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Role of Bus Aggregators in improving City Bus Services in India

SHAKTI
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About Shakti:
Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that support renewable energy, energy efficiency and the adoption of sustainable transport solutions.

EXECUTIVE SUMMARY

Technology start-ups across the country have begun to aggregate privately-owned buses to provide transport services. These "Bus Aggregators" typically own no assets other than Information Technology infrastructure and Fare-collection tools, and enter into agreements with private bus owners for operations. Aggregator bus services differ from those offered by State Transport Undertakings (STUs) by enabling passengers to track bus timings and arrival, and guarantee seats for the duration of their journey. However, several STUs are also in the process of adopting Intelligent Transport System (ITS) technology to improve the reliability of their services.

Aggregator buses have been in service in major cities including Bengaluru, Delhi, Hyderabad and Mumbai, plying along corridors that connect major business or technology parks with residential areas and operate alongside STU bus services. In Gurgaon, however, aggregators are running services in the absence of a mature public transport network.

Though governed by the Motor Vehicles Act of 1988, as all road transportation in India is, bus aggregator services do not always lie within its scope due to private ownership and the business model of operations. For example, aggregators are recognized by the Act as agents in the sale of tickets, rather than technology providers fulfilling the role of a system planner in a public transport network.

The provision of public bus services by the private sector, including aggregator firms, presents both opportunities and challenges. The private sector may be able to respond to growth in demand with expansion of public bus capacity sooner than State-run corporations. However, in cities with mature public transport system, the private sector may compete along routes facilitated by STUs. Rather than complementing existing services to bring about a net addition of bus services and shifting private vehicle users to the aggregator services, these services may capture the demand being served by STUs.

This paper attempts to understand the various regulatory, economic and social considerations presented by the aggregator model to serve as the basis for further research on the impact of the aggregator model in an urban context. Through an assessment of current operations, the paper acknowledges that aggregators need to be regulated and a level playing field needs to be created.

CONTENTS

ABBREVIATIONS USED

Abbreviation	Full Form
BEST	BrihanMumbai Electric Supply and Transport Undertaking
BMTC	Bangalore Metropolitan Transport Corporation
DTC	Delhi Transport Corporation
INR	Indian Rupees
IPT	Intermediate Para Transit
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
MTC	Metropolitan Transport Corporation (Chennai)
NCR	National Capital Region
STU	State Transport Undertaking

1. INTRODUCTION

Historically, public transportation in India has been largely bus-based. As of 2014-15, an estimated 74% of total passenger-trips in the country were completed by formal public transport services (MoRTH, 2016a), operated mostly by the 62 State-owned Road Transport Corporations (referred to as State Transport Undertakings (STUs) henceforth).

Exponential vehicular growth in India – a 6.2 fold increase (MoRTH, 2016b) in the last two decades – driven primarily by an increase in private vehicle growth, has resulted in reduced traffic speeds and endemic congestion in most cities. Due to the proliferation of single or low-occupancy vehicles, the decline in modal share of public buses is a cause for concern. Increased congestion levels have contributed to the lack of reliability of public bus services. Uncertainty in bus arrival timings and its impact on waiting times at bus stops discourage public bus usage. Though most STUs are financially constrained, some are investing in Intelligent Transport Systems (ITS), including Vehicle Tracking Units and Passenger Information Systems (PIS), to improve the reliability of their services

In parallel, technology start-ups across the country have begun to aggregate privately owned buses, typically seating 20 passengers, to provide transport services. These "Bus Aggregators" typically own no assets other than the Information Technology infrastructure and fare-collection tools, and enter into agreements with private bus owners for operations. Aggregator bus services differ from those offered by STUs by enabling passengers to track bus timings and arrival, and assuring them seating for the duration of their journey.

Aggregator buses have been in service in major cities including Bengaluru, Delhi, Hyderabad and Mumbai, plying along corridors that connect major business or technology parks with residential areas, and operate alongside STU bus services. In Gurgaon, however, aggregators are running services in the absence of a mature public transport network.

The legal framework for aggregator bus services is governed by the Motor Vehicles Act of 1988, the provisions of which pre-date advances in Information Technology. The Act regards aggregators and limits their roles to that of agents in the booking of tickets to travel, rather than system planners in a public transport network. The Act also does not regulate such technology-enabled bus services to best serve the interests of society at large, as described in later sections of this report.

This report finds it important to not view bus aggregators in isolation, but also consider their ramifications for urban Indian society. Towards this end, an initial assessment of the feasibility of bus aggregator services in India is undertaken here, by applying to them the political, economic and social considerations that govern public bus services. The report begins with a comparative analysis of private bus aggregator operations vis-à-vis public bus transit systems as they currently operate. At the same time, bus aggregators may provide alternative service in cities and employment opportunity to several drivers. As such, bus aggregators are currently not subject to the same social and regulatory constraints that STUs are subject to, leading to an unleveled playing field with implications for stakeholders and cities alike.

2. OVERVIEW OF PUBLIC BUS SYSTEMS IN INDIA

The 2011 Census of India found 31.16% of India's population living in urban areas, up 3.35% from the previous census in 2001 (Census of India, 2011). Average trip lengths have increased in cities as economic opportunities, residences, schools and other services are scattered across the city. Table 1 shows the increase in trip length between 2007 and 2011 in cities of different sizes and populations.

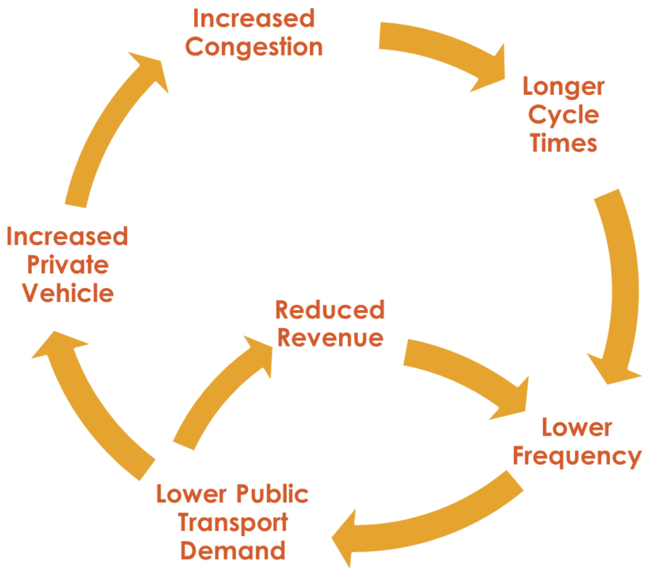
Table 1 Per capita trip rates and trip lengths in Indian cities

Population range (in million)	Per capita trip rate		Motorised trip length (km)	
	2007	2011	2007	2011
Less than 0.5	0.7-0.76	0.7-1.6	1 - 3.5	3.8 - 4.5
0.5 to 1	0.81-1.02	0.36-1.56	2.2 - 3.6	3.5 - 7.2
1 to 2	0.88-1.08	0.93-1.5	4.1 - 6.04	5.8 - 13.8
2 to 4	1.06-1.22	1.02-1.26	3.8 - 7.7	5.6 - 8.03
4 to 8	1.18-1.40	1.23-1.46	7.1 – 10	8 - 11.3
Above 8	1.23-1.36	1.27-1.42	9.3 – 13	11.2 - 15.8

Source: CSTEP (2014)

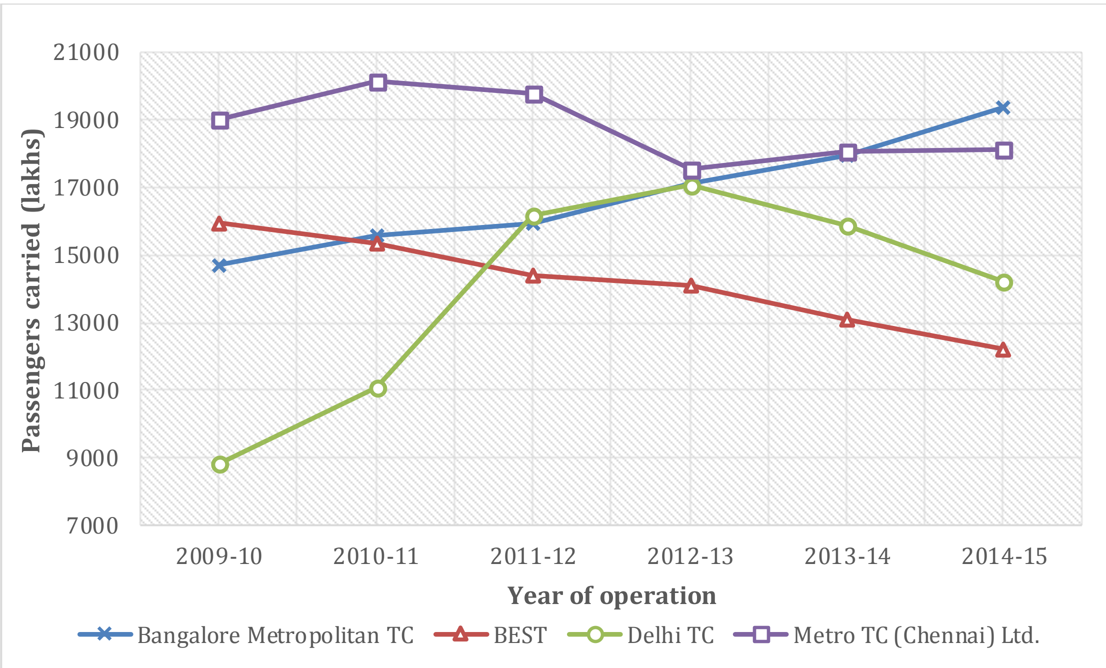
Growing urbanization coupled with rapid motorization has resulted in public transport agencies being caught up in a vicious cycle impacting their efficiency (Figure 1). Increased congestion level across major cities has led to peak hour speeds dropping below 15kmph, thus increasing the cycle lengths of bus operations. As a result, fleet sizes need to be expanded to ensure acceptable frequencies. However, due to limited funding support from governments, STUs have not been able to expand their fleet size and keep pace with growth in cities. In fact, in the last 4 years all major STUs have hardly seen any expansion in their fleet. This has led to decline in their bus ridership. Data available for 2010-15 indicates stagnant or shrinking ridership for three of the four largest metropolitan transport corporations in the country (Figure 2).

Figure 1: Impact of increase in private vehicle ownership



SOURCE: WRI India

Figure 2: Bus ridership of major STUs



SOURCE: Government of India (2016)

In Delhi, both DTC and cluster bus operators combined were only able to supply 5,531 buses on the road against a requirement of 11,000 buses in 2015, a net shortage of almost half the total number of required buses (CAG, 2014). Cluster bus operators are private bus owners providing public bus services on certain route clusters, as allocated in their public-private partnership agreement.

In Bengaluru, despite BMTC's ridership remaining relatively high in comparison with other metropolitan cities, a decline in the modal share of buses is evident (Table 2). Data compiled from various studies over the years show that buses have lost modal share over the years to two wheelers, cars and IPT. BMTC's fleet has been steadily decreasing since 2013-14, as older vehicles are scrapped and not enough new buses have been added to the fleet (BMTC, 2017).

Table 2 Modal share of buses in Bengaluru

Mode of travel	ILFS (1994)	RITES (2002)	Bangalore Mobility Indicators 2011
Bicycle	9.05	2	4.4
Two-wheeler	22.45	36.31	36.8
Car	2.38	5.44	8.8
Bus	**60.19**	**48.91**	**39.7**
Auto-rickshaw	5.28	6.9	10.29
Others/ taxi	0.65	0.44	0

SOURCE: Pangotra and Sharma (2006), UMTC (2011)

2.1 DECLINE IN QUALITY OF BUS SERVICES IN INDIA

Verma et al (2013) used the SERVQUAL framework to study the gaps in quality of service provided by Bangalore Metropolitan Transport Corporation (BMTC), among the country's major State Transport Undertakings (STUs) with service levels comparable with other STUs in the country. Gaps were assessed over five dimensions: Reliability, Responsiveness, Assurance, Empathy and Tangibles, which addressed relevant determinants of quality of service on public buses (Table 3). A gap-analysis conducted as part of their study indicated that BMTC's bus services were perceived to be below passenger expectations across all the five dimensions mentioned.

Table 3 Dimension of Public Transport Service

Dimension	Determinants of Quality of Service assessed
Reliability	Availability of bus schedule and route information, Availability of buses during peak hours, Frequency on routes, network coverage in the city.
Responsiveness	Convenient location of bus stops, Response time to resolve complaints.
Assurance	On board safety, Crew well trained in safety measures, Availability of fire and emergency exits.
Empathy	Seat availability, convenience for the differently abled.
Tangibles	Cleanliness and maintenance of buses and stops

SOURCE: Verma et al (2013)

3. THE BUS AGGREGATOR CONCEPT

Bus aggregator models use algorithms to chart routes based on demands, sourced from potential customers, employee travel data available from major technology parks and current routes of clandestine bus operations in the city. The model allows convenient boarding points for passengers along predetermined routes, providing direct trips to passengers. The model sources demand for a trip through its front-end interface, typically a smartphone application, that allows passengers to reserve and pay for seats for a journey. In addition to seat assurance and electronic payments, the smartphone application also serves as a passenger information system, allowing passengers the real-time tracking of bus schedules and arrival at the nearest stop.

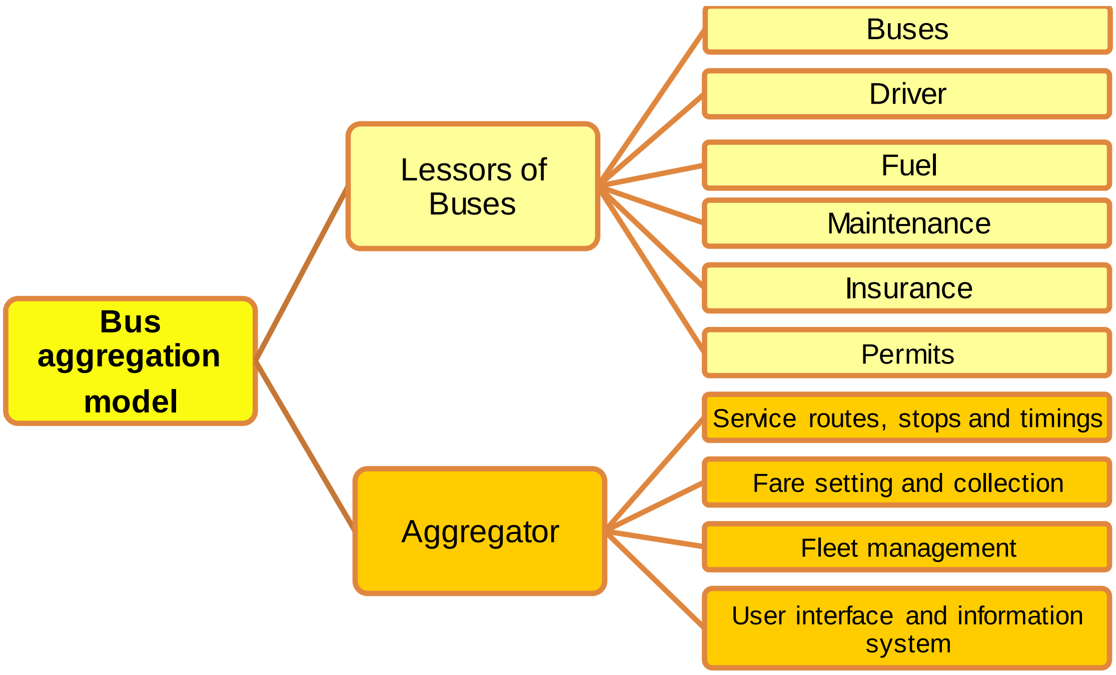
In addition, these buses may be equipped with amenities such as air-conditioning and wireless internet. Further, these buses may also be equipped with CCTV cameras to improve passenger security during the commute, in line with similar measures taken by buses operated by STUs.

The Indian market is served by aggregators including those listed in Table 4.

3.1 BUSINESS MODELS

As the bus aggregator model is still evolving, there are few variations in the market. For instance, San Francisco's Chariot leases its buses and employs its drivers directly, while Singapore's Beeline acts as an aggregator to provide services to its users through existing bus operators. Bus aggregators in India follow the latter, aggregating privately owned buses for the services. Lessors of buses are compensated an agreed sum every month (Source: WRI Phone Interviews with aggregators), for the provision of driver, fuel, vehicle depreciation, maintenance and insurance. Aggregators and bus owners fulfil the roles of system planner and bus operator, as explained in Figure 3.

Figure 3: Roles of Aggregators and Lessors



SOURCE: WRI India

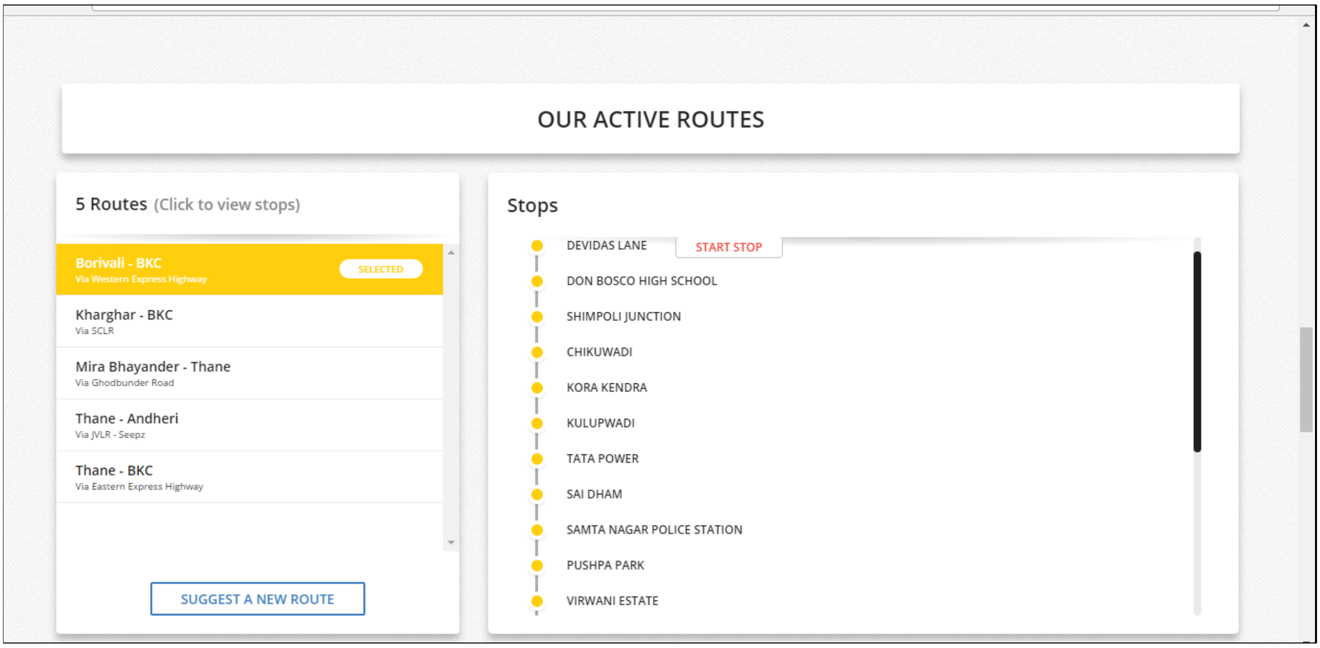
Table 4: Bus aggregators in India

OLA SHUTTLE	cityflo	Shuttl	ZipGo	Commut
Operating in Delhi NCR & Bengaluru	Mumbai	Delhi NCR	Delhi NCR & Bengaluru	Hyderabad
Commenced September 2015	May 2015	April 2015	August 2015	September 2015

SOURCE: WRI India

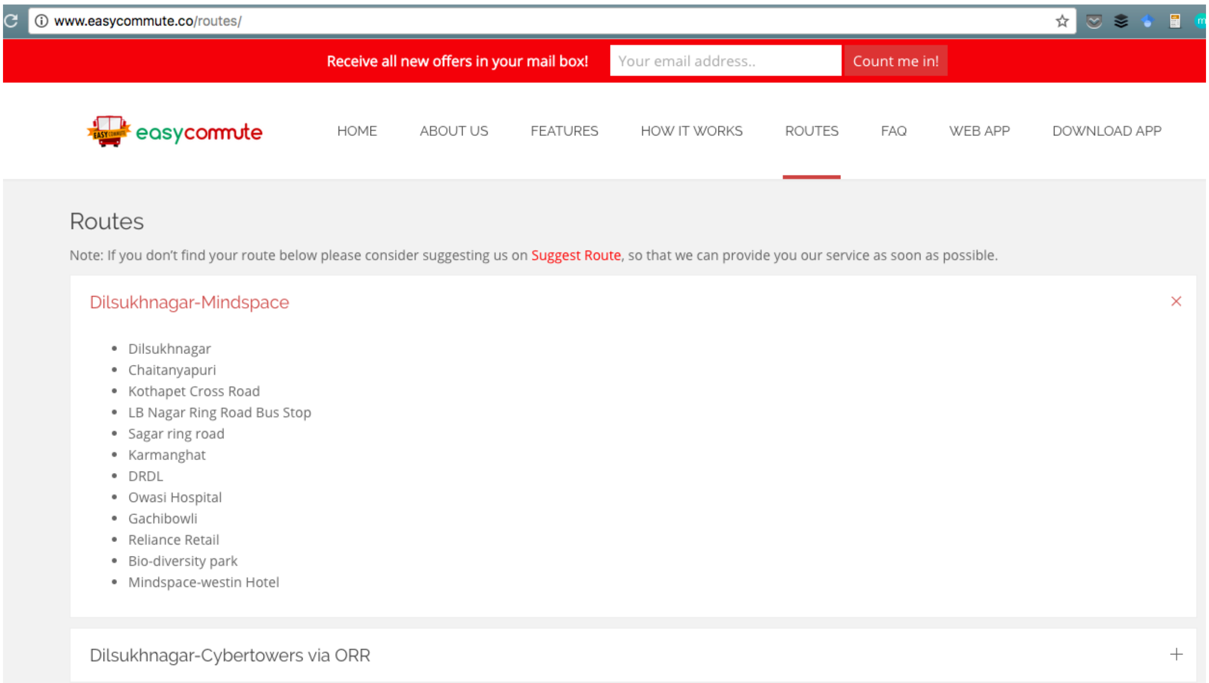
Aggregators in India currently focus on routes linking business and technology hubs in a city. For instance, three of five routes (Cityflo website, February 2017) operated by CityFlo in Mumbai serve Bandra Kurla Complex, a hub for leading businesses and the Stock Exchange.

Figure 4: Aggregator bus service routes – Mumbai



SOURCE: CityFlo website

Figure 5: Aggregator bus service routes – Hyderabad



SOURCE: EasyCommutwebsite

While bus routes are typically chosen based on an estimation of demand through reservations, aggregators have also recently used crowdsourcing schemes.

Buses aggregated thus far have mostly been mini buses, typically seating between 12 and 20 passengers. These buses typically are leased for shorter periods thus the continuation of these services remains questionable.

Some of the features of bus aggregators in India and elsewhere are indicated in Table 5.

Table 5: Features of bus aggregators

Operator	Leap	Beeline	Ola Shuttle	Shuttl
Location	San Francisco, USA	Singapore	Bengaluru & Delhi NCR	Delhi NCR
Seat Assurance	✓	✓	✓	✓
Demand-Responsive Routing	✓P	✓P	×	×
Air-conditioning	✓	✓	✓	✓
Wireless Internet	✓	N/A	N/A	N/A
Passenger Insurance	✓	N/A	N/A	N/A

SOURCE: WRI India;
P = predetermined through demand estimation and crowdsourcing

4. REGULATORY CONSIDERATIONS

Bus aggregator services have been mostly provided by the private sector around the world. While many providers began services, some have terminated operations within months, including Limo in Mumbai. Often the reasons for failure may be traced back to the lack of viability of the business model and regulatory challenges in India. This section provides the regulatory assessment for the operations of bus aggregator services and the view point of key stakeholders. Table 6 describes key stakeholders to define the environment in which bus aggregators operate in India. The influence and perspective of these stakeholders are covered as follows.

Table 6: Mapping Stakeholders in the Bus Aggregator Model

Stakeholder	Role
Transport Department & Regional Transport Authority (RTA)	Issue of licenses, permits and fitness certificates for vehicles; Fare setting; Emission checks; Levying taxes and fees; Setting rules for Parking, etc.
State Transport Undertaking (STU)	Public bus service provision; Route selection for operation of bus services; Ability to form a Special Purpose Vehicle (SPV) or forge partnerships with private sector.
Bus Aggregator	Provision of technology to match passenger demand with supply of buses; Fare collection.
Asset owners	Operation of bus services; Lease of assets including buses to other operators
Commuters	Citizens travelling using services of STUs or Bus Aggregators
Unions	Protection of employee interests in various STUs

SOURCE: WRI India

4.1 MOTOR VEHICLES ACT

Road transportation in India is governed by the Motor Vehicles Act of 1988. The Act classifies public bus services to be of two types based on the nature of service provided: stage carriage or contract carriage (Table 7).

Table 7: Public bus types in India

A "*stage carriage* means a motor vehicle constructed or adapted to carry more than six passengers excluding the driver for hire or reward at separate fares paid by or for individual passengers, either for the whole journey or for stages of the journey".

- Section 2(40) of Motor Vehicles Act, 1988

A "*contract carriage* means a motor vehicle which carries a passenger or passengers for hire or reward and is engaged under a contract, whether expressed or implied, for the use of such vehicle as a whole for the carriage of passengers mentioned therein and entered into by a person with a holder of a permit in relation to such vehicle or any person authorized by him in this behalf on a fixed or an agreed rate or sum –

(a) on a time basis, whether or not with reference to any route or distance; or
(b) from one point to another,

and in either case, without stopping to pick up or set down passengers not included in the contract anywhere during the journey, and includes –

(i) a maxicab; and
(ii) a motorcab notwithstanding that separate fares are charged for its passengers"

- Section 2 (7) of Motor Vehicles Act, 1988

Permits to operate stage carriage services are mostly reserved for STUs in major Indian cities including Bengaluru, Chennai and Mumbai. This has been deemed essential by Courts to prevent uneconomic competition from impacting essential public services. An example may be found in the Supreme Court ruling (BA Lingareddy vs KSRTC) discussed below:

In October 1962, the Karnataka State Road Transport Corporation (KSRTC) notified the Bellary Scheme by which the Corporation proposed operating stage carriage services on the 86 routes in the Bellary sector. The notification was approved and subsequently published by the State Government in the gazette, providing for the operation of stage carriages by STUs only and allowed no exemptions.

There were however, stage carriage permit holders other than the STUs before and at the time of such a gazette notification. The Bellary scheme was modified in 1980 to allow such permit holders to operate stage carriages on routes that did not overlap the 86 notified by the scheme.

Subsequently, a case in the Supreme Court of India – BA Lingareddy vs KSRTC- set out to quash the orders modifying the Bellary Scheme awarding monopoly to the Bangalore Metropolitan Transport Corporation (BMTC), the successor of KSRTC in operating stage- carriages in Bengaluru. As such, under the current scenario, a private operator will not be granted a stage carriage permit under ordinary circumstances.

Privately owned buses are, therefore, mostly awarded permits to operate contract carriage services. Under this permit, aggregator bus services may not stop en route to pick up or set down passengers, a practice indicated by the route details published on their webpages (Figures 4 & 5). As learnt from multiple interactions, however, STUs share a view that bus aggregator services currently halt at various points along a route to pick up or set down passengers.

In such cases, Regional Transport Authorities have been instrumental in suspending aggregator services citing their violation of the STU monopoly. Such a situation may be the result of a subjective interpretation of the contract carriage definition (Table-7).

The Contract Carriage definition,

- Requires transport operators to enter a contract with passengers, who are to be transported from one destination to another.
- Does not allow those not party to the contract to be picked up or set down en route.

The ambiguity in this definition lies in the nature and validity of the contract mentioned. While a contract may be any agreement, expressed or implied, between passengers and a transport service provider, the definition lacks clarity on the number of contracts that may be entered into.

Clarity on the issue may be found in the Supreme Court's ruling in The State of Andhra Pradesh vs B.Noorullla Khan, which states that the words "under a contract" in Sec 2(7) of the Act refer to a single contract made for the vehicle as a whole, that is under 'a contract'. It remains valid from the time of departure of the public service vehicle from its origin, to its arrival at the stated destination. The creation of a second contract with a new passenger en route, therefore, would conclude the validity of the initial contract. In such a case, picking up new passengers from different points along the route would amount to operating as a stage carriage.

While aggregators may not be creating multiple contracts and may only allow the boarding or alighting of passengers included in the initial contract, RTAs have been challenged in the monitoring of operations. In the absence of regulation requiring transparency from the aggregators, therefore, the possibility of creation of multiple contracts has been linked to the violation of the stage carriage monopoly granted to STUs, serving as grounds for the suspension of aggregator services.

Private buses may, however, apply for a stage carriage permit where STUs have not been granted exclusive rights to operate public transport. Examples include Delhi and smaller cities such as Coimbatore.

4.1.1 VIEWS OF STUS

Opinions on the potential impact of bus aggregator services have been mixed across the country. While STUs in some cities, such as Jaipur, have initiated assessments to study the ability of bus aggregator services to reduce road congestion and urban pollution, others view the model as a challenge to their operations. In Bengaluru and Mumbai, bus aggregator services have been perceived as a direct competition to their city bus operations. This resulted in STUs urging the transport departments in the states of Karnataka and Maharashtra to suspend these services (Bhat and Bharadwaj, 2015; Korde, 2016).

All major STUs operate air-conditioned bus services to improve comfort levels for passengers and encourage private vehicles users to shift to buses. The fleet allocation by major STUs is listed in Table 8.

Table 8: STU bus fleets by type

STU	Total Fleet	Premium buses	Premium fleet %
BEST	4143	262	**6.32**
BMTC	6169	650	**10.54**
DTC	4501	1223	**27.17**
MTC	4032	97	**2.40**

SOURCE: Interviews with STUs

While small in proportion, demand for premium public transport is restricted primarily to routes linking key business and technology hubs in a city to residential districts. Focus group discussions (Appendix-1) conducted as part of the research for this paper indicated that STUs were concerned about the detrimental financial impact of a rise in capacity along premium routes due to aggregator services. In many cities, premium routes are the profit-making routes for STUs that help in cross subsidizing the services along regular routes serving low income communities. The rationale behind the concern is due to comparable fares presented in Fig-7 of this report.

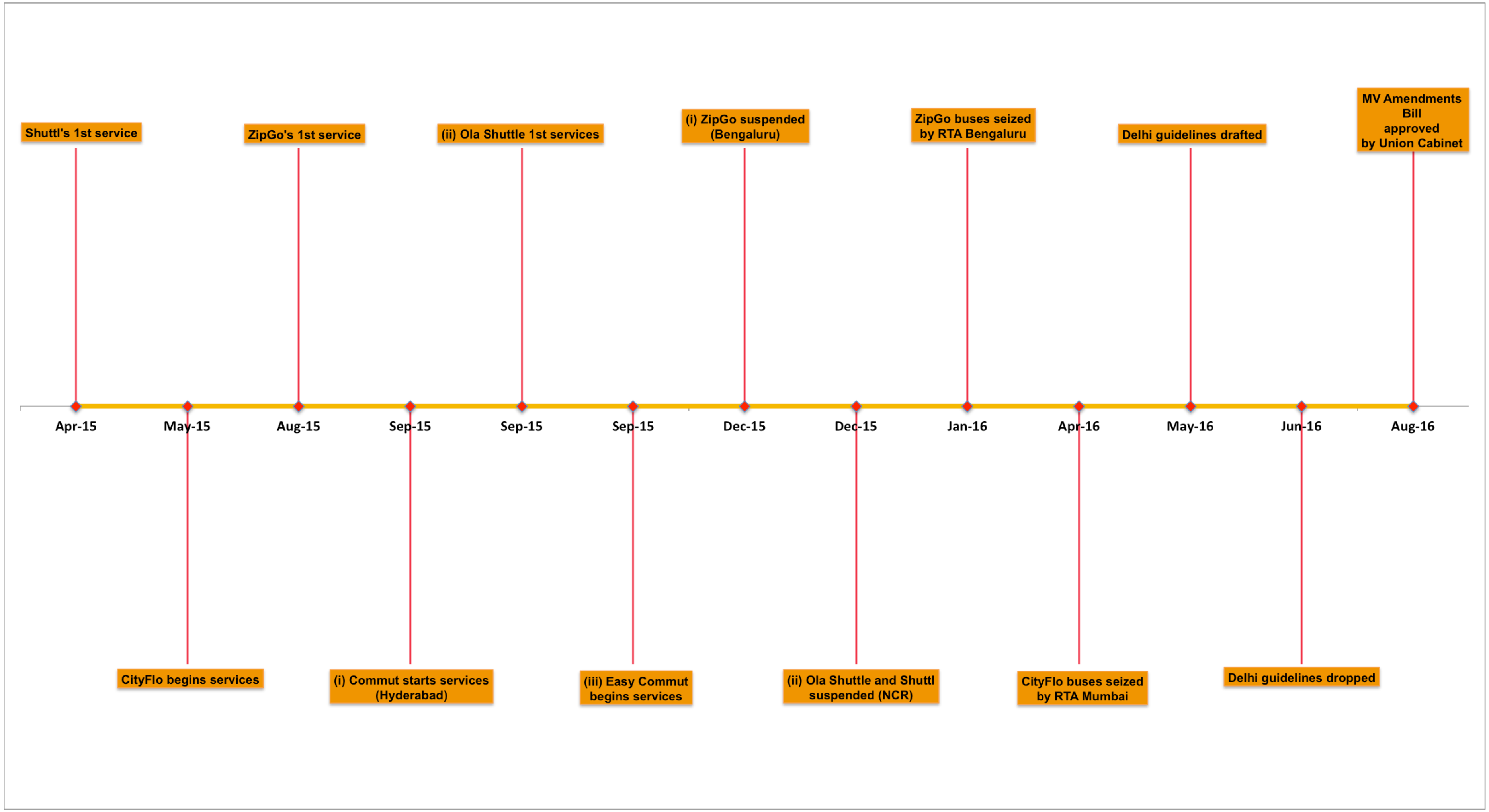
STUs, however, recognize a potential to regulate clandestine stage carriage bus operations through aggregators. Clandestine bus services are typically contract carriage permit holders operating stage carriage services to complement earnings from their regular operations. The existence of such services may reflect the unmet demand in the city by STU services. As clandestine services are often the services aggregated, STUs share an opinion that they may be regulated through partnerships with Aggregators (Appendix-1).

4.1.2 VIEWS OF AGGREGATORS

Aggregators stress on compliance with the contract carriage permit with the claim that most of their boarding and alighting of passengers happens only within the first and last few kilometers of the journey and not during the entire journey. Their other contention is that passengers are not hailed on-road and the operator has information about the passengers before the beginning of the journey as required under the contract carriage permit.

Further, the aggregators contend their services are on routes that have unmet passenger demand that may rely on private vehicles, thus contributing to congestion. In view of their potential to alleviate congestion in such cases, the aggregators seek clarity on regulations, the ambiguity in which has led to their services being suspended. Both claims, however, may be questionable, as understood from the route and stop information offered on the webpages of aggregators (Fig-4 and Fig-5) and route information published by STUs.

Figure 6: Bus aggregation in India: A Timeline



SOURCE: WRI India

4.1.3 RECENT REGULATION

The recognition of bus aggregators as an evolution of conventional bus systems, with potential to reduce urban road congestion, has resulted in the following government-led initiatives to regulate the model:

- Rules for aggregators in the Road Transport Safety Bill 2015
- App-based Premium Bus Scheme formulated by the Government of Delhi

Though neither are in effect at the time of writing this report, for reasons described below, these rules reflect the views of governments and provide an idea of what might be expected from future regulation.

Regulation of bus aggregators may be essential to create a level playing field in the provision of urban public bus services, as aggregators and STUs currently face different regulations (Table 9). As existing rules favor one provider of public buses over another in various instances, the consequences for urban society makes the case for regulation.

Table 9: Regulatory constraints for STUs and bus aggregators

Regulation	Stage Carriage	Contract Carriage
Fare Setting	✓	×
Route Selection (While applying for permits)	✓	×+
Timetable Adherence (On record)	✓	×
Minimum Service Obligations	✓	×
Vehicle Insurance	✓*	✓
Vehicle Fitness Certification	✓	✓

SOURCE: WRI India.
+ = Contract Carriage application requires areas of operation to be specified
* = STUs may be exempt under Section 146 of the Motor Vehicles Act of 1988

Road Transport and Safety Bill 2015

In 2015, the Ministry of Road Transport and Highways drafted the Road Transport and Safety Bill (RTSB). Primarily concerned with various aspects of improving road safety, the bill address contemporary issues with public transport, as part of which it defines the role of aggregators.

As per the definition, aggregators are 'digital intermediaries or marketplace for a passenger to connect with a driver' of a passenger vehicle, who may not own or lease vehicles themselves, or employ drivers unless they register themselves to be 'taxi operators' (Section 3(40) of the RTSB, 2015).

Further, Section 160 of the draft sets out guidelines for improving transparency in aggregator operations. Aggregators are directed to share the following information with transport authorities:

- Number of trips operated and passengers served
- Fare structure used
- Scheduled and effective kilometers operated.

While Section 93 of the Motor Vehicles Act of 1988 treats aggregators as agents in the sale of tickets for travel on buses, Section 3(40) of the RTSB 2015 defines aggregators and the manner in which they may conduct their operations. Section 160, however, may not result in the transparency required to conclusively establish any violation of stage carriage monopoly as described in Section 4.1.2 of this brief. The Bill also recommends the drafting of national standards for vehicle safety (Section 50) following relevant stakeholder consultation, which may impact aggregator and STU bus operations.

The Road Transport and Safety Bill 2015 was introduced at Parliament in August 2016, when it was cleared by the Union Cabinet. Its provisions are yet to come into force at the time of writing this paper, as the bill awaits being passed into law by the Parliament.

App-based Premium Bus Services Scheme 2016

The Scheme for App-based Premium Bus services, drafted by the Government of the National Capital Territory of Delhi in May 2016, was premised on limitations of conventional bus services in encouraging private vehicle use, the growth of which had resulted in congestion and air pollution in the National Capital Territory. Bus aggregator services were viewed as a means of reducing private vehicle dependence.

The scheme was to apply to all contract and stage carriage buses in the region that an aggregator or provider of information technology services could connect passengers with. Aggregators were directed to 'engage at least 50 premium buses' and determine the routes on which they may ply. Fares were to be determined by the market and regulated by the government only if a need arose to prevent predatory pricing.

Passengers and aggregators were required to enter a contract, for the use of a premium bus in whole and not a part. The latter were directed to post a 'passenger manifest' on their web-based applications no later than five minutes prior to the commencement of a service. This would prevent any disagreements between transport authorities and aggregators with regards to the creation of contracts under Sec 2(7) of the Motor Vehicles Act of 1988.

The guidelines also set standards for operations under various circumstances. In the event of a breakdown of a premium bus, for instance, the guidelines recommended aggregators arrange alternative modes for the completion of the trip, or risk incurring a penalty. For ensuring the safety of women, aggregators were to enable a 'panic button' on their mobile application.

Through the publishing of these guidelines, the Government of National Capital Territory of Delhi formally recognized bus aggregator services as a requirement for large cities. These guidelines, however, did not address a few issues crucial for the efficient operation of app-based premium buses:

- Prevention of competition between bus aggregators and conventional bus operators.
- Optimum fare setting recommendations.
- Service level benchmarks
- Sharing of specific data to enable future improvements of public transport

For political reasons beyond the scope of this paper, the guidelines did not come into force on the date mentioned therein. No such guidelines have since been published by other state governments for the implementation of bus aggregator services in their cities.

4.2 ECONOMIC CONSIDERATIONS

At the time of compiling this report, aggregators have been in operation for two years in various Indian cities. While gaps in conventional public transport service quality may explain the demand for aggregator services, sustained service provisions may also be attributed to lower costs of operations in comparison with STUs.

4.2.1 COST OF OPERATIONS

With the exception of Gurgaon, bus aggregators in India operate in cities with mature public transport networks. In the absence of partnerships in such an environment, lower costs of operations play a significant role in sustaining operations, which aggregators have been able to achieve with the use of mini buses and technology, and through their business model.
The differences in costs of operations between STUs and aggregators may be understood as follows:

Table 10: Costs of Operation (per km) for various public transport providers

STU	BEST	BMTC	DTC	Private Operator*	Aggregator^
Staff	₹ 53.68 (30.4%)	₹ 26.14 (34.1%)	₹ 35.57 (46.1%)	₹ 17.45 (38.3%)	₹ 5 (17.2%)
Fuel	₹ 22.87 (13%)	₹ 24.28 (31.6%)	₹ 18.47 (23.9%)	₹ 16.57 (36.4%)	₹ 8.57 (29.5%)
Maintenance	₹ 17.75 (10%)	₹ 8.91 (11.6%)	N/A	₹ 5 (11%)	₹ 4 (13.8%)
Depreciation	₹ 18.08 (10.2%)	₹ 7.95 (10.3%)	₹ 10.21 (6.6%)	₹ 6.21 (13.6%)	₹ 4 (13.8%)
Tax	N/A	₹ 3.63 (4.7%)	₹ 0.59 (0.07%)	₹ 0.27 (0.6%)	₹ 3.87 (13.3%)
Other Costs**	₹ 77.35 (43.8%)	₹ 5.74 (7.4%)	N/A	Nil	₹ 3.56 (12.3%)
TOTAL	**₹ 176.29**	**₹ 76.65**	**₹ 77.02**	**₹ 45.50**	**₹ 29**
Bus Type (seats)	Standard-sized (42)	Standard-sized (42)	Standard-sized (42)	Standard-sized (42)	Mini bus (20)
CPKM per seat	₹ 4.19	₹ 1.82	₹ 1.85	₹ 1.08	₹ 1.45

SOURCES: Interviews with BEST, BMTC DTC and Aggregator in Bengaluru;
* = Public-Private Partnership in Bhopal;
^ = Aggregator; CPKM = Costs per Kilometer;
**= Other costs for STUs include interest on capital expenditure. Similarly, aggregators incur technology and marketing costs.

Table 10 describes the costs incurred by various public bus operators for every kilometer of service provided. While the total cost of operations per kilometer for aggregators was confirmed through interviews, its breakdown was deduced using market averages, tax guidelines and standard practices in computing fuel consumption and depreciation. The assumptions made in this regard, including the technology costs involved in the bus aggregator model, are presented later in this section, where the viability of the bus aggregator model is assessed. Other costs and savings for aggregators may be further understood through the following assessment of individual cost components listed in the table. These assessments reflect lower costs incurred by aggregators when compared with STUs, as indicated by the cost per kilometer per seat in the table above.

Crew and Staff Costs

While STUs and other conventional bus service providers employ a crew of two personnel per bus: a driver and a conductor, the use of technology enables bus aggregators to eliminate the need for a conductor. In addition, wages paid to the drivers for aggregator services do not include welfare components that are standard provisions at STUs (Table 11)

Table 11: Standard employee benefits included in STU crew wages

Though there may be variations at different STUs, the following benefits are among those offered to employees, including the bus driver and conductor:	
▪ Provident Fund	▪ Children's education allowance
▪ House Rent Allowance	▪ Dearness Allowance
▪ Free health check ups	▪ Rewards for safe driving
▪ Contributions to pension	▪ Incentives for fuel saving

SOURCE: Interviews with STUs

Further, the staff requirements of STUs are higher to support their citywide operations and due to the shift system used to provide extended hours of service. These include driver trainers, maintenance workshop staff, lawyers and public relations staff. Currently, Aggregators are not involved in any maintenance of buses and may require fewer human resources given their smaller scale of operations and business model, which places the responsibility of vehicle maintenance on its owners.

Fuel Efficiency

Among the many factors influencing the fuel efficiency of a vehicle, its size and the nature of operations play a significant role. Physical parameters such as vehicle weight and vehicle load significantly impact the fuel efficiency of a vehicle, with fuel consumption increasing with weight. (Pelkmans et al, 2001: 657). While STUs provide premium public transport services on standard-sized buses seating over 40 passengers, aggregator services have thus far been run on lighter, mini buses with about 20 seats that have higher fuel efficiency.

Table 12: Fuel consumption of various buses

Bus Type	Fuel Consumption	
	km per litre	ml per seat km
Standard-sized (42 seats), air-conditioned bus	2 - 2.5	9.5 – 12 ml
Standard-sized, regular bus	3.5 - 4	6 – 6.80 ml
Mini bus (20 seats), air-conditioned	8 - 9	5.5 – 6.25 ml

SOURCE: Interviews

Though the mini buses used by aggregators may consume less fuel per kilometer run (Table-12), fuel consumed by such buses on a per seat kilometer basis appears to significantly reduce any cost savings in comparison with STU operated bus services.

Maintenance Costs

Table 13 shows the average daily kilometers' usage of buses by leading STUs in the country. High usage of buses in urban areas increases costs due to frequent spare parts, tyre and battery replacements. The purchase of spares from original equipment manufacturers (OEM), and the cost of in-house maintenance by STUs keeps their costs high in comparison to bus aggregators, who are not responsible for any maintenance today. The distance covered by an aggregator bus each day may be understood from relevant costs as shown in Table 17.

Table 13: Vehicle Productivity at STUs

STU	2014-15 (Kms/day)
BEST	157.29
BMTC	194.02
DTC	158.04
MTC	254.27

SOURCE: MoRTH (2016c)

Depreciation

High usage of buses by STUs also impacts their depreciation. Depreciation of buses is measured from the cost of a vehicle and the distance it covers in 8 years, which is the useful life of a bus as prescribed by the Companies Act of 2013. Useful life is the time period over which an asset, in this case a bus, may be available for use. Therefore,

Depreciation = P/[M x 12months x 8years]
Where,
P = price of the bus, and M = monthly usage of a bus, in Kilometers.

Currently, bus aggregators operate fewer kilometers each day compared to STUs, and mini buses used by aggregators cost less (Rs.10-15 lakhs) than standard-sized buses (Rs.35-40 lakhs) used by STUs. From the formula above, therefore, it may be noted that STU-operated buses face higher depreciation costs, thus increasing the overall cost of operations.

Taxation

The assessment of the impact of taxation on cost comparisons between STU and aggregator services may not be as direct as the other components discussed above. With states responsible for its setting, Motor Vehicles Tax varies from one state to another, both by rate and method of computation. Taxation also varies for stage and contract carriages.

For instance, while the tax rate for contract carriage buses with more than 12 seats is set at ₹ 1500 quarterly per seat (Transport Department, 2017) in Karnataka, it is set at ₹ 1700 annually per seat in Maharashtra, if the vehicle seats fewer than 25 passengers (Motor Vehicles Department, 2017). For STU operated stage carriage buses, on the other hand, Karnataka and Maharashtra tax ₹ 3957 and ₹ 71 annually per seat (Motor Vehicles Department, 2017) respectively.

Table 14: Annual taxation for Karnataka and Maharashtra

Permit Type	Karnataka	Maharashtra
Contract Carriage, per bus*	₹ 252,000	₹ 79,800
Contract Carriage, per mini bus	₹ 120,000	₹ 34,000
Stage Carriage, per bus*	₹ 166,194	₹ 2982

SOURCE: Transport Department (2017); Motor Vehicles Department (2017);
* = standard-sized bus with 42 seats; mini bus assumed here to seat 20 passengers.

As indicated by Table-14, though STU operated stage carriage buses appear to be taxed less in general, Aggregators pay less in tax per contract carriage minibus operated in Bengaluru. The tax environment may, therefore, favor the aggregators depending on the state where operations are based. The periodic revision of tax rates applicable in various states limits this paper's ability to make long-term projections.

4.2.2 VIABILITY OF OPERATIONS

The viability of their business model holds key to the future of aggregator bus services in India. Aggregators have thus far leased privately owned buses for an agreed period and sum, the details of which have been confirmed through interviews and secondary sources. This information is used here to derive relevant costs to ascertain the viability of aggregator bus operations for both stakeholders: the technology providers or aggregators, and the owners of buses. Table 15 details the assumptions made and calculations performed.

Table 15: Viability of aggregator bus services

1. **Known Variables:**

   (i) Costs per Kilometre (CPKM) of operating a 20-seater mini bus: ₹29
   (ii) Amount paid to Lessors of buses, per month (as learnt from interviews with aggregators): ₹75,000

2. **Assumptions made:**

   (a) Average trip length: calculated from routes operated by aggregators in Bengaluru

   (b) Fare range for a trip length of 25kms: estimates from aggregator websites; assumption made to be ₹100 in light of dynamic fares used.
   (c) Cost of High Speed Diesel (HSD) assumed to be ₹60 per litre.
   (d) Maintenance costs (₹4 per kilometer) & Insurance per month per bus (₹1250) derived from market average.
   (e) Driver wages (₹15,000 per month) derived from market average.

   (f) Admin costs for aggregators:

   - Number of employees assumed to be 20.

   - Average salary of employees assumed to be ₹500,000 annually.
   - assuming 50 buses leased, admin costs per bus per month estimated to be:
   [(500,000 x 20)/12]/50 = ₹16,667 …(iii)

   (g) Dead kilometres assumed to be 25% of total distance covered per day.

   (h) Depreciation: P/(Mx12x8), as described in Section 4.2.1. Here, P = price of mini bus, which market estimates indicate to be around ₹10,00,000.

3. **Viability for Aggregators:**

   From (i) and (ii), kilometers paid for per bus = 2586.21km

   Therefore, daily kilometers paid for per bus = 99.47km

   From (a), average trip length = 25km.

   Accounting for dead kilometers (g), number of revenue trips per bus per day = 3 trips.

   Revenue required per trip to break even = [(ii + iii)/30]/3 = ₹1018.52

   From (b), load factor per trip required for aggregator to break even = 51%

4. Viability for Bus Owners:
   If fuel economy is 7kmpl, fuel required to cover 2586.21km = 369.45 litres.
   From (c), cost of fuel = ₹22167
   From (h), Depreciation per km = ₹10,00,000/ (2586.21x12x8) = ₹4.02
   Therefore, Depreciation per month = ₹10396.56

   Total costs for bus owners = 22167 + 10396.56 + 15,000 + 1250 + (2586.21 x 4) = ₹59158.40

SOURCE: Interviews with aggregators; WRI India

Calculations based on the information available indicate a profit per bus for its owners, and a bus over half full for the length of a trip as a requirement for aggregators to recover costs. These costs are before the computation of tax, which if included may impact breakeven loads required for profitability depending on the State in which operations are based. The calculations here have not taken into account the technology costs incurred by aggregators.

4.2.3 SERVICE OPERATIONS

The viability assessment presented above reflects the current regulatory environment where aggregators have not been expected to fulfill minimum service obligations, offer alternative arrangements in the event of breakdown en route, or adhere to schedules. Aggregators are currently not bound by regulation to provide services throughout the day and may restrict operations only to peak hours or cancel a trip if adequate seats have not been booked.

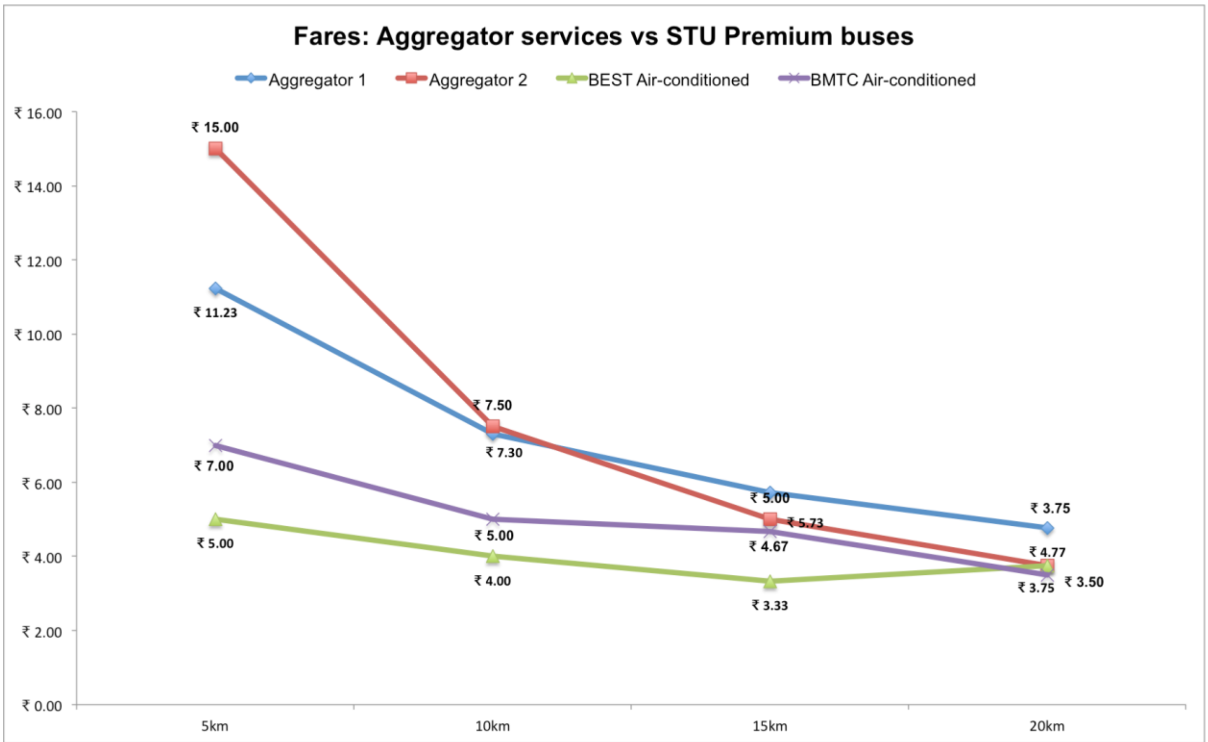
STUs, on the other hand, are required to operate services regardless of demand or the time of the day, which increases their fleet and manpower requirements. Such differences in operations allow aggregators to keep costs low.

4.2.4 FARES

As the Delhi government's Scheme for App-based Premium bus services noted, bus aggregator services have the potential to shift users of single occupancy vehicles to mass transit and help alleviate urban road congestion. While the ride comfort offered by bus aggregator services may be attractive it is yet to be seen if private vehicle users will switch to these services.

Figure 7 and Figure 8 compare fares on aggregator bus services with other modes of urban transport. This comparison uses average costs of usage of shared taxis, two-wheelers and hatchback cars, which were determined through inputs from respective users.

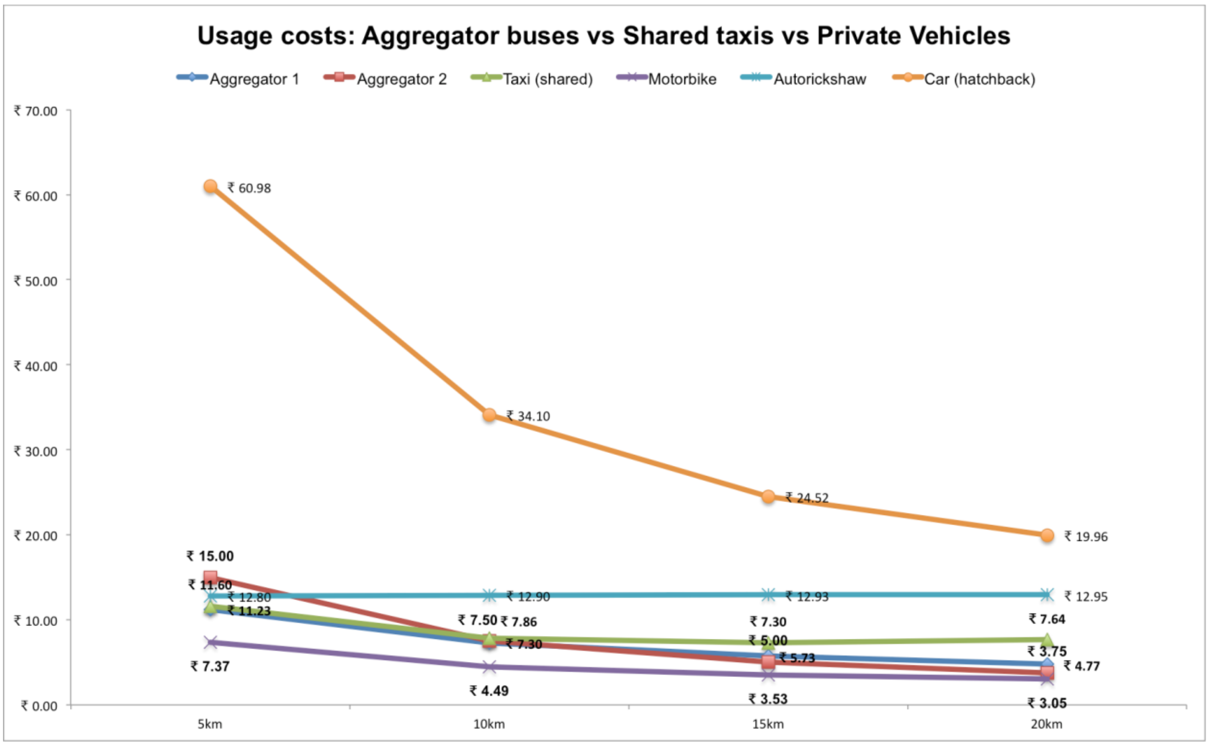
Figure 7: Fare comparison of bus aggregator with STU premium buses



SOURCE: WRI India

The pricing of bus aggregator services may currently be located in Indian cities between air-conditioned STU bus services and shared taxi services. For the first 10 kilometers of a journey, however, bus aggregator fares and shared taxi fares have been found to be similar.

Figure 8: Fare comparison of bus aggregators with private vehicles



SOURCE: WRI India

While these shared taxis and bus aggregators compete for demand from the users of cars and taxis, their ability to shift users of two-wheelers appears to be limited only on the basis of cost comparisons.

4.3 SOCIAL CONSIDERATION

State Transport Undertakings fulfill the social obligation of providing essential transport links in Indian cities. Yet the national discourse on the bus aggregator subject has been limited to regulatory issues without taking into consideration the social concerns. This section seeks to introduce such concerns to discussions on aggregator bus services through the following issues.

4.3.1 DRIVER WAGES

In addition to the basic salary, State Transport Undertakings provide benefits including medical allowances, insurance and pension contributions (Table 16) to their drivers, and other staff. As per their current business model, the private sector may not extend these benefits to their drivers. However, it is possible that drivers of aggregator services may be paid higher wages compared to drivers of informal public transport services, which will be confirmed through surveys.

Table 16: Wages and benefits for bus drivers

Operator	Basic Pay (monthly)	Pension	Gratuity	Annual Increments
BMTC	₹ 15,000	✓	✓	✓
Private Operator	₹ 17,000	✓	✓	✓
Aggregators	₹ 13000-15000	✓	×	×

SOURCE: Interviews, Purple Bhopal webpage

4.3.2 RISKS FOR LESSORS

The model may leave bus owners in a similar financial predicament as drivers. While bus owners are compensated monthly by aggregators, the tenure of the lease for the bus may be impacted by estimation of future demand and political risks (Section 4.1).

Uncertainty in the extension or renewal of leases poses risks for lessors, who may be liable to the debt incurred on assets such as their buses. These constraints may, in turn, impact the salary paid to drivers by bus owners.

4.3.3 PASSENGER SAFETY AND SECURITY

Bus aggregators in India and around the world are equipped with provisions that ensure the security of passengers. Passenger information collected during ticket reservation could be used to ensure their accountability while CCTVs installed could enhance security. In the matter of passenger safety during a commute, however, it remains uncertain if bus aggregators offer passenger insurance, which is standard on similar services in other countries.

State Transport Undertakings, on the other hand, have policies and procedures in place to compensate passengers in the event of an accident (Table 17). Some STUs might offer insurance as part of their monthly passes. For instance, BMTC offers insurance covers amounting to ₹ 1, 00,000 and ₹ 5, 00,000 to their daily and monthly pass holders respectively (BMTC, 2017).

Table 17: Accident Compensation paid by STUs

Year	BMTC		BEST	
	Cases Compensated	Amount Paid (Crore INR)	Cases Compensated	Amount Paid (Crore INR)
2012-13	18	0.24	257	4.49
2013-14	76	1.76	231	5.13
2014-15	135	4.12	353	7.31

SOURCES: Interviews with STUs

While Chapter XI of the Motor Vehicles Act (1988) requires an insurance cover for a vehicle and passengers, verification may occur only during the grant of a permit for the vehicle. In the absence of periodic checks or verifications, private operators of bus services may not be sufficiently incentivized to offer passenger insurance due to the additional costs involved in its provision.

4.3.4 VEHICLE MAINTENANCE

The maintenance of public buses has implications for both the owners of the bus and its users or passengers. Poor maintenance can result in disruption of public transport services due to frequent breakdowns, which add to the costs of the owners of the bus.

Proper maintenance is also required to maintain optimum fuel efficiency of the vehicle (Vasudevan and Mulukutla, 2014). While major State Transport Undertakings in India have developed in-house capabilities to ensure the proper maintenance of buses, the bus aggregator model limits itself to the allocation of costs for maintenance.

The frequency of bus maintenance is determined based on a number of factors including distance covered, hours of operations, period between maintenance checks, and fuel consumption. While compensating bus owners for maintenance, the bus aggregator model, in its current form, may not explicitly bind bus owners to such maintenance schedules, presenting setbacks for bus owners and passengers.

4.3.5 STOPS AND PARKING

The bus aggregator model similarly lacks clear guidelines for the stopping of buses en route, and their parking when not in use. While STU operated buses are bound by Section 72 of the Motor Vehicles Act of 1988 to stop only at specified locations, bus aggregator services may stop at random along their routes. This could result in obstruction to road access and impact road safety especially where intersections and turnings are involved.

Similarly, while State Transport Undertakings have invested in depots to park their buses when not in use, the bus aggregator model currently relies on the availability of space on the sides of major roads and residential streets in a city, as bus owners may not own or have access to shelters.

4.3.6 CONGESTION AND ENVIRONMENT

As discussed earlier in Section 4.2.4, current fare levels on aggregator services are well suited to incentivize a shift of car users to mass transit. The same, however, may not be true for those using motorbikes for their daily commute. As such, the ability of bus aggregator services to reduce single occupancy vehicle trips and, therefore, alleviate road congestion and mitigate air pollution remains unclear due to their current scale of operations. Table 18 presents the summary of various challenges for the different public bus providers in India.

Table 18: Challenges for public bus providers in Indian cities

	STU	Aggregator
Regulatory Compliance		
License	Licensed by State	Procured as per Sec 93 of the Motor Vehicles Act of 1988
Permit	May benefit from monopoly	Constraints vary by state
Fare Setting	↓	↑
Minimum Service Obligations	↓	↑
Economic Challenges		
CPKM	↓	↑
Fares	↓	↑
Taxation	↓	↑*
Social Impact		
on Congestion	PT usage alleviates congestion	**?**
on Emissions	PT usage combines trips, reducing emissions	**?**
Employee welfare	↑	↓

SOURCE: WRI India;
↑ = favoured/favours; ↓ = constrained/does not favour;
? = unknown; * = varies by state

5. WAY FORWARD

It is widely known that cities across the country require bus fleet augmentation. In this context, regulation of bus aggregation could address the concerns described in Section 4 of this paper and thus safeguard the interest of all relevant stakeholders.

From the perspective of the road space occupied per person and fuel consumed per person kilometer both the bus aggregator model and the STU operations are comparable. Hence, aggregator model could support fleet augmentation in cities and lead to a sustainable alternative over personal modes. However, it needs to be seen if these operations are complementing the STU operations.

The addition of a technology layer to public transit is welcome, as it allows for improving the efficiency in demand management and overall customer experience. Providing affordable transport services with alternative options for the citizens should be of prime importance. The paper calls for further research and dialogue between various stakeholders to provide bus services that are accessible to all.

The next steps could focus on the regulatory framework for public-private partnerships. Impact analysis based on data from aggregators will help in framing the regulations around minimum service level benchmarks and contracting procedures for bus operations by the aggregators, and maintenance norms of buses for ensuring passenger safety thus improving the overall service provision in a city.

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7. APPENDIX

WRI India organized two meetings of regulators, STUs and entrepreneurs – first in April 2016 in New Delhi, then in Mumbai in August 2016 – to discuss bus aggregation and its impact on Indian cities.

The discussions were attended by major STUs such as BMTC, BEST and DTC, regulators such as Gurgaon and Mumbai Regional Transport Offices, and representatives from aggregator firms. The discussions enabled the expressing of concerns and exploring the prospects of possible collaborations between STUs and Aggregators.

While there was consensus on the need to rethink stage and contract carriage provisions in light of new developments such as technology-enabled aggregator buses, regulators expressed concerns of competition on routes where both operators provided services. As premium services operated by STUs were not always profitable, the increase in premium capacity with aggregator services on the same routes was a cause for concern for STUs.

The second meeting in Mumbai focused on the potential for collaboration as previously mentioned. The financial limitations of STUs, their challenges in investing in technology, and the ability of collaborations to prevent competition were viewed as reasons to engage with aggregators. This agreement was followed by discussions on aspects of aggregator bus operations such as fare setting and the impact of dynamic or surge pricing, consistency of service in peak and off-peak hours, and the potential of aggregators to regulate clandestine bus operations. STUs shared the view that some clandestine bus operations in cities like Bengaluru were carried out using mini buses similar to those used for aggregator operations, enabling the legitimization of such services through a collaboration.

The discussions, however, ended without a consensus on dynamic routing, or the demand-based altering of route along the journey. While some viewed the feature to be essential in serving demand, some were concerned about its impact on existing bus services.