuses on describing the identified key research needs and gaps, and presents the thematic profile of the program. In addition, the challenges on data availability to carry out research and improve the service will be discussed, based on the data study report by de Penja (2022).

4.1 Thematic profile: Knowledge and research gaps

This subchapter starts with the description of the methodology the different authors used to identify future key research themes (4.1.1), summarizes their key findings (4.1.2) and closes with the justification and conclusion as to which thematic areas will form the thematic profile of the ISM program.

4.1.1 Methodology

Cassius et. al. (2021), Behrens et. al. (2022), Shaheen and Cohen (2022) and Song (2022), in the case of China, looked into potential topics for the future VREF Program.

The study by ITDP (Cassius et. al. 2021) identifies research gaps based on literature analysis and an expert workshop. Behrens investigated research gaps via a survey sent to the forty most influential researchers with a response rate of 58 % (23 respondents). Su interviewed five leading Chinese universities about their plans for future research and their view on the most relevant topics for research on shared mobility in China. Shaheen and Cohen conducted more than 36 expert interviews with academics, mobility service providers, public sector representatives. In addition, they hosted two workshops with a total of 18 experts, which reflected on their work and discussed future research themes.

4.1.2 Key study findings: Future research topics

Cassius' (2021) examination of the literature highlighted a lack of research on the policy implications and impacts dedicated to shared mobility and paratransit, especially in LMICs. They identified three major categories: current service impacts; transport management – particularly the role of government to regulate, finance and control the sector; and the improvement of paratransit (informal transport) in LMICs (e.g business models and option for integration with other modes).

Behrens found that in regions with a high share of informal transport such as Latin America, Africa and East Asia, the leading researchers plan to focus on the following type of transport services: informal public transport operations; ridesourcing; quality of service improvement; and informal-formal service integration. Leading researchers in Europe, North America and Oceania, plan to focus on shared mobility operations, Mobility as a Service (MaaS) and the impact of COVID-19 on shared mobility options.

Behrens et. al. (2022) came up with a more detailed disaggregation of prioritized research needs, which provides more insights. For all respondents combined, the top five prioritized research needs included investigating:

- The integration of (shared mobility, flexible transport, and informal transport) services with mass public transport services.
- The needs of vulnerable passengers, and equity, in service provision.
- The regulation of shared mobility services.
- The introduction of electric (shared mobility and informal transport) vehicles.
- The digitalisation (particularly ridesourcing and fare collection) of informal transport services.

Shaheen and Cohen (2022) found, based on the interviews, workshops and literature analysis, the following five main categories for future research:

- The built environment;
- Travel behaviour and environmental impacts;
- Culture considerations and social equity;

- Economic and labor impacts;
- Other policy issues including safety, infrastructure, pricing, and others.

For China, Song (2022) identified the following key gaps in Chinese research:

- Equity topics are seldom touched, especially with respect to vulnerable groups (e.g., the disabled, children, the elderly, women, lower-income workers, etc.).
- Health impact assessments are weak for shared mobility studies, especially assessments of the health benefits of bike-sharing and other active mobility modes within shared mobility services.
- Lack of road safety studies due to lack of decent (real) data, such as accident/fatality and injury data.
- There is a lack of analysis on the implications and impacts of policies and regulations on both the shared-mobility ecosystem (especially the shared-mobility industry and users) and external groups (the general public, other road users).
- Studies of the employment and welfare of employees/drivers are limited.
- Research on social and economic improvements

Furthermore, Song (2022) highlighted the strong interest of the interviewed researchers on MaaS, with four of the five leading universities expressing a strong interest in this as a future research topic. Another gap identified was about courier services, particular 2/3 wheelers.

4.1.3 Future thematic areas

All studies highlighted the significant gap in research in LMICs and on informal transport. Behrens and Shaheen and Cohen also highlighted the lack of multi-country comparative studies and flagged the importance of this for research. All studies used different terminologies and provided a different level of granularity to identify the key research themes. As part of this ISM roadmap we would like to propose a general thematic profile, whilst avoiding being too prescriptive and detailed. Therefore, the thematic areas are purposefully wide and open to interpretation. Nevertheless, they build on the commissioned studies as well as other activities such as workshop participation and expert calls.

While there was some diversity on the key research topics by the commissioned studies, there was a strong commonality among them, which could be summarized into three broad thematic areas:

- Impact;
- Governance;
- Integration.

The following Table 1**Error! Reference source not found.** summarizes which selected topics should be considered under the three suggested thematic areas (IMPACT, GOVERNANCE, INTEGRATION)

	Behrens (2022)	Cassius et al (2021)	Shaheen and Cohen (2022)	Song (2022)
IMPACT	Needs of vulnerable passengers, and equity in service provision. Digitalisation (particularly ridesourcing and fare collection) of informal transport services.	Current service impacts	Travel behaviour and environmental impacts; Culture considerations and social equity; Economic and labor impacts;	Equity topics especially with respect to vulnerable groups. Health impact assessments. Employment and welfare of employees/drivers. Social and economic improvements.
GOVERNANCE	The regulation of shared mobility services.	Transport management – particularly the role of government to	Policy issues including safety, infrastructure, pricing.	Implications and impacts of policies and regulations.

		regulate, finance and control the sector; and the improvement of paratransit (informal transport).		
INTEGRATION	Integration of (shared mobility, flexible transport, and informal transport) services with mass public transport services. Mobility as a Service.	Business models and option for integration with other modes.		Mobility as a Service.
OUTSIDE THE SCOPE OF THE IRP	Introduction of electric (shared mobility and informal transport) vehicles.			Road safety studies.

Table 1 Allocation of identified key research topics to the three main thematic areas

While the three thematic areas are very broad, certain aspects are seen as crucial and therefore highlighted in the following paragraphs:

1) IMPACT

All studies highlighted the importance of improving understanding of the impact of shared mobility as well as informal transport in terms of access, equity, economic, environmental aspects. While there is some research on the social, economic and environmental impact of shared mobility systems in HIC, this draws a rather incoherent picture of the current services from a sustainability perspective. There is also a huge gap in the understanding of the impacts of the current informal and shared mobility services in LMICs. A key aspect highlighted in all studies is the need for more research on equity. Often informal and shared mobility services do not provide access to areas where the most deprived people live. Also, the environmental and economic impacts are unknown, so research could help to improve the impact of services in the future.

2) GOVERNANCE

Under the term of governance, all authors highlighted the lack of knowledge when it comes to the role of policy to manage, regulate and integrate the service. This is of particular relevance to the uncertain impact of the current services. The thematic area of governance includes research on impacts of regulation (e.g. pricing, environmental and safety standards). In many places there is a tendency to abandon services while establishing new services like BRT. Research could help to gain a better understanding of the impact of the transformation of urban mobility services.

3) INTEGRATION

Shared mobility and informal transport is a key but currently mostly disconnected part of the urban transport system around the world. Research defining the potential role and impact of shared mobilty and informal transport services could help to shape better physical as well as digital integration such as: better integration of last-mile options; feeder services to mass transport; fare integration; and digital integration in app based offers, amongst others, could enable a better service in cities.

A future research focus on **"Impact, Governance and Integration"** for the ISM Program would cover the most important challenges the system is facing in becoming more equitable and sustainable. Certain research themes, such as "business models", can play a key role as a cross-cutting theme. For example, the trend of large scale international investment and the development of super-apps would benefit from research into the impact of such models, as well as the way to regulate such finance as well as how this might contribute to strengthen the integration of mobility services. In addition, the themes are

purposefully very broadly defined to ensure some guidance, but at the same time provide enough flexibility for the researchers to define the scope of the research. These identified themes should not per se exclude other topics suggested by researchers in the next phase, but would require additional justification for the need and its applicable knowledge to improve current practice.

4.2 Data collection activities and gaps

The studies by Cassius et. al. (2021), Behrens et. al. (2022), Shaheen and Cohen (2022) and Song (2022) highlighted the substantial gap of available information and data on informal transport in LMICs. The information on shared mobility in HIC and China are described as better, but not insufficient particular to allow assessment of the services from a sustainability perspective. To complement the work of the four studies, the paper from de Penja (2022) carried out a scan of mobility data collection efforts in informal transportation and shared mobility including the identification of key data collection initiatives and recommendations for future action to improve the data situation.

To collect information, de Penja (2022) conducted online searches and desk research. He also reached out to nearly 200 contacts of the Global Partnership for Informal Transportation to gather additional information. The online research focused on English and Spanish sources. These are his main findings (shortened based on his Executive Summary):

- In the Global North, the shared mobility data is held mainly by the private sector. There are ongoing regulatory battles to require the platform and app companies to provide this data to governments.
- In LMICs, mobility data about informal transportation is collected by private companies, civic mappers and volunteers, and researchers, with the support or funding of development agencies.
- There is a clear gap in the regular collection, update, and maintenance of data, particularly for informal transportation.
- There is a severe gap in the capacity of government agencies in the LMICs to acquire, use, maintain, and update mobility data.
- There are few efforts (if any) of governments in LMICs to aggregate or collect the data outside of the private sector providers.
- There are very few efforts of collecting and aggregating data for geographies larger than metropolitan areas. There are cross-country efforts led by private companies, usually, with select cities in the network of cities where the companies operate.
- Multi-city collection efforts are funded by development agencies such as UK's DFID, France's AFD, and Germany's GIZ. The World Bank, the Inter-American Development Bank, and (to a smaller extent) the Asian Development Bank have also funded in this space.
- Not only primary operational and fleet data are missing or not publicly available, but particular no data on governmental policies such as regulation and financing regimes.

Based on the report, it can be concluded, that while there is a variety of activities collecting data on informal and shared mobility, particular in HIC cities with larger scale resources, there are almost no data available on national level. On the global scale a first step is seen to create "a protocol to report or an agreement to standardize the types of information being collected and the process for collection". (de Penja 2022). He also recommends to improve the collection of comparable information and to improve the homogeneity of the existing information, indicators and measurements.

While the study showed very clear a wide range of gaps and opportunities for the ISM Program to engage, VREF still needs to better understand the current activities and interact with the key international players such as World Bank, AFD, IDB and GIZ. It is also crucial to better understand the researchers' specific data needs to improve the quality of their research and strengthening their impact. In the last decade, the data collection by the VREF supported BRT Center of Excellence has been instrumental to improve the understanding of BRT systems in different parts of the world, and has enabled comparative research on BRT systems.

5 Program implementation

The envisaged time frame for the ISM Program is nine years, 2021 – 2029, divided into three phases:

- Initial phase: 2021 – 2022
- Program phase 1: 2023 – 2026
- Program phase 2: 2027 – 2029

The ISM Program will follow the general VREF program structure (See Figure 10 below) combining a thematic profile with three pillars of action - *Knowledge Building*, *Community of Learning* and *Next Generation Scholars* – and supported by continuous program coordination.

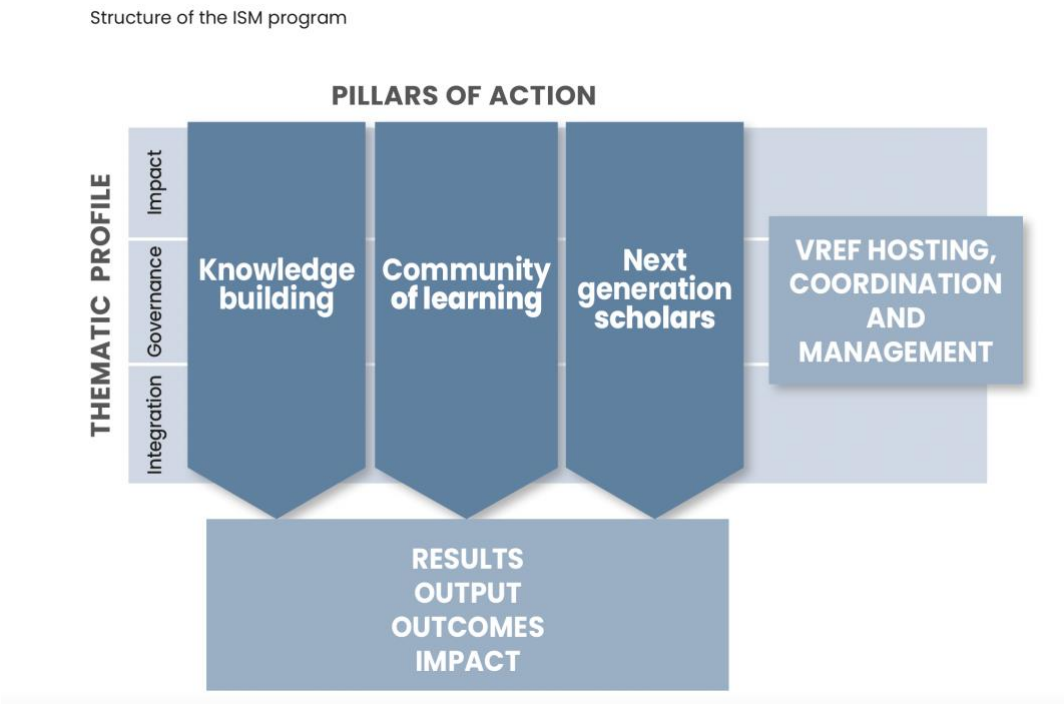

Figure 10 Generic Structure of VREF Programs.

The three pillars of action are designed to complement each other to achieve the objectives of the program.

The Knowledge Building pillar will focus on research and knowledge creation through research program(s), research projects, special studies, think pieces, knowledge syntheses etc. Scientific publication will be embedded in the activities under this pillar.

The Community of Learning pillar will focus on communication, exchange and learning activities among networks of researchers and other experts, framed around the findings of research. It will also strengthen the outreach and communication of research findings beyond academic channels and establish a community of individuals and organizations with interests in the program.

The overall aim of the Next Generation Scholars pillar is to support and enhance the growth and renewal of academic capacity in relevant areas of the program through capacity building and career development for young scholars, as well as improved education on bachelor, master and Ph.D. levels.

Finally, VREF's program coordination and management will strive to continually strengthen the ISM Program through initiating, enabling, catalyzing and facilitating activities under the three pillars, as well as linking the ISM program to other VREF programs (e.g. Walking as a mode of transport; Mobility and access in African cities) and the FUT programme on a general level.

5.1 Main direction and priorities in the implementation of the program

In summary, the implementation of the program should be characterized by:

- A geographical focus on low- and middle-income contries (LMIC).
- Comparative studies between different local, regional and/or international contexts.
- Collaboration and exchange among researchers globally, primarily in LMIC but also in HIC.
- Interdisciplinary approaches to knowledge building, education and learning.

Chapter 2 has shown the relevance of informal and shared mobility services globally. Overall, there is a huge growth in research in this area which is driven primarily by researchers in US and China but also to a certain extent by researchers in Europe. The researchers in these areas often benefit from existing national funding. However, there is a substantial lack of research on informal and shared mobility in LMICs. This is due in part to the lack of research capacity in such countries, in part a lack of attention among the research community in other parts of the world and a lack of dedicated research program funding. Therefore a focus on informal transport in LIMCs will allow the program to address significant gaps in knowledge and capacity globally in this research area.

At the same time, the studies carried out within the program to date have identified a lack of comparative multi-country studies (between HICs and LMICs as well as between different LMICs) due to restrictions in funding beyond national boundaries within most existing programs in the US, China and Europe. It has also been argued that due to many similarities between shared mobility applications in HICs and informal transport based services in LMICs, there should be new knowledge creation through comparative studies to better understand the impact of various services, as well as opportunities to better regulate and integrate them with public transport. Furthermore, through the growing tech-based solutions created and applied in LMICs, there is also a growing demand for research on knowledge and innovation transfer in both directions.

While most of VREF's funding should support researchers in LMICs, there is a also strong interest in facilitating collaboration between LMIC and HIC researchers. Thus research that focuses solely on shared mobility modes in HIC will be excluded from the ISM program, while comparative analysis which requires research on shared mobility in HIC as part of a collaborative multi-country study will be part of the future program.

Behrens et. al. (2022) observed that almost half of the existing scientific literature is authored by engineers, largely reflecting a technical focus. There seems to be a lack of interdisciplinary research which could help to better assess the impacts (equity, environment, economic, etc) of informal and shared mobility services. Therefore, not only multi-country collaboration will be encouraged in the program, but also interdisciplinarity.

While technology is a crucial dimension in mobility services, the focus of future research supported by the ISM Program will not be on technical dimensions or technology development. The program will not provide any funding for entrepreneurial activities outside academia, nor will it support research for developing new applications or services. Nevertheless the program will encourage research that explores the impact of such technologies and services, including topics such as the impact of a digital divide in LMICs.

5.2 Modes of operation

The implementation of the program will focus on two complementary modes of operation: an International Research Program (IRP), which will be carried out by a multi-regional research consortium based on a competitive call, and complementary activities managed by VREF.

(i) The *International Research Program* (IRP) will be at the center of the program, carrying out most of the research under the Knowledge Building pillar and allocated a major share of the ISM program budget. The IRP should be understood as a cohesive, multi-year research program, under which research projects will be implemented by a consortium through multi-country collaboration. The program will be lead and coordinated by one lead university, which

will plan and carry out research projects in close cooperation between at least 3-4 research partners in different countries and world regions. The IRP will also contribute to strengthening scientific networks, exchange and collaboration within the ISM area through an annual ISM Research Forum (organized in cooperation with VREF under the Community of Learning pillar). Further, the IRP will contribute to supporting the Next Generation Scholars pillar by involving Ph.D. students and early career researchers in research projects and other academic capacity building activities. As further described below, the consortium carrying out the IRP will be selected through an open call for proposals. The IRP is envisaged to be launched in June 2023.

(ii) Activities complementary to the work of the IRP will be managed by VREF under all three pillars of action. VREF will initiate and support such activities after consultation with the IRP and other actors. Under the Knowledge Building pillar, complementary activities could be e.g. special research studies in areas beyond the scope of the IRP, think pieces, knowledge synthesis reports and data collecting initiatives. The other two pillars Community of Learning and Next Generation Scholars will be lead by VREF, focusing on activities such as networking, events and communication initiatives that link research and practice, joint learning activities, a program website, mobility grants, young researchers' events, scholarships and other supporting measures. The ISM Research Forum, which will highlight presentation and discussion of ongoing research results, will be a major event in the programme, co-organized by VREF and the IRP.

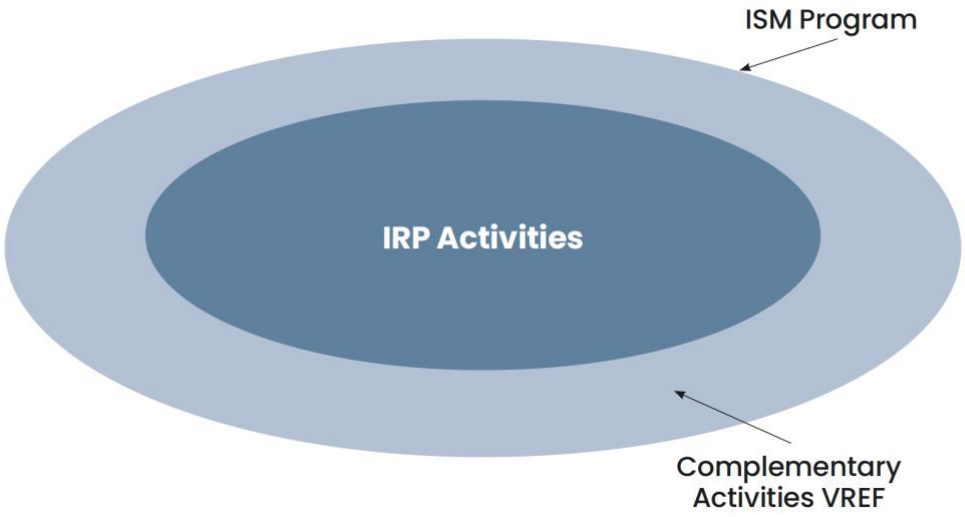

Figure 11 Complementary modes of operation in the ISM program

Complementary activities will be initiated by VREF in consultation with the IRP as well as other researchers and experts and implemented by selected researchers, experts or other partners depending on the specific activity (see *Table 2*).

The table below provides an overview of potential activities which are further discussed in this chapter.

	Knowledge building	Community of learning	Next generation scholars
IRP	International Research Program (IRP) - Research projects - Comparative research - Case studies - Peer reviewed papers - Etc.	ISM Research Forum IRP seminars, webinars and other scientific meetings	Academic capacity building embedded in the IRP, e.g. Ph.D. students and early career researchers participating in research
VREF with imple-menting partners	Complementary knowledge building activities initiated by VREF, e.g: - Special research studies - Think pieces - Research synthesis reports - Data initiatives	Complementary CoL activities initiated and partly implemented by VREF, e.g: - Program website - Networking, events and communication initiatives linking research and practice - Joint learning activities	Complementary activities, initiated and partly managed by VREF, e.g: - Young researchers' events - Mobility grants - Scholarships - Teaching materials
VREF	VREF Program management: - Follow-up and review of the IRP - Ensuring links to other programs and the FUT Program level - Coordinating and to some extent implementing CoL and NxtGen activities - Partnership management and activities - Website management		

Table 2 Three Program pillars and Program management

5.3 Knowledge building

The main mode of operation for the knowledge building pillar will be the International Research Program (IRP). The core aim of the IRP is knowledge generation through new international research collaboration. The IRP will be complemented in the Knowledge Building pillar through additional activities such as work on data and special research papers, initiated by VREF.

5.3.1 International Research Program (IRP)

The IRP should focus on generating new knowledge, exchanging research results, and carrying out other activities that contribute to reducing current gaps in knowledge in the broad area of ISM. To ensure the longevity of this research in a rapidly changing environment and to enable international partners to enlist and support talented staff for a longer period, the IRP is planned to run for a minimum of three years with an opportunity for extension, following an in-depth review, for three more years. This timeframe allows the consortium not only to establish cross-country and interdisciplinary research, but also provides the potential option to build a wider network over time through establishing an annual Research Forum as well as successively identifying additional associated partners (see Communities of Learning).

It is envisaged that the IRP, through its strong international recognition and outstanding research, should enable the participating partners to position themselves to increase their own funding beyond VREF. Co-funding/external funding is thus encouraged, as this would allow the program to extend its research and therefore its recognition and impact.

The IRP will be established through an open call for proposals. The proposal should combine:

(i) a research plan;

(ii) ideas for strengthening scientific exchange and networking;
(iii) ideas for how to embed academic capacity building in the research plan, and
(iv) a strategy for scaling the IRP over time through leveraging of VREF funding.

The research should follow the thematic profile of the ISM as described in section 4.1 (impact – governance – integration), and in particular strengthen research around informal transport in LMICs. At the same time, the open call will not limit the participating partners to those themes, but also provide an opportunity for the participants to share their own research agendas. To further insure diversity and renewal, the IRP should also keep a minimum of 15% of its annual budget flexible to respond to new ideas and initiatives either within the consortium or through potentially new associated partners.

The IRP should be implemented in line with the main directions and priorities described in 5.1 (focus on LMICs– comparative research – global collaborations and exchanges – interdisciplinary approaches).

VREF will allocate a major share of the IRP grant to research institutions in LMICs. At the same time, one of the goals of VREF is to support global activities such as comparative studies, which should therefore also be part of the ISM Program. Therefore, research institutions in HIC countries are encouraged to participate, bringing in their research experience on shared mobility as well as enabling comparative studies between the global regions. The opportunity of global collaboration between HICs and LMICs institutions will foster a better understanding of different situations, conditions and contexts, as well as enable learning about various factors influencing the development of informal and shared mobility, thereby strengthening knowledge generation within the program. Further details (such as the dedicated role of the lead institution vs. the other researcher partners, more information on the thematic profile etc.) will be defined in the Call for Proposals text.

5.3.2 Complementary activities by VREF

One of the objectives of the ISM program is to share scientific knowledge and strengthen the dialogue between researchers and actors within policy and practice. VREF considers it vital to share findings from the IRP with key stakeholders throughout the program, which to a large extent will be facilitated under the leadership of VREF.

Furthermore, complementary activites under knowledge building could be specific research pieces concerning topics or dimensions which are beyond the scope of the IRP consortium. To ensure synergies and avoid duplications of efforts, such complementary activities will be initiated after the selection of the IRP consortium.

5.4 Community of Learning

The second program pillar is Community of Learning (CoL), which will be lead by VREF in the form of specific collaborative activities with the IRP consortium. The CoL aims to strengthen the collaboration within and beyond the IRP, establishing an extended global research community on informal and shared mobility through exchange and joint learning activities that are framed around the ISM research findings. The CoL will also disseminate and communicate research findings beyond academic publications and scientific events as a means to raise awareness to the work of the ISM Program and thus increase its impact.

5.4.1 ISM Research Forum

As part of the IRP activities, and in cooperation with VREF, it is foreseen that an annual event – an ISM Research Forum – will be initiated to facilitate exchange of knowledge and ideas for further research and collaboration among IRP researchers and invited external researchers. The ISM Research Forum could be extended over time, pending identified needs of the research community.

5.4.2 Broader Networking and events

In addition to the IRP Research Forum, further opportunities to strengthen interactions between researchers and other experts on informal and shared mobility will be created by the VREF Secretariat. Such activities could include e.g. a workshop hosted and organized by VREF or, alternatively, an event that is carried out in partnership with other institutions.

5.4.3 Publications/Outreach Material (non-academic)

While peer reviewed papers and academic studies are a key part of the IRP, further material could be developed to target practitioners and decision-makers. This could be in the form of info-graphics, creation of micro-sites, brochures or non-academic publications.

5.5 Partnership activities

International partnerships are key for the ability of VREF to expand its impact through various forms of collaboration. Potential options for activities through partnerships will be explored as the program is implemented.

5.5.1 Program website

A website for the ISM program will be established and hosted by VREF as part of the VREF website www.vref.se. The website will be an interactive and dynamic platform for supporting the aims of the program, contributing to shaping the program profile and supporting the extended community around the program, as well as providing information to more general audiences.

5.6 Next Generation Scholars

The third program pillar is Next Generation Scholars which can consist of several activities:

- IRP academic capacity building
- Other collaborative activity options under the NextGen FUT Program
    - PhD and/or post-doc program
    - Teaching materials
    - Young researcher events
    - Mobility Grants and other possible scholarships

The proposals for an IRP should include ideas for strengthening its own research capacity, particularly among young scholars. This could be in the form of strengthening specific skills (e.g. presentations, scientific writing, research management) or initiating external collaborations e.g. with industry or public service institutions through internships or "embedded Master and Ph.D. candidates in which candidates are positioned within relevant public or private organizations as part of their master/Ph.D. work.

In alignment with plans under the NextGen Program within VREF, further options will be explored and developed. Based on experiences within the IRP and demanddriven discussions within the VREF network, a Ph.D. or PostDoc Program could be established. This could entail a summer school or scholarships for a few collaborative Ph.D.s as part of the IRP. Another option could be to host young researchers' events as a side activity of other VREF partnership activities such as Mobilize.

5.7 Role of VREF Secretariat and link to other FUT Programs

The role of the VREF Secretariat is to manage the ISM and be responsible for strategic program coordination and initiation of activities. VREF will manage all activities in connection with grants, all open and limited calls for proposals, review processes, follow-ups and evaluations, as well as commission studies, events and other activities. VREF will mainly have the role of initiator, catalyzer, facilitator and funder, whereas the implementation of most activities will be handled by university partners within the IRP, and in some cases by other partners. The website will be hosted by VREF, and complementary activities under the Communities of Learning pillar might be implemented or co-organized by VREF.

VREF will not be part of the IRP. The scientific and operational leadership of the IRP will be the full responsibility of the lead partner in the IRP. VREF will initiate the IRP through formulating and managing the open call, as well as undertaking regular follow-ups of the IRP, including a review in the last year of IRP program phase 1.

In addition to the above, VREF will work actively to identify synergies with other FUT Programs and enhance cross-collaboration between ISM and the other VREF funded programs.

5.8 International partnership opportunities

Partnerships with non-academic actors are an important part of VREF's work to achieve its objectives toward making informal and shared mobility systems in LMICs more sustainable and equitable. While the bibliometric study by Behrens et.al. provided an excellent overview of universities which are actively publishing papers on informal and shared mobility, while also highlighting the main collaborations between researchers at different universities, a complementary stakeholder mapping of non-university based actors and initiatives was carried out by VREF. This mapping identified initiatives by NGOs, bilateral partners and transport associations that aim to influence policy makers and businesses to improve the sector's performance.

Sharing state-of-the-art knowledge produced through the IRP with such initiatives can help to inform broader capacity building efforts. Furthermore, international partnerships with non-academic institutions could provide opportunities for researchers to engage directly with those initiatives through activities such as workshops, webinars or other events. Opportunities that are created by the ISM program can strengthen the dissemination and uptake of the research. At the same time, it can help to inform the research community to better understand the needs of decision-makers.

5.9 Implementation process 2022 - 2023

The first year of implementation, July 2022 – June 2023 will have two parallel, partly intertwined processes:

- A call for proposals for an International Research Program (IRP) on ISM. The call will follow a 2-step model, with Expressions of Interest (EoI) as a first step. Based on the EoI, VREF will award planning grants to a limited number of teams/consortia, that will be invited to submit full proposals in the second step. VREF plans to select a consortium by June 2023.
- Complementary activities by VREF with the aim of building networks and a broad community around the program. These activities will include e.g. commissioned research papers, events, a program website and activities to support early career scholars and Ph.D. students.