

Example - BMTC





About us



Shakti Sustainable Energy Foundation was established in 2009 to support India's developmental and energy security objectives. We work towards facilitating India's transition to a sustainable energy future by promoting policies that encourage renewable energy, energy efficiency and sustainable transport

SGArchitects

SGArchitects was established in 2006 and provides consultancy services in the field of sustainable urban transport including public and non-motorized transport. We provide expertise in research, planning and implementation for all forms of sustainable urban transport projects, including developing toolkits, guidelines and other resource material



The Transportation Research and Injury Prevention Programme (TRIPP) at the Indian Institute of Technology (Delhi) is an interdisciplinary programme focussing on the reduction of adverse health effects of road transport. TRIPP attempts to integrate all issues concerned with transportation in order to promote safety, cleaner air, and energy conservation.

Key PT studies undertaken by SGA

For STU's

- Bus Terminal and Design Guidelines
- Bus Depot and Design Guidelines
- Roadmap for bus fleet infrastructure development for STU's (for HRTC, JKSRTC, MSRTC and APSRTC)
- Electric depot design for (GNCTD, DIMTS)
- Web based tool kit to evaluate fleet operations data

Public Transport

- BEAD BRTS Evaluation and Design Tool
- BRTS corridor Design (Delhi, Pune, Rajkot, Indore)



Need for the Tool

- Most STUs are unable to recover operational cost, and are dependent on State support for meeting fleet, infrastructure requirements and operational losses.
- In the absence of any quantifiable short or long-term improvement projections, or a structured annual budgetary requirement, linked to a loge term vision, State financial machinery resists funding STUs
- Because of this most STUs are in a deteriorating cycle compromising sustainable mobility efforts and limiting access to essential services for a majority of the population.
- Even if current mode share is to be retained fleet expansion is necessary to cater to an increasing population/trips investments in STUs is necessary
- If STUs can produce long term plans with investment requirements and matching benefits/outcomes, States will be amenable to invest and objectives of STUs will be met.

Spreadsheet based Fleet Estimation Study 2017-18

- Himachal Road Transport Corporation (HRTC) – 2017
- Jammu and Kashmir State Road Transport Corporation (JKSRTC) – 2018
- Maharashtra State Road Transport Corporation (MSRTC) – 2018
- Andhra Pradesh State Road Transport Corporation (APSRTC) - 2018



- City data- Current year, Urban/rural Population data, Population Growth rate
- Fleet details: Intercity/Intracity, mini/regular/luxury, fleet size
- Trips details: Daily/over night trips, Bus/IPT trips, Tourist trips
- Avg. trip length: Intercity/intracity

Input

Default

Values

Output

- Modal share- Intercity/intracity, Bus/IPT
- STU Data: STU Intercity/intracity trips, routes, Avg. route length, One way bus routes, Avg. Occupancy (%), Avg. staff per bus
- Improvement in fleet utilization, operational efficiency 'GAP', Avg. expected bus life, Annual rate of change,
- % of same day/overnight trips, percent of average seating capacity, Average Cost of buses,
- Average expected revenue from scrapping of buses,
- Cost, capacity and Land Required per bus for depot and terminal

- Budget, Land requirement for Terminal/depot development
- Intercity/intracity Fleet Procurement, Cost, growth per year, land requirement, growth in bus/IPT trips, Model share growth in bus/PT per year

STEP 1 – SERVICE CLASSIFICATION

SERVICE CLASSIFICATION CRITERIA







Expected Yearwise Cumulative Fleet and Land Requirement



Yearwise Budgetary Requirement (Crores) for Fleet and Infrastructure







Gi ba pr tri	iven for e ased on d rojections ip types	ach year ocumented for different	Scenario Building input	Scenario Building input	FIEET Version - 1.0 Mode Share
		Ļ			Mode Share of Bus from total work trips (All modes)
Total fle	eet =	Trips in region per day	X Mode share by STU	X Avg. pass trip length	Intracity Current Desired Rate of Change Trajectory ≤10 km
		Fleet utilization	X Avg. km per bus per day	X Avg. occupancy	≥10 km ✓ Intercity
FIEET Version - 1.0 [Page1] Page2					
Service Compo	ositon (Intracty) —	Current Fleet Composition (%)	Desired Fleet Composition Rate of Change (%)	jectory of Desired Fleet Rate of C Dange Utilization	of Change Trajectory of Desired Avg Vehicle Rate of Change Trajectory of Change Avg Occupancy Rate of Change Trajectory of Change Trajectory of Change Trajectory of Change Tr

STU Vision Data

Service specific parameters



Working of FIEET Tool EXAMPLE: BMTC

Fleet tool 2019 Input Forms









Feet tool 2019 Input Form - 1



Option to continue using last saved data, start a new evaluation, to access the estimation engine (by the developer) or to exit





			STU Basic Informati	on							
F l EET too	'EET tool ₂₀₁₉ Input Form - 2			Sele	ect STU fro efine a ne	m data ba w STU	se				
			STU Name R	vito Vito	- Operations TNITP A	_	Intracity			: tt	
	Population	•	OSRTC Data		Total No of Trip	s (educational)			Total Work T	rips by All Modes	
Urban	Rural	Tot	al		Intracity	Intercity		Intradity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)
7005496.5	984 3496872	1.02 41974	218		2635859	6735767.836		2919971	292482.225	5890895	2318321.625
1	Total Non-Work 1	rips by All Mode	5		Total Work Trips	by Bus			Total Work Trips	by IPT	
Intracity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)	Intracity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)	Intracity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)
2171260	217487	4380409	1723880	70930	53660	148916	641872	68028	19380	60878	63274
Mode Shar	re of Bus from tota	l work trips (All	modes)	Mode S	hare of IPT from I	total work trips (A	ll modes)	M	ode Share of Bus	from total bus t	rips
2%	18%	3%	28%	2%	7%	1%	3%	aw (< 10KM)	6%	16%	70%
M	ode Share of IPT f	orm total IPT tri	ps		Total Tourist	trips by Bus			Total Tourist t	rips by IPT	
Intracity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)	Intercity (<10KM)	Intercity (>10KM)	Intracity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)	Intracity (<10KM)	Intracity (>10KM)
32%	9%	29%	30%	15897	79957	1492	64566	1086	6300	66483	14345
Te	ourist Trips from S	tate - All modes		Total St	ate+ outside Sta	te all tourist trips	- All Modes	Av	erage Annual Ex	ponential Growt	h Rate
Intercity (<10KM)	Intercity (>10KM)	Intracity (<10KM)	Intracity (>10KM)	Intercity (<10KM)	Intercity (>10KM)	Intracity (<10KM)	Intracity (>10KM)	u	iban Ra	ural T	ourist
694	3516	5141	666	71552	80104	17579	92220	0.02	12 0.00	99 0.0	250

FLEET tool 2019 Input Form - 3

User form 1-Splash page																					
User form 2 - STU Basic Info (population/trips)																					
User form 3 – STU Fleet data User form 4- STU Service	STU Fleet Data FIEET Version - 1.0																				
Data User form 5 - STU Infrastructure Data	Fleet Data (Intracity) Bus Type Name High Floor Standard AC Low Floor	Seating Capacity 41.3 38.8	 > 15 yr 4 0 	15 yr 39 0	14 yr 48 3	13 yr 210 38	12 yr 334 11	N 11 yr 628 181	o of Buses by 10 yr 966 126	9 yr 67 49	8 yr 304 29	7 yr 488 81	6 yr 691 94	5 yr 243 3	4 yr 0 0	3 yr 30 23	2 yr 1320 110	1 yr 299 0	Total (dick to calculate) 5671 748	Cost of Bus 2500000 8000000	Age limit for bus
User form 6 – STU Vision Data 1	AC Express Low Floor Electric bus	38.8	0	0	0	5	2	0	0	7	4	11	13	0	0	3	0	0	102 0	8000000	12
User form 7 – STU Vision Data 2 User form 8 – Mode	Error check	Go Back													S	HAKTI Stanaale energy Mincatur	SG	Arch	itects		
Share (STU, Other Bus & IPT) User form 9 – Default Values	Save & Continue	Exit	Open D)efault values							-		kiner				(3)	2	© SGArchite	cts	

Give a name to all service, define average seating capacity, composition by age, cost of bus and expected age





FLEET tool 2019 Input Form - 4

User form 1-Splash page																	
User form 2 - STU Basic Info (population/trips)																	
User form 3 – STU Fleet data	STU Service Data Version - 1.0																
User form 4- STU Service Data User form 5 - STU	Service Vala (Initiality) Service Name Regular Vajra City Service	Bus Type High Floor Standard AC Low Floor	Fleet Strength 5671 748 193	Fleet Utilization (%) 85.30 76.30	Avg EPK 41.24 55.06	Avg CPK 52.88 85.19	Avg Daily Km (Scheduled) 204.9 215.7	Avg Route length 15.46 21.59	Daily Passenger Trips (ticket sale) 6345600 600300	% share of pass holders in total STU trips 4.00 0.00	Avg Vehide Utilization (%) 99.00 96.00	Total Operational Hours 16 16	% Load factor 69.50 54.70	Total Operational Routes 5443 668	Staff to Bus ratio 5.6 4.8	Avg Daily dead kilometres 36000 1000	
Infrastructure Data	Electric bus	Low floor	0	85.00	41.24	52.88	215.7	153.5	0	4.00	96.00 99.00	16 16	54.70 69.50	91	4.8 5.6	1000 36000	
User form 6 – STU Vision Data 1																	
User form 7 – STU Vision Data 2																	
User form 8 – Mode Share (STU, Other Bus & IPT)	Error check Save & Continue	Go Back Exit	Open Defa	ault values						S SHA	KTI ARLE ENERGY FIDE	SGArc	hitects	TRIPP			
User form 9 – Default Values									2	Farm		12	Co.c.				

Define operational characteristics of all services, utilization, occupancy, efficiency, CPK, EPK, no. of routes, staff to bus ratio



SHAKTI SUSTAINABLE ENERGY FOUNDATION



F^eEET tool ₂₀₁₉ Input Form - 5

	TU Infrastructure Data
User form 1-Splash page	FIEET
User form 2 - STU Basic Info (population/trips)	Version - 1.0
User form 3 – STU Fleet data	
User form 4- STU Service Data	Depot Total No of Developed Depot Sites Total Area under active Depot (hectare) Total Area under active Depot (hectare) Total land area allocated to depot including developed and undeveloped (hectare)
User form 5 - STU Infrastructure Data	45 3375 3375
User form 6 – STU Vision Data 1	Terminal Total land area allocated to
User form 7 – STU Vision Data 2	Total No of Developed Terminal Sites Total Area Under active Terminals (hectare) Terminals induding developed and undeveloped (hectare) 54 5400 5400
User form 8 – Mode Share (STU, Other Bus & IPT)	
User form 9 – Default	
Values	Error check Go Back SHAKTI SGArchitects

Include current infrastructure details, existing number of depots, terminals and total land availability for both





F**e**EET tool 2019 Input Form

User form 1-Splash page

User form 2 - STU Basic Info (population/trips)

User form 3 – STU Fleet

User form 4- STU Service

Estimation Method

Next

Go Back

Composition By: (Intracity) —

O Bus Fleet

Passenger Trips

ServiceTransition type (Intracity) -

Generate unutilized fleet

O use existing fleet at all cost till service age

User form 5 - STU

data

Data

Infrastructure Data

User form 6 – STU Vision Data 1

User form 7 – STU Vision Data 2

User form 8 – Mode Share (STU, Other Bus & IPT)

User form 9 – Default Values

Select the estimation method





 \times

Feet tool 2019 Input Form - 6

User form 1-Splash page														
User form 2 - STU Basic Info (population/trips)														
User form 3 – STU Fleet data User form 4- STU Service Data	STU Vision Data (Intracit - Service Composition (Intr Service Name Regular Vajra City Service Vayu Vajra Electric bus	y)-1 Bus Type High Floor Standard AC Low Floor AC Express Low Floor Electric hus	Current Fleet Composition (%) Desired (%) 91.43% 0.00 8.32% 0.00 0.25% 0.00	Fleet Years to acheive target 10 (Same fo	Trajectory of Change LOGARITHMIC or all services)	Desired Fleet Utilization (%) 85.00 76.00 76.00	Years to acheive target	Trajectory of Change Linear Linear Linear	Desired Avg Vehicle Utilization (%) 99.00 96.00 96.00	Years to acheive target	Trajectory of Change Linear Linear Linear	Desired Avg Occupancy (%) 70.00 55.00 55.00	Years to acheive target	Trajectory of Change Linear Linear
User form 5 - STU Infrastructure Data	Electric bus	Elecule Dus	0.00% 100.0	0 Exponentia	Logarithmic	85.00	10	Linear <u> </u>	99.00	10	Linear	2 70.00	10	Linear 💌
User form 6 – STU Vision Data 1				Indicative figure d growth curves Linear - Rate of ch	ifferentiating the different ange remains same over									
User form 7 – STU Vision Data 2				growth period Exponential - Rate over growth perior Logrithmic - Rate o over growth perior	of change steadily increases f f change steadily reduces f									
User form 8 – Mode Share (STU, Other Bus & IPT)			1											
User form 9 – Default Values	Error check Save & Continue	Go Back Exit	Open Default	values						E	SHAKTI SJSTANARLE ENERGY POUNEATION	SGArchite	© SGArchitects	

Create horizon year envisioned scenario for all services – envisioned operational characteristics, utilization, EPK, CPK, etc., period to achieve the vision (example 10 years) and trajectory of change (linear, logarithmic or exponential)

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F*L*EET tool ₂₀₁₉ Input Form - 7

User form 1-Splash page															
User form 2 - STU Basic Info (population/trips)	STU Vision Data — Service Composi	(Intrac	tity)-2												
User form 3 – STU Fleet data	Service Nan	ne	Bus Type	Desired EF	Years to acheive target	Trajectory of Change	Desired CPK	Years to acheive target	Trajectory of Change	Desired staff to bu ratio	s Years to acheive target	Trajectory o Change	f Desired Op route	erational es	Years to acheive target
User form 4- STU Service Data	Regular Vajra City Se Vayu Vajr	rvice a	AC Low Floor AC Low Floor AC Express Low I	r 60 Floor 90	10	Linear Linear Linear	55 88 88	10	Linear	• 5.2 • 4.5 • 4.5	10	Linear Linear Linear	• 0 • 0	_	10
User form 5 - STU Infrastructure Data	Electric bu	JS	Electric bus	45	10	Linear 💌	55	10	Linear	5.2	10	Linear	• 6000		10
User form 6 – STU Vision Data 1	2	1													
User form 7 – STU Vision	.2														,
Data 2	Trajectory of Change		Desired Avg. Route length	Years to acheive target	Trajectory of Change	Current Cost	Expected Cost	Years to acheive target	Trajectory o Change	of Curr Trip	ent Pass. Exp D Length T	ected Pass. rip Length	Years to acheive target	Traj t C	jectory of Change
User form 8 – Mode	Linear	•	20	10	Linear 💌	2500000	2400000	10	Linear	• 4	.27	5	10	Linea	ar 💌
Share (STU, Other Bus & IPT)	Linear	•	22	10	Linear 💌	8000000	7500000	10	Linear	• 4	. 18	5.1	10	Linea	ar 💌
User form 9 – Default	Linear	•	165	10	Linear 💌	8000000	7500000	10	Linear	• 1	9.00	22	10	Linea	ar 🔻
Values	Linear	•	20	10	Linear 💌	18000000	10000000	10	Linear	▼ 4	.30	6	10	Linea	ar 💌

Additional information to create envisioned operational characteristics







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FEET tool 2019 Input Form - 8

	STU Vision Data (Mode	Share)				
User form 1-Splash page	FIEET					
User form 2 - STU Basic Info (population/trips)	Mode Share					
User form 3 – STU Fleet data		Mode Share By STU Bus		Mode Share By Other Bus		1ode Share By IPT
User form 4- STU Service Data	Intracity	Current Desired Years to acheive target	Trajectory of Change Current	Desired Years to Traject acheive target of Char	tory Current Desir	ed Years to Trajectory acheive target of Change
User form 5 - STU Infrastructure Data		19.77% 24.00 % 10	Linear v 5.24%	4.30 % 10 Linear	▼ 8.31% 5.40	% 10 Linear _▼
User form 6 – STU Vision Data 1	Intercity	0.00% 0.00 % 10	Linear 💌 36.22%	38.84 % 10 Linear	▼ 11.73% 11.66	5 % 10 Linear 💌
User form 7 – STU Vision Data 2						
User form 8 – Mode Share (STU, Other Bus & IPT)						
User form 9 – Default Values	Error check Save & Exit	Go Back	fault values		SUSTAINABLE FOUNDATION	SGArchitects

Current mode share for STU buses, other buses and IPT is estimated and displayed – users are required to input an envisioned mode share for each, time period to achieve it and trajectory of change

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RIPP

FEET tool 2019 Input Form - 9 STU Default Data

	Item	Value	Item	Value
	> 10km Work Bus trips origin from other states (travelling to state) as percent of work bus trips in state	2.50%	Perscent of STU Inter city trips >10km as percent of total inter city trips by bus	66.57%
User form 1-Splash page	> 10km Education Bus trips origin from other states (travelling to state) as percent of work bus trips in state	2.50%	Work IPT trips origin from outside state (travelling to state) as percent of work IPT trips in state	1.00%
Llean forme 2 CTU Desig	> 10km Non work (and non tourist) trips bus trips origin from other states (travelling to state) as percent of work bus trips in state	2.50%	Percent of same day education trips less than 10km by IPT in urban areas	4.00%
User form 2 - STU Basic	Percent of education trips less than 10km in urban areas	85.00%	Intra city non work trips <10km by IPT	47.23%
	Percent of education trips less than 10km in rural areas	70.00%	Percent of same day education trips less than 10km by IPT in rural areas	0.50%
User form 3 – STU Fleet	Percent of inter city work trips >10km originating from urban area	10%	Inter city non work trips <10km by IPT	20.17%
data	Percent of inter city education trips >10km originating from urban area	10%	Percent of same day education trips more than 10km by IPT in urban areas	15.00%
User form 4- STU Service	Percent of inter city non-work trips >10km originating from urban area	10%	Intra city non work trips >10km by IPT	8.95%
Data	Percent of education trips less than 10km by buses in urban area	14.52%	Percent of same day education trips more than 10km by IPT in rural areas	4.00%
	Intra city non work trips <10km by bus	39.90%	Inter city non work trips >10km by IPT	23.65%
User Iorm 5 - STU	Percent of same day non work trips by city bus	22.50%		02200
Infrastructure Data	Percent of overnight non work trips less than 10km	0.00%		Intra
User form 6 – STU Vision	Percent of overnight non work trips by city bus	1.00%	Land Required per bus for depot development (sqm)	100.00
Data 1	Percent of same day education trips less than 10km by public buses in rural	20.00%	Average Depot Capacity (buses)	100.00
User form 7 – STU Vision	areas Percent of same day education trips more than 10km by public buses in urban	21.00%	Land Required per bus for terminal development	70.00
Data 2	areas Percent of same day education trins more than 10km by public buses in rural areas	37.00%	% of non local STU buses using inter city terminal (as % of STU buses)	5%
User form 8 – Mode	Inter city non work trips <10km by bus	10.27%	Average terminal capacity	40.00
	Inter city non work trips >10km by bus	36.17%	Current average operational hours	14
	Percent of STU Intra city trips < 10km as percent of total intra city trips by bus	71.63%	Cost per bus for developing depot (rs)	800000.00
User form 9 – Default	Dement of STIL Inter city trips <10km as percent of total inter city trips by bus	33.43%	Cost per bus for developing terminal (rs)	250000.00
Values	Dercent of STU Intra city trips <10km as percent of total intra city trips by bus	28.37%	Factor to relate terminal capacity to bus fleet (Fleet/(Capacity*X), where	1.25

Default data – recall the form any time – either edit the data or restore defaults such as per bus area requirement, scrap cost, etc.

Test Case – BMTC 2019



A sole government agency that Data Constraints operates urban public transport bus service in Bengaluru with a current Mode share of 19.77%.

 BMTC has fleet strength of over 6000 buses covering around 11.94 lakhs kilometers making 69660 trips daily.

- The agency constitutes around 33444
 employees and 54 bus stations and 45 depots across the city.
- BMTC has 10 travel and transit Management centers (TTMCs).

hat bus ent	Data Collection	Online source & reports	Source
	Population (Bengaluru)	8,443,675	Census 2011
000 khs ips	Mode share (BMTC – STU buses)	19.77 %	Estimated from census 2011 and STU data
	Urban population growth rate	2.12%	Census 2011 and Karnataka – Tourism Survey report
44 and	Rural population growth rate	0.99%	
nsit	Tourist growth rate	2.50%	







Test Case – BMTC Base Year data 2019



Data Collection For 3 different services

- Service 1 : Regular Standard Buses
- Service 2 : Low floor AC buses
- Service 3 : Low floor AC buses Airport Shuttle

Service 4 : Electric Buses (Fleet to be 100% electric from 0% today in 10 years)

	Data Collection	BMTC (overall/ weighted avg.)	Service 1	Service 2	Service 3	Service 4
	Fleet strength	6482	5632	742	108	0
	Fleet utilization	87.74%	89.2%	77.9%	77.9%	89.2%
	Vehicle utilization	89.3%	89.8%	86.3%	86.3%	85.7%
	Trips catered per day	35,12,000	34,00,000	1,00,000	12,000	0
	% Load factor	63.5%	65.0%	53.4%	53.4%	65.0%
	Staff to bus ratio	5.18	5.18	5.18	5.18	5.18
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Test Case – BMTC, Horizon Year 2029



The test case scenario is defined by the **service wise inputs** provided as vision data form under **6 Parameters**:

- Fleet Composition
- Fleet Utilization
- Vehicle Utilization
- %Load Factor
- Operational routes
- Staff to Bus Ratio

Envisioned mode share is 24.0% from the current 19.77%

Envisioned Values	BMTC	Service 1	Service 2	Service 3	Service 4
Fleet Composition		0% 🛃	0% 🛃	0% 🖶	100% 🚺
Fleet utilization	92.0% 🚹	92% 🚹	80% 🚺	80% 🚹	92% 🚹
Vehicle utilization	85.74% 🛃	99% 🚹	96% 🚹	96% 🚹	99% 🚹
Operational Routes	2264	0	0	0	2264
% Load factor	66.0%	66%	53.9%	53.9%	66%
Staff to Bus ratio	5.2	5.2	5.2	5.2	5.2



SGArchitects Linear trajectory is maintained with targets desired to be achieved in 10 years

Outputs Generated by Tool

Total 35 Outputs are generated	List of Outputs List of Outputs			
by the tool – Comprising of	Year Wise Budgetary Requirement for Intra and Inter City Services	Year wise Budgetary Requirements for fleet and Infrastructure		
	Annual Seats to be added			
	Expected Year wise Cumulative Land Requirement for Intra City Fleet	Expected Year wise Land (Hectares) and Fleet Acquisition Requirement		
	Expected Year wise Growth in Number of Trips	Expected Year wise Depot and Terminal		
List of Outputs	Expected Year wise Growth in Bus Trips	Development Requirement		
	Expected Year wise Growth in daily passenger PT Trips	Expected Year wise Cumulative Fleet and Land		
Service wise year wise Bus Fleet	Year wise Bus Trips by Purpose	Requirement		
Service wise expected Year wise	Year wise Intracity Trips by Distance	Total (Inter city + Intercity) - Expected Annual Operating cost, Earning and Total profit		
	Year wise PT mode share (<=10km)	Year wise overall Viability Gan		
Comico wice Floot Litilization	Year wise PT mode share (>10km)	Both Inter and Intra combined- Expected Year		
Service wise Fleet Utilization	Annual Additional Staff Recruitment Requirement	wise Cumulative Land Requirement for Fleet		
Service wise Vehicle Utilization	Total Staff Strength			
Service wise Occupancy	Expected Staff to Vehicle Ratio			
Service wise Average Pax Trip-length	Projected Number of Routes	Some of the outputs for a test		
Service wise Average Route Length	Projected Headway (Minutes) case are presented in fol			
	Expected Operating cost Intra and Intercity	slides		
Service wise Average fleet composition	Expected Annual Operating Cost, Earning and Total Profit			
Service wise Unutilized Fleet	Year wise Mode share			
	Year wise Viability Gap			

Case 1

Case 2

×

Composition is estimated by percent of service/fleet type and not passenger – Bus Fleet service transition sticks to C Passenger Trips planned projections even if existing fleet is rendered unutilized Composition is estimated by percent of service/fleet type and not passenger – Bus Fleet service transition ensures O Passenger Trips that existing fleet is utilized till end of life



Case 2 based outputs are presented in subsequent slides

Fleet composition by Service Type Comparison of cases



Annual number of buses rendered unutilized



No buses are unutilized in Case 3 and Case 4

Expected Cumulative Land Requirement _{Case 2}



- Total land requirement for Intra City Fleet (Hectares)

Land requirement (Hectres)	2020	2025	2030	2040	2050
Depot	110.46	146.92	182.25	225.88	280.00
Terminal	50.74	67.49	83.72	103.76	128.63
Total	161.21	214.41	265.97	329.64	408.63

Annual Fleet Procurement Requirement_{Case 2}



Total Fleet Required	2020	2025	2030	2040	2050
Regular	645	68	0	0	0
AC	0	95	0	0	0
Airport Service	0	13	0	0	0
Electric	693	1142	242	1341	636

Annual Depot & Terminal Development Requirement_{Case 2}



No. of sites to be developed	2020	2025	2030	2040	2050
Depot	4	5	3	3	4
Terminal	9	10	5	6	8

Annual Budgetary Requirement & Viability Gap_{Case 2}



— — Linear (Viability gap (Cr))

Annual cost & Revenue in Crores	2020	2025	2030	2040	2050
Operating Cost	2652.01	3395.73	3900.72	4834.58	5992.97
Revenue	1935.33	2584.26	3334.67	4133.02	5123.31
Infra Dev. And Fleet	1485.57	1745.92	244.29	1350.44	669.32
Viability Gap	2202.25	2557.38	810.33	2052.00	1538.98

Next decade: Cumulative investment (expenditure) = 49304.8 Cr, revenue = 25466.8 Cr and State support required = 23837.9 Cr

Estimation of Horizon Year Scenario

Change in Fare (x₁)

Change in quality of ped. env. (x_2)

Change in avg. headway (wait time) (x_3)

Invest/improvements in veh. Tech. (x₄)

Pvt. veh. parking restrictions/limits (x₅)

Congestion charging (x_6)

Reserved bus lanes (x₇)

Investment in depot infrastructure (x_8)

Invest in pas. amenities (stations) (x_9)

$y_a = \beta_{a1}x_1 + \beta_{a8}x_8 + \beta_{a9}x_9 + \beta_{ab}y_b$

Change in EPK (y_a)

Change in occupancy/ load factor (y_b)

Change in vehicle utilization (y_c)

Change in fleet utilization (y_d)

Change in number of routes (y_e)

Change in CPK (y_f)

Change in mode share-STU buses (y_g)

Change in mode share-other buses (y_h)

Change in mode share of IPT (y_i)

Average pass. trip length (y_i)

Average route length (y_k)

Staff to bus ratio (y_l)

Thank you ...