

■ 研究ノート

Integration of Paratransit into Feeder Bus Services for the Rawalpindi-Islamabad Metro Bus Rapid Transit System in Pakistan

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Abstract: This paper proposes an empirical research plan to examine the conditions of feeder services that access the Bus Rapid Transit (BRT) system in the Rawalpindi-Islamabad Metropolitan Area (RIMA). The Rawalpindi-Islamabad BRT is a publicly operated express bus system established in 2015 and currently operating only one route between the cities of Rawalpindi and Islamabad. This brand-new BRT system is equipped with high technology features. However, just outside the stations, there are no formal bus services and only unreliable informal paratransit services available to reach the BRT system. Such a lack of reliable formal feeder services may cause potential BRT passengers to prefer privately operated vehicles like cars or motorbikes. The existent literature shows the general reliance of RIMA residents on paratransit services for daily city travel and their dissatisfaction with and distrust of these services. Our empirical research in RIMA, scheduled in February to March 2018, will specifically focus on paratransit and feeder bus services to access the BRT stations. We will conduct pre-interview surveys on the reliance of BRT passengers on paratransit as feeder services and will interview public officials about current policy status of regulating paratransit or launching formal bus services. More narrow and comprehensive research is scheduled in September 2018.

Keywords: Bus Rapid Transit, Paratransit, Feeder Bus Services

I. Introduction

Many transport authorities in developing cities have installed a bus rapid transit (BRT) system as a cost-effective alternative to rail transport (ITDP, 2014). According to the 2018 Global BRT data, more than 160 cities have installed BRT due to its affordability and potential for stimulating urban growth. In Pakistan as well, transport authorities are introducing BRT systems in major cities. The local development authorities of Rawalpindi and Islamabad have collaborated to establish the Rawalpindi and Islamabad (RI) BRT in 2015 following the nation's first BRT installation in Lahore in 2013. However, lack of reliable feeder bus services makes it difficult for passengers to access BRT stations. Currently, informal paratransit is providing feeder services for passengers to access the RI BRT stations. Such paratransit services as Qingqi, Suzuki pickups and Hiace are low-quality and low-capacity and do not seem to be winning the trust of the passengers.

The availability of reliable feeder bus services is an integral part of the BRT system (Wright and Hook, 2007). The existing literature has examined the relationships of informal paratransit services with mass transit systems including bus and railway services. Studies of Dhaka (Shafiq-

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Ur-Rehman, Timms, & Montgomery, 2012) and Bangkok (Tangphaisankun, Nakamura, & Okamura, 2010) showed difficulty in integrating paratransit with mass transit services because of complex station designs needed for integrated operation and commuters' distrust of paratransit in general. In contrast, Bogota has successfully provided formal public feeder bus services by banning and replacing paratransit operators after initially failing to formalize paratransit as a feeder service into the BRT system (Salazar & Behrents, 2013).

How can reliable feeder bus services be provided to enhance transportation access to BRT stations in RIMA, the nation's capital region? Currently, there are no publicly operated bus services in RIMA. Can paratransit services be improved, formalized or integrated as reliable BRT feeder services? Or are the local governments of Rawalpindi and Islamabad aware of this problem and are they planning to provide formal feeder bus services in the future? To answer these questions, we will conduct exploratory research to understand the transportation access conditions of passengers to the BRT stations and current policy status of regulating paratransit or launching formal bus services.

In the following sections of this paper, we will first provide a brief overview of the RIMA BRT system and its feeder service problem. Then, we will review the problems of paratransit services and residents' use and perception of these services by relying on studies conducted by Adeel *et.al* (2014 & 2016). More detailed description of our empirical research on paratransit and BRT feeder services are provided at the end.

II. Rawalpindi-Islamabad BRT and Feeder Bus Service Problem

Rawalpindi and Islamabad are known as twin cities, which together make up the third largest metropolitan area in the country, the Rawalpindi and Islamabad Metropolitan Area or RIMA. According to the census of 2017, the population of RIMA is a little more than three million. Rawalpindi is considered highly dense and has mixed land use, with most of the areas being commercially and residentially bound together. By contrast, Islamabad is a master-planned city that hosts several federal offices and that has well-developed roads and structures. Approximately 500,000 trips are made daily between these cities for employment, school, and entertainment purposes (CDA, 2012).

As Table 1 shows, the BRT system in Pakistan was first completed in Lahore in 2013, with systems in other cities completed, under construction, and planned. All the BRT systems in Pakistan are planned and operated by provincial transport authorities. The RI BRT system, also known as the RI Metro Bus System, was opened in 2015, and operated as a branch of the Metro Bus Authority located in Rawalpindi. This formal transportation system is a collaborative project between the Rawalpindi Development Authority (RDA), which manages development projects in the Rawalpindi area, and the Capital Development Authority (CDA), which manages development in the Islamabad area. The 22.5 km BRT corridor runs between Rawalpindi and Islamabad (from Saddar to Pakistan Secretariat) and consists of 24 stations, as shown in Figure 1.

Table 1. BRT Construction Status in Pakistan

City	Operators	Year of Expected Operation	Construction Status	No. of Stations	Length (km)
Lahore	Lahore Metro Bus	2013	Complete	27	27
Rawalpindi-Islamabad	Rawalpindi-Islamabad Metro Bus	2015	Complete	24	22.5
Multan	Multan Metro Bus	2017	Complete	21	18.2
Karachi	Karachi Metro Bus	2017	Under Construction	90	109
Faisalabad	Faisalabad Metro Bus	2017	Planned	18	30
Peshawar	Peshawar Metro Bus	2018	Under Construction	30	30

Source: Kashif (2015) for Lahore BRT, NESPAK (2015) for Rawalpindi-Islamabad and Multan BRTs, ADP (2017) for Karachi and Peshawar BRTs, and Daily Times 2018 for Faisalabad BRT.

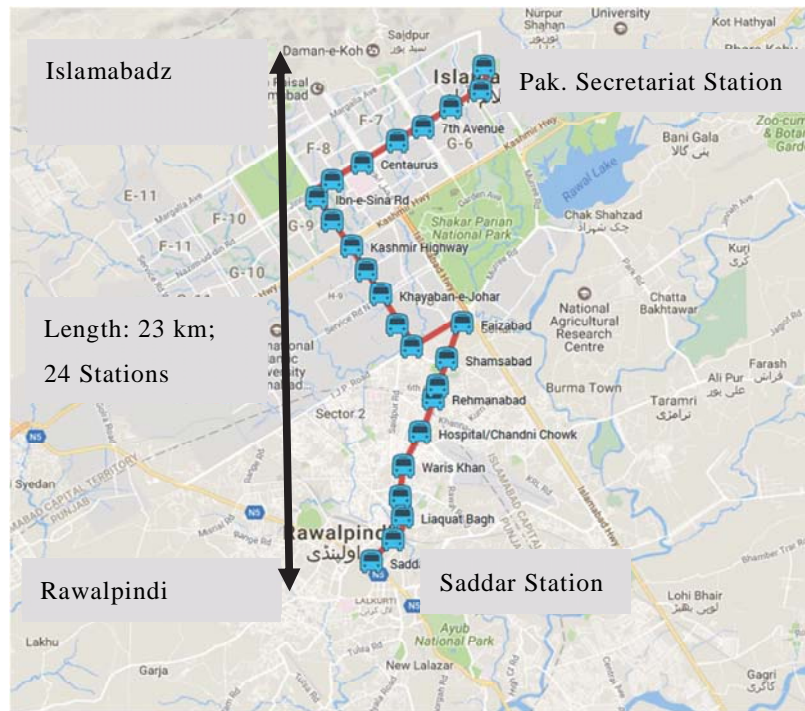


Figure 1. Route of RI BRT corridor and 24 stations

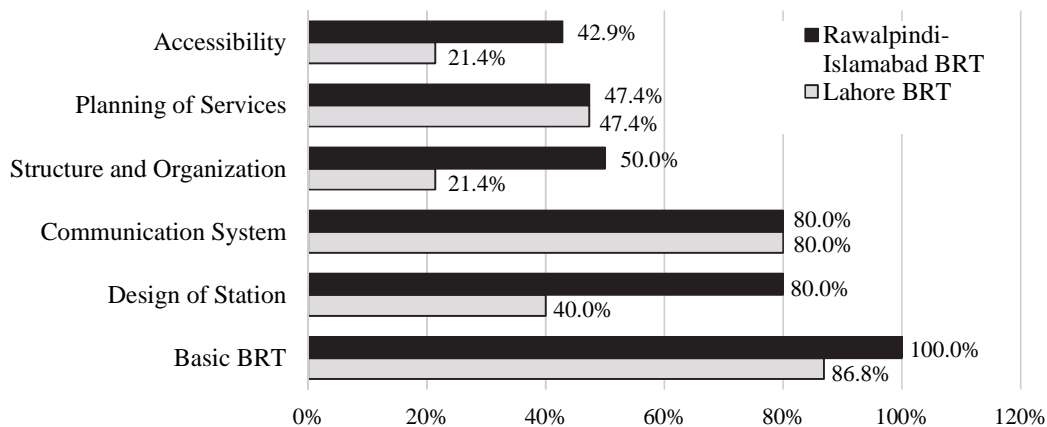
Base Map Source: Google

Table 2 summarizes the evaluation results of BRT features for the Lahore BRT studied by Kashif (2015) and the RI BRT by one of the authors (Khan, 2017). The table draws upon the BRT Standards for 2014 (ITDP, 2014), which is the most widely used assessment model for BRT systems around the world. In the table, the 2014 BRT standard shows the full points that can be given to each feature evaluated, and the points given to Lahore and RI according to the BRT Standard guideline. The percentage values are obtained by dividing each point value by the corresponding standard full point value. There are six major evaluation categories: Basic BRT, Station Design, Communication System, Structure and Organization, Service Planning, and Accessibility (and its subcategories). The percentage values for Lahore and RI BRTs are illustrated in Figure 2. As Figure 2 shows, compared to the Lahore BRT system, the RI BRT system is slightly better in terms of Basic BRT, Station Design,

**Table 2. Points Given to Service Attributes of BRT in Lahore and RI
According to BRT Standards 2014**

Element Evaluated	Lahore BRT (A)	RI BRT (B)	BRT Standard (Full Points) (C)	Lahore BRT (A/C)	RI BRT (B/C)
1. Basic BRT	33	38	38	86.8%	100.0%
2. Design of Station	4	8	10	40.0%	80.0%
3. Communication System	4	4	5	80.0%	80.0%
4. Structure and Organization	3	7	14	21.4%	50.0%
5. Planning of Services	9	9	19	47.4%	47.4%
6. Accessibility	3	6	14	21.4%	42.9%
<i>Access for Everyone including Pedestrians</i>	3	6	6	50.0%	100.0%
<i>Bicycle Parking, Bicycle lanes and sharing integration</i>	0	0	5	0.0%	0.0%
<i>Other Public Transport Integration</i>	0	0	3	0.0%	0.0%

Source: ITDP (2014) for BRT Standards 2014, Kashif (2015) for Lahore BRT, and Khan (2017) for RI BRT.



**Figure 2. Analysis of BRT Service Attributes in Lahore and RI
According to the BRT Standards 2014**

Source: Data taken from Kashif (2015) for Lahore BRT, Khan (2017) for RI BRT, and ITDP (2014) for BRT Standards 2014.

Structure and Organization, and Accessibility. In addition, both systems were given the same points in Service Planning and Communication System. However, Accessibility is by far the lowest performing category in either city.

Table 2 also illustrates the points for the detailed components of Accessibility. It shows that Accessibility was given the lowest points due to lack of bicycle lanes and parking areas near the BRT stations. More importantly, no other public transportation is integrated with the BRT system, indicating no formal feeder bus services. Thus, such limited transportation accessibility makes it

difficult for those living in the remote areas to commute to workplaces or educational institutions by using the BRT in both cities.

This vacuum created by lack of formal feeder bus services is filled by informal paratransit services that connect passengers from their origins to the main BRT stations. However, these paratransit services are of poor quality and low-capacity, pricey, unregulated and unmonitored (Adeel *et al.*, 2014). They do not seem like attractive and reliable feeders to BRT stations for those who can afford to own cars and motorbikes, particularly in an increasingly car-oriented metropolitan area like RIMA.

III. Problems with Transit/Paratransit Services and Daily Travel in RIMA

Lack of reliable feeder services seems to vitiate the attractiveness of the RI BRT system, and this lack is connected with the general absence of reliable transit services in RIMA. In RIMA, there are no subways and commuter trains, and no publically operated bus services other than the RI BRT. Transit for daily needs is provided solely by private paratransit operators. In this section, we will review existing literature on problems with transit services and residents' daily travel activities in RIMA by employing the studies by Adeel *et al.* (2014; 2016).

III.1 Problems with Transit/Paratransit Services

Adeel *et al.* (2014) researched transit services in RIMA by communicating with transport officials, gathering reports from Islamabad Transport Authority (ITA) and Rawalpindi Transport Authority (RTA), and consulting online street maps. Table 3 summarizes their research findings that illustrate the characteristics and problems for different types of paratransit and BRT services in RIMA.

Table 3. Comparison of Problems and Components Between RI BRT and Paratransit

Problems	Components	Qingqi/Rickshaw	Suzuki/Wagon	RI BRT
Regulatory	Status	Unauthorized	Legal	Legal
	Government Role	Prohibitional	Regular	Promotional
	Cities	Rawalpindi	Both	Both
	Priority	Least	Normal	High
	Fare Subsidy	No	No	Yes
Spatial	Population	Restricted	Highest	Medium
	Service Location	Inner city	Main roads	Main corridor
	Movability in Congestion	Higher	Lower	Highest
Demand	Travel Speed	Low	High	High
	Usage Purpose	Social, educational, connecting trips	Work	Work and education
	Service Frequency	Medium	High	High
	Off Peak Availability	Poor	Poor	Good
	Route Completion	Yes	No	Yes
	Accidents	Higher	Higher	Lowest

Source: Adeel *et al.* (2014).

According to their study, Qingqi and rickshaws face high regulatory hurdles as they are not authorized to run on streets. They run in the inner areas of Rawalpindi, but are completely banned and in Islamabad. Passengers give paratransit the least priority because of its poor quality, small size, no separate compartments for female passengers, poorly maintained and old vehicles, and many safety and security concerns. This is because no subsidies are coming from the local government, which has declared paratransit as prohibited transport. In addition, fares are not regulated, leading to much contention among local transport authorities, public transport operators and the passengers. Hiace and Suzuki have been taking advantage of such unregulated fare structures and charging the passengers whatever they please. They also compete to get passengers, resulting in reckless driving, long waiting times, congestion and accidents.

RI's BRT, on the other hand, is a highly developed formal transport. Adeel *et al.* (2014) state that the RI BRT has been promoted by the local governments of RIMA for its better performance in terms of high capacity (160 passengers), frequent availability, speed, less waiting-time and modern vehicles. Females often choose BRT to travel because it has separate compartments, comfortable seats, and spacious standing room owing to the large vehicle size. Regular subsidies from the government have resulted in extensive bus infrastructure that ensures the safety and security of the passengers. Despite a few financial and operational issues, the demand for BRT remains high.

The authors' research shows that three-quarters of the population live beyond walking distance of transit service, resulting in very low access for the population. Forty-one, 61 and 81% of the population are not able to reach any transit services within five, ten, and twenty minutes of walking distance, respectively. Hiace covers 80% of the population within a fifteen minute of walk distance. However, a large proportion of the population is still underserved by the transit services leaving paratransit to transport 13% of the population in RIMA. Similarly, the formal BRT in RIMA covers only 8% of the population who live within a ten-minute walk, and around 85% live more than twenty minutes from the nearest station. On the bright side, almost all the residents in the Rawalpindi area are able to reach some mode of transit within twenty minutes of walking as compared to the 70% of the population in the Islamabad area.

III.2 Problems with Daily Travel

Adeel *et al.* (2016) conducted an empirical survey on the transportation disadvantaged population and examined activity exclusion of those who live in various parts of RIMA. Their findings show that only 26% of men travel daily for work and education purposes, while only 11% of women travel for work and 2% for education. Around 78% men are reported travelling for religious duties as compared to only 2% of the women. Similarly, fewer women than men can operate a car or motorbike, leaving them dependent on male family members to help them commute. Also, their study finds that 82% of women use private vehicles for work and 77% for education, while only 34% of men do so for either activity. Furthermore, 96% of men in the underdeveloped part of the study area prefer to walk for religious duties and 58% are reported walking to work as compared to 8% of the women. This disparity seems to arise from women's lack of trust in paratransit. There are no separate

compartments for women and harassment is a real fear.

In addition, the authors find that the cost of transit services is a major concern for 57% of the respondents, with distance to the bus, availability, and wait times a problem for 35-42%. The low-income population reported spending around Rs 3000 (\$27) a month on transit services, while people who live in suburban areas, farther away from work or school, reported spending around Rs 5000 (\$45) a month. Though men expressed more concerns due to their frequent use of transit services, female respondents had concerns about harassment (even a slight touch from a strange man) and the discomfort of using transit for long distance travel. Similarly, people who live in the developed areas of RIMA and who have high incomes of around Rs 100,000 (\$980), reported to spending around Rs 20,000 (\$190) per month on transit. This shows that the low-income population spends a higher proportion of its earnings on transit as compared to the higher-income population. Therefore, many people cut back on activities that depend on using transit. As the dissatisfaction on transit services keeps increasing, people either buy automobiles or find jobs that are within walking distance from their homes.

IV. Empirical Research Plan on BRT Feeder Conditions and Planning Status

A lack of formal transit services has resulted in the growth of both paratransit and private vehicles. Unregulated paratransit services are often highly unreliable, uncomfortable, and unpredictable, which markedly increases the dissatisfaction of the passengers (Adeel *et al.*, 2016). Adeel *et al.* (2014) stress the need to enhance transportation accessibility by establishing integrated formal feeder bus services to the RI BRT system. However, both Adeel's studies in 2014 and 2016 focused on studying general transportation problems with paratransit services and residents' travel activities in RIMA. In our research, therefore, we would like to place a specific focus on empirically studying the conditions of feeder bus services, which at present are only available via paratransit, to the RI BRT stations.

Considering the current transit service conditions in RIMA, where there is no publicly operated bus service, it may sound too unrealistic to propose placing formal bus services in the metropolitan streets at this moment. However, there might be increasing demand from residents and policy makers/planners, who are certainly concerned by worsening traffic congestion, to at least enhance feeder services and support this brand new public transportation project of the RI BRT.

Can paratransit services be improved, formalized, or integrated as reliable BRT feeder services (as has been tried in Dhaka and Bangkok and, unfortunately, appears to be failing (Shafiq-Ur-Rehman, Timms, & Montgomery, 2012; Tangphaisankun, Nakamura, & Okamura, 2010))? Or are the local governments of Rawalpindi and Islamabad aware of this feeder problem and are they planning to provide formal bus services in the future, as in the successful case in Bogota (Salazar & Behrens, 2013)? To investigate these questions, we will conduct exploratory research to understand the transportation access of passengers to the BRT stations and current policy status of regulating paratransit or launching formal bus services. More specifically, our empirical

qualitative-based research, scheduled for February to March 2018 in RIMA, will address the following four questions.

Q1: What is the policy/planning status of improving transit services, and in particular BRT feeder services?

Q2: What are the business conditions of paratransit operators and their opinions on improving transit services, possibly regulating or formalizing their services?

Q3: How do BRT passengers access the BRT stations?

Q4: How are residents commuting between Rawalpindi and Islamabad? For what reasons do people choose private automobiles over BRT?

Building from the findings of this exploratory research, we plan to conduct more narrow and comprehensive research scheduled in September 2018. In the following subsections, a detailed methodological description is provided for each of the four questions.

IV.1 Interviews with Transportation Planning Organizations

Q1: What is the policy/planning status of improving transit services, and in particular BRT feeder services?

Table 4 summarizes the transportation planning organizations we plan to interview and the purposes of these interviews in our research. Interviews will be conducted at local government offices such as Rawalpindi Development Authority (RDA) and Capital Development Authority (CDA), the Metro Bus Authority branch office located near the Saddar BRT station, and National Engineering Services Pakistan (NESPAK), which is the consultant company of the RI BRT project. Questions will address the formalization of paratransit service, the introduction of formal feeder bus services, and the improvement of paratransit services such as Qingqi and rickshaws. Similarly, interviews will be conducted at the metro bus authority branch office with BRT experts to gather information on ridership data, GIS and shape files, and plans to expand the main corridors of RI BRT. Next,

Table 4. Interview Targets and Purposes for Transportation Planning Organizations in RIMA

Organization	Description	Purpose	Data Collection
Rawalpindi Development Authority (RDA) Capital Development Authority (CDA),	RDA manages development in Rawalpindi and CDA manages development in Islamabad	For information regarding current and future policies for improving the quality of paratransit and road networks.	Population distribution in RIMA, maps of road networks in RIMA
Metro Bus Authority	The organization that operates the RI BRT, located in Rawalpindi near Saddar BRT station	For information on plans for installing feeder bus services and expanding the BRT network in RIMA	Ridership data, GIS maps, shape files of RI BRT
National Engineering Services Pakistan (NESPAK)	Consultant company of the RI BRT project	For information regarding future BRT projects in RIMA	Documents that show current policy status, drafts, maps

interviews with key informants at NESPAK will gather regional spatial data, population distribution, and any other relevant available data. All the interviews will be audio-recorded for further analysis.

IV.2 Interviews with Paratransit Operators

Q2: What are the business systems and conditions of paratransit operators and their opinions on improving transit services, possibly regulating or formalizing their services?

Interviews will be conducted of rickshaw and Qingqi-pullers, as well as Hiace and Suzuki drivers to understand how they provide their services, their business systems and conditions, and the problems they face daily. Their opinions about how to best encourage government investment in and regulation of paratransit services will also be assessed.

IV.3 Pre-interview Survey of BRT Passengers

Q3: How do BRT passengers access the BRT stations?

Approximately 30 survey interviews will be conducted of BRT passengers, subdivided by age, gender, and occupation to mainly collect the following three types of information:

- (1) Respondents' socio-economic characteristics such as age, gender, residential locations, purposes of using BRT, their experiences of using BRT, and problems they face in accessing BRT;
- (2) Respondents' trip patterns such as entrance and exit patterns, modes, travel time, costs, and waiting times;
- (3) Respondents' perceptions about using paratransit to access BRT and their views on an integrated formal feeder bus system to enhance the quality of service, in terms of safety, security, and comfort.

Two stations will be selected, one from each city, to conduct this research. So far, Saddar station has been selected for the Rawalpindi area. The two-kilometer radius around the Saddar consists of commercial areas including shopping malls, individual shops, branches of various government and private services, restaurants, hotels, and so on. Hiace and Suzuki routes are also established in the narrow roads of the Saddar area, causing pollution and traffic jams. For the Islamabad side of the BRT corridor, Pakistan Secretariat station has been selected. This study area consists of nearly organized federal and government districts and private offices. However, it is more than fifteen minutes' walk to the nearest commercial area.

RIMA maps will also be used to mark the locations of the origins/destinations of the passengers. These maps come from the official websites and previous studies in RIMA conducted by NESPAK (2015) and Adeel *et al.* (2014). Electronic devices will be used to record any conversations related to the research and writing pads will be used to take frequent notes of any useful observations or points made by the respondents that were not mentioned in the questionnaires.

IV.4 Pre-interview Survey of Commuters between Rawalpindi and Islamabad

Q4: How are residents commuting between Rawalpindi and Islamabad? For what reason, do people choose private automobiles over BRT?

The main purpose of interviewing the Rawalpindi-Islamabad commuters is to understand their reasons for not riding the RI BRT and using private vehicles to travel to work or study. Their suggestions on what improvements need to be made to RI BRT in order for them to use public transportation will also be assessed. The potential sample can be collected at those commercial areas that are within twenty minutes of walking distance from the nearest BRT station.

Acknowledgements

Our research project is partially funded by the Research and Development Institute of Regional Information at Ritsumeikan University.

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パキスタン、ラウルピンディ・イスラマバード BRT システムにおけるフィーダー・バスサービスへのパラトランジットの統合化

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【要旨】本稿では、パキスタン、ラウルピンディ・イスラマバード都市圏(RIMA: Rawalpindi-Islamabad Metropolitan Area)のラピッドバス交通システム (BRT: Bus Rapid Transit) にアクセスするためのフィーダーサービスの状況を調査するための研究計画を提示する。ラウルピンディ・イスラマバード BRT システムは、2015 年に開設された自治体運営の専用レーンを走るエクスプレス・バスシステムであり、現在ラウルピンディ市とイスラマバード市間の 1 ルートのみが運行している。高度な交通デザイン技術を備えた最新の BRT システムであるが、停留所の「駅」にアクセスするためのフォーマルな公共交通はなく、インフォーマルなパラトランジットしか存在していない。信頼できるフィーダーサービスの欠如により、潜在的な BRT の乗客が自家用車やバイクを交通手段として選択している可能性がある。既存文献では、RIMA 市民が日常的な移動手段としてパラトランジットを利用している状況や、市民のパラトランジットへの不満や不信が研究されている。2018 年の 2 月から 3 月に予定している今回の我々の探索的な予備調査では、BRT の駅にアクセスするためのパラトランジットとフィーダーサービスの現状に焦点を絞る。BRT の乗客によるパラトランジットのフィーダーサービスとしての利用状況をプレインタビュー調査により把握し、またパラトランジットやバスサービスに関する政策状況について交通局にヒアリング調査を実施する。これらの調査結果を基に、2018 年の 9 月に本格的な調査を実施する予定である。

キーワード : BRT, パラトランジット, フィーダー・バスサービス