LOW CARBON IPT ACTION PLAN FOR UDAIPUR

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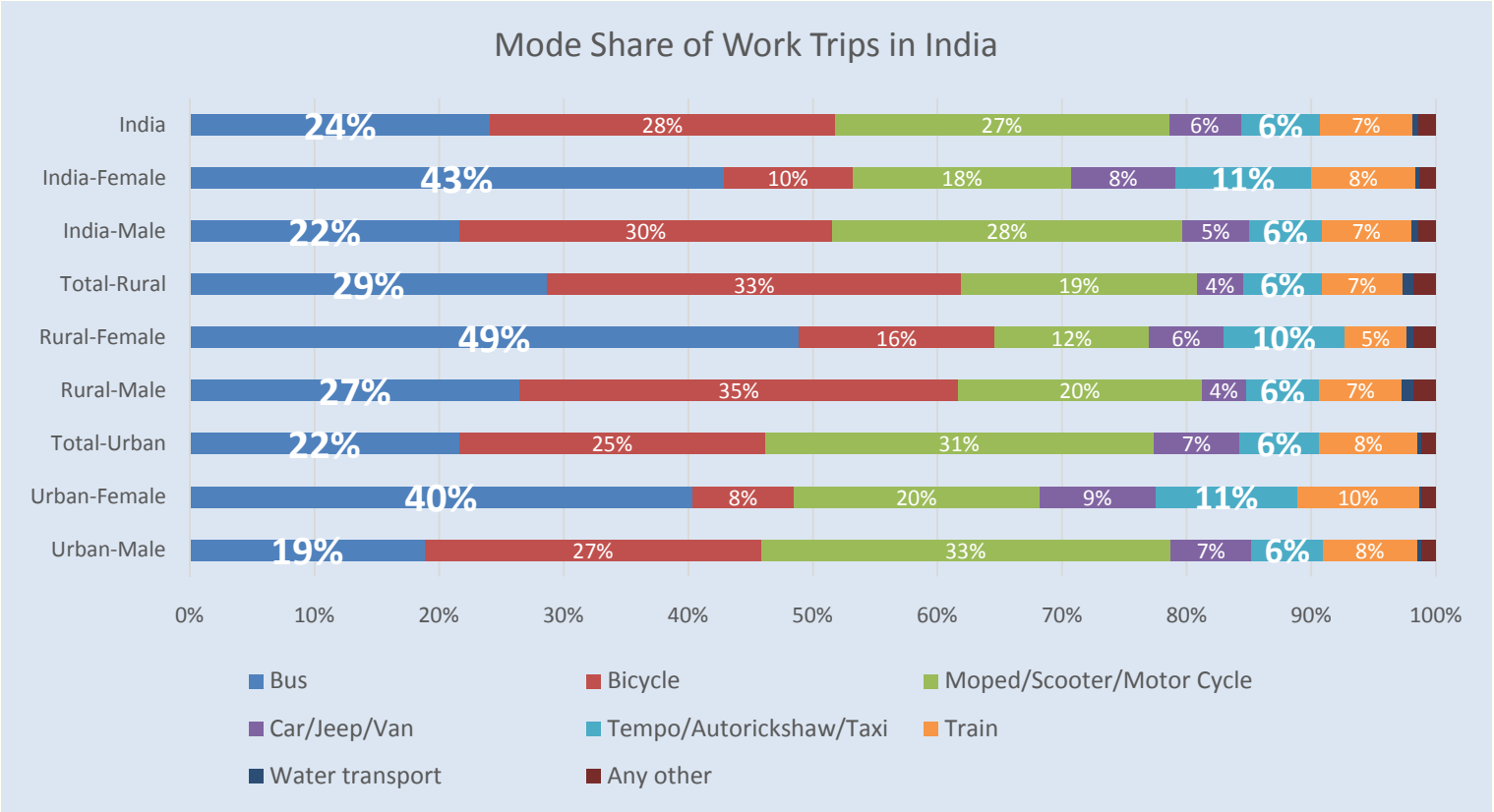
Public Transport in Indian Cities

- Indian cities currently have a high public transport usage provided by a combination of formal and informal systems
- This needs to be retained and enhanced further to meet our developmental and environmental goals



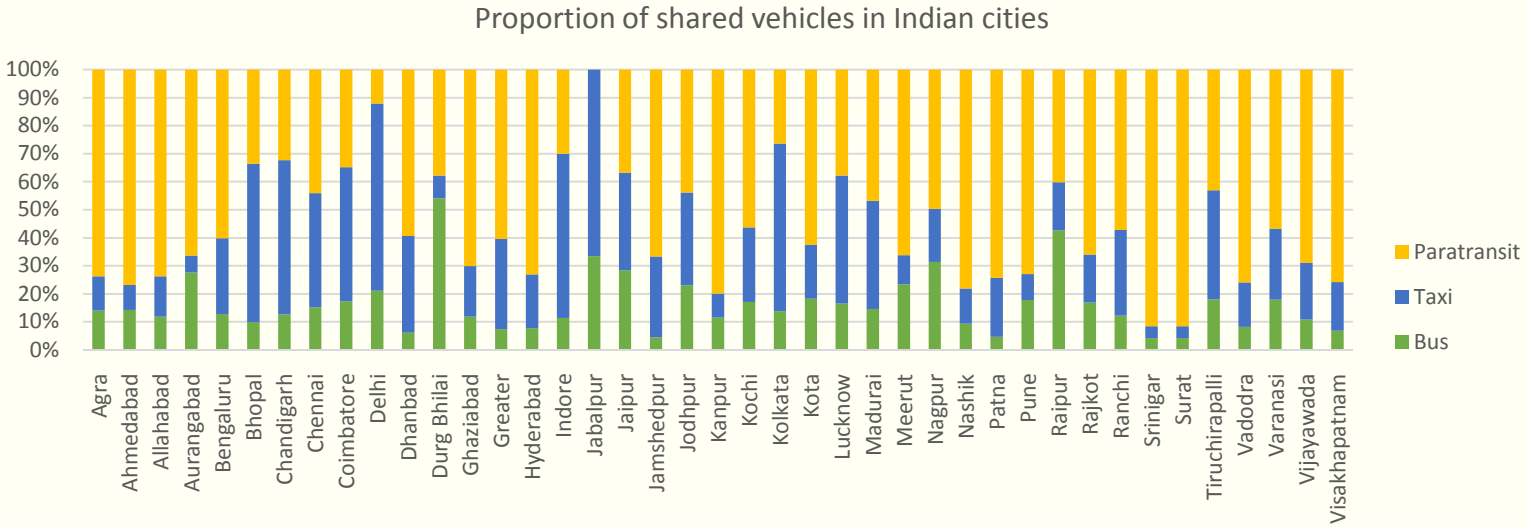
Source: Census of India, 2011

Why Low-Carbon IPT?

- Intermediate Public Transport (IPT)/ Paratransit systems are the major form of shared mobility usage in many small and medium sized cities
- Even in the larger cities, they form the majority of 'shared mobility' fleets

Population	Bus	Paratransit	Rail	Car	2-Wheeler	Cycle	Walk	Total
>10 million	20	3	14	6	9	5	43	100
1-10 million	13	11	2	3	23	13	37	100
<1 million	4	13	0	2	27	6	49	100

Source: Moser et. al., 2016



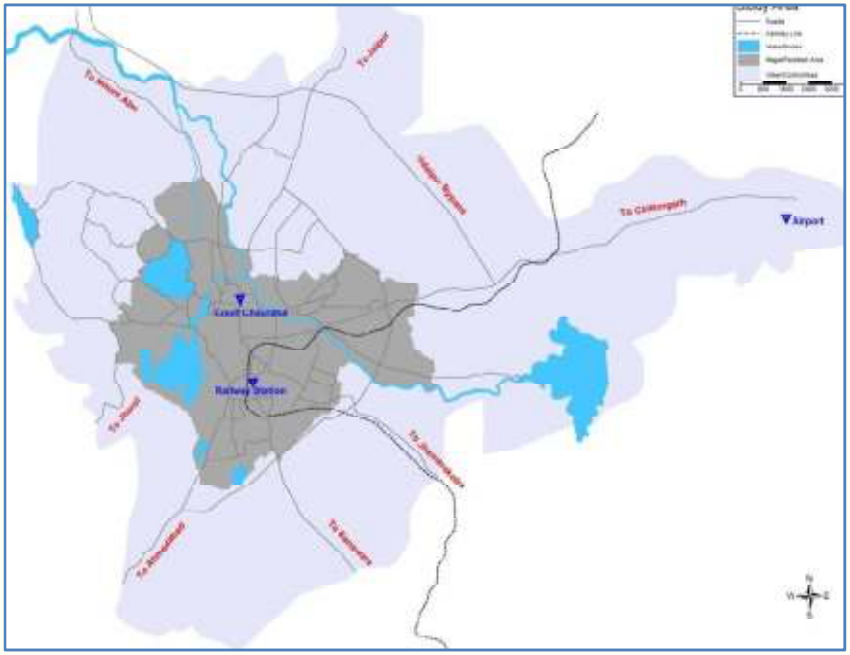
Source: MoRTH, 2017

Udaipur-City characteristics

- Medium sized city with high population density
- 6,313 auto rickshaws and 2,637 tempos providing IPT services to the city & suburbs

Study Area	Population	Area (sq. km)	Density (ppl per ha)
Udaipur Municipal Corporation	451,100	64	257
Udaipur Urban Control Area	637,717	348	61

Mode	% trips	Avg. trip length (km)
Walk	48	1.18
Cycle	2	2.37
2-Wheeler	34	5.54
Car	3	4.52
IPT	11	7.06
Bus	2	--

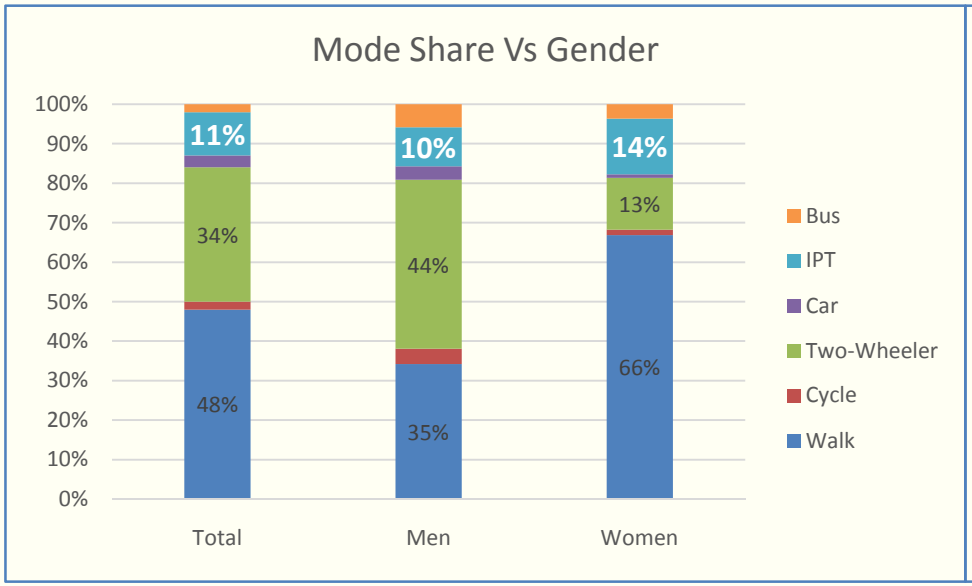


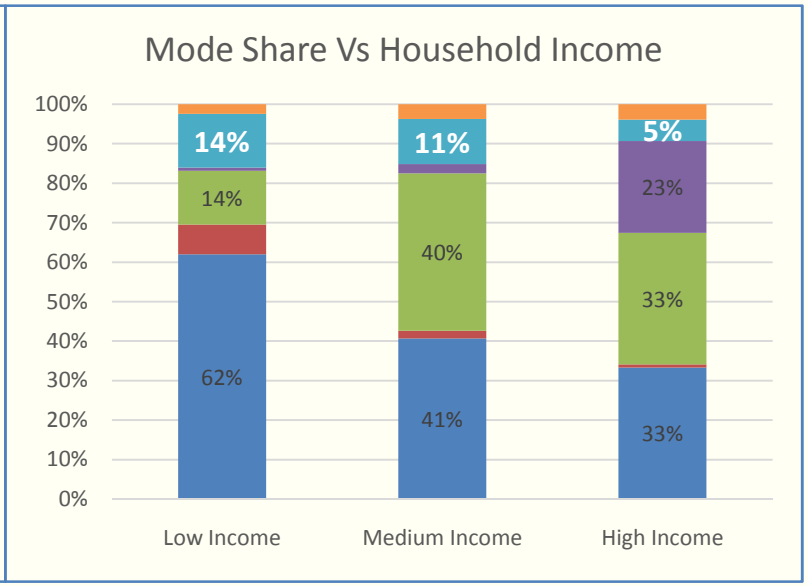
Source: LCMP Udaipur, 2014

IPT USE CHARACTERISTICS

Udaipur: Travel Demand Patterns

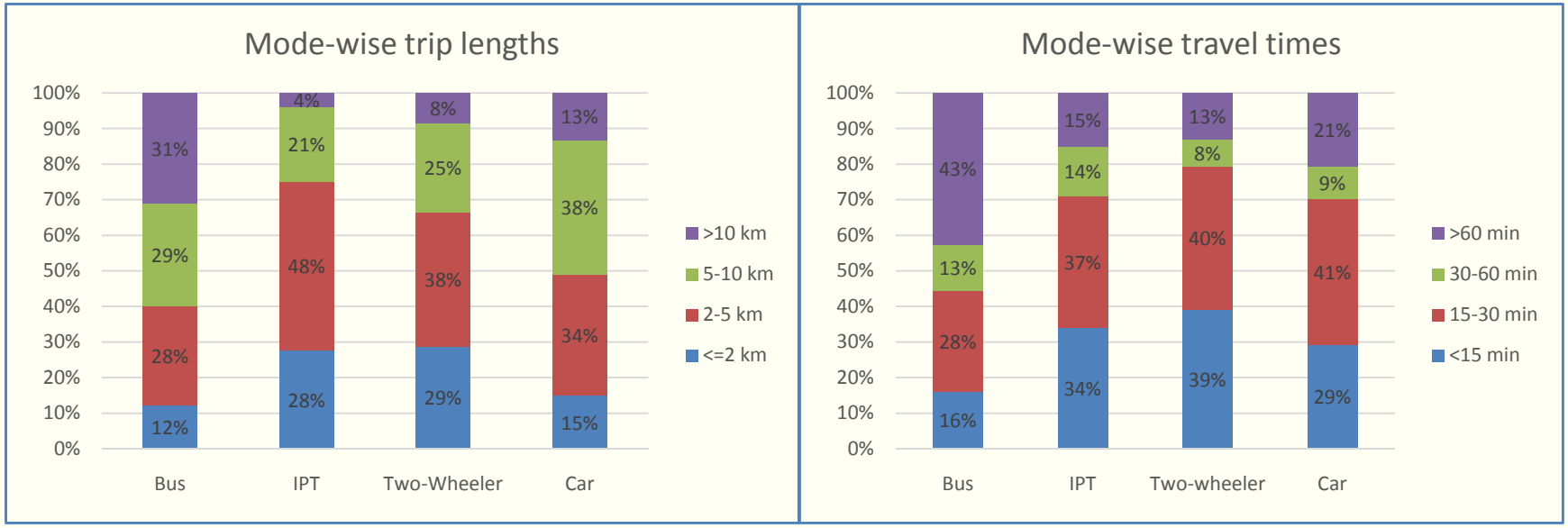
- Two-wheeler and walk the most preferred modes for men
- Walk and IPT the most popular modes for women
- Two-wheeler and Car usage increases with income
- Need to retain walk trips and increase share of Bus and IPT





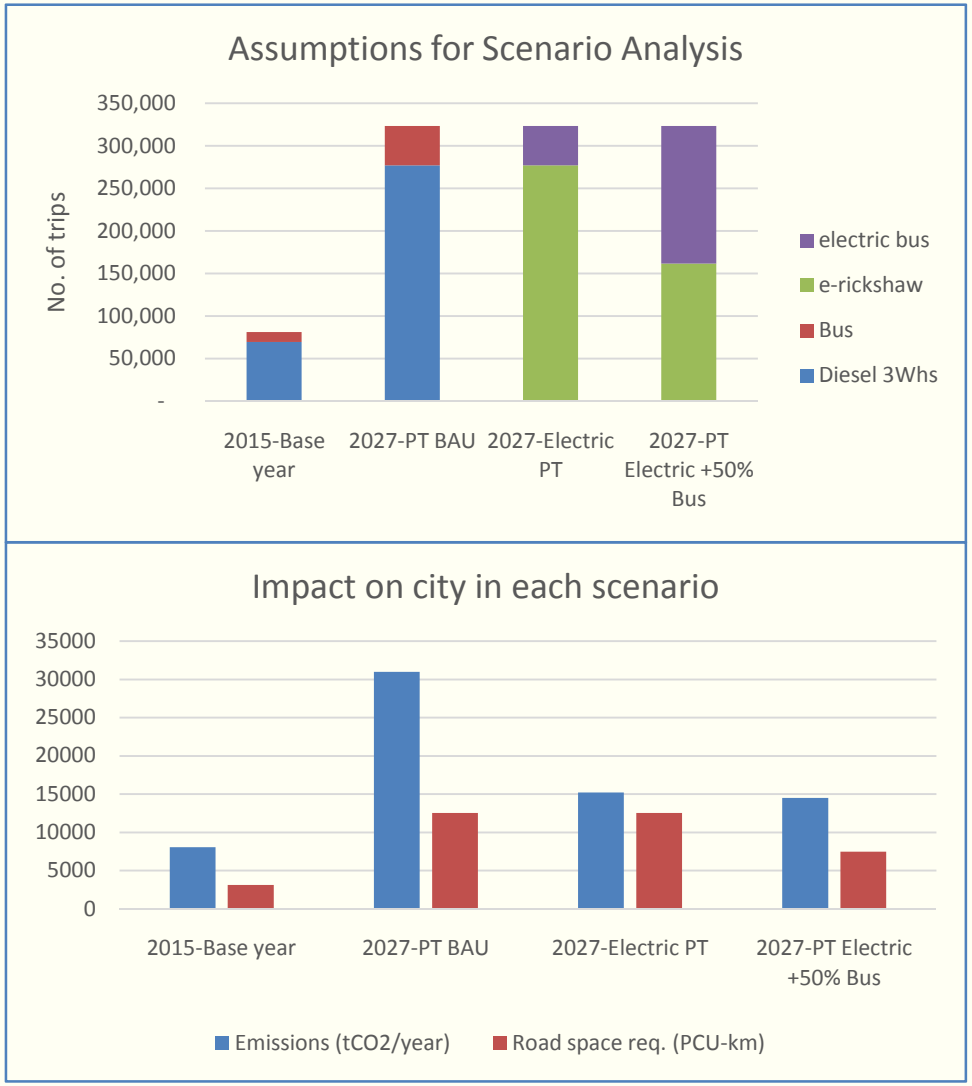
Shared vs Private Vehicle Travel Patterns

- Two-wheeler and IPT have similar trip length and travel patterns
- Bus and Car have similar travel patterns
- 25% of IPT and 33% 2-wheeler trips > 5km, which should ideally be on buses
- Users need a good quality bus service as an alternative to long distance IPT, two-wheeler and Car trips
- Need increased availability of IPT as an alternative to short distance two-wheeler and Car trips



Benefits of Low-Carbon IPT in Udaipur

- 2027 considered as the horizon year
- BAU scenario based on population projections from UN-Population and LCMP, 2015
- Public transport trips projected to increase from 14% in 2014 to 32% in 2027
- Two alternative supply scenarios have been modelled
- Scenario 1: Electrify PT and IPT
- Scenario 2: Increase bus share of PT
- **Key findings:**
- Electrification leads to approx. 50% reduction in PT emissions
- Increased share of buses further reduces road space requirements



IPT SYSTEM CHARACTERISTICS

IPT in Udaipur-Forms and Functions

- Small auto-rickshaws for Point to Point (P2P) services
- Operate on contract carriage permits

IPT in Udaipur-Forms and Functions

- Big auto-rickshaws for Point to Point (P2P) services
- Operate on contract carriage permits
- Observed to operate shared services occasionally

IPT in Udaipur-Forms and Functions

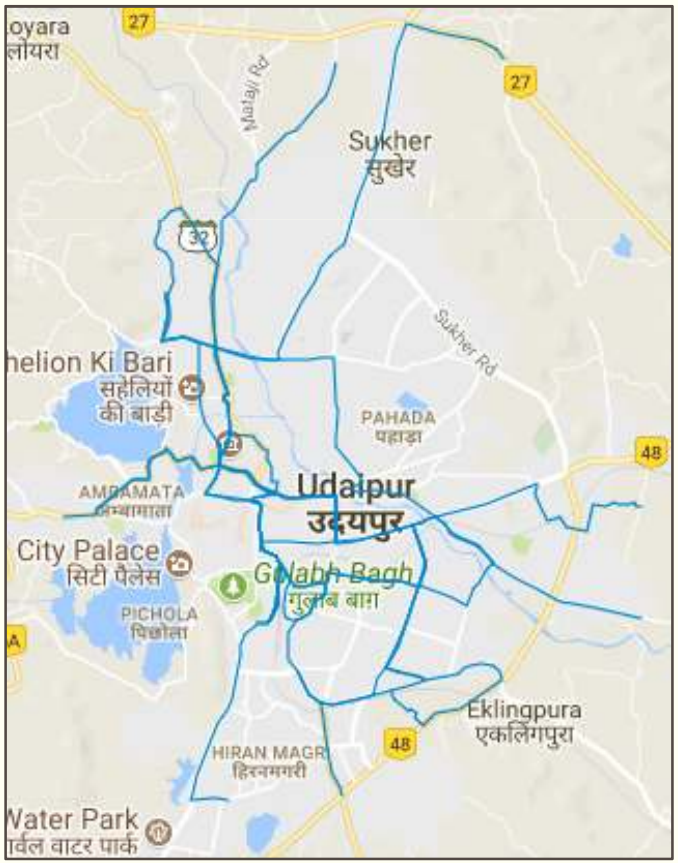
- Tempos operating shared transport/ fixed route services
- Routes pre-defined by Road Transport Authority (RTA)

IPT in Udaipur-Forms and Functions

- Three wheelers and tempos offering goods movement

Overview of stage carriage permits

- Mismatch between routes available Vs operational routes
- Only 10 of the 25 identified routes cover 90% of the permits



Existing IPT Governance Framework

GOVERNING AGENCY	ROLE OF AGENCY		
	POLICY	PLANNING	REGULATION
Traffic Safety Committee (Chaired by District Magistrate(DM))	Number of permits across IPT types		
Udaipur Municipal Corporation		Multi-modal planning Smart city projects IPT Infrastructure	
Road Transport Authority (RTA)			Vehicle Registrations and Permits Fitness tests
Traffic Police			Traffic Management Safety and Security

LOW-CARBON IPT PATHWAYS

Electrification of IPT fleets

STAKEHOLDERS IMPACTED	TECHNOLOGY ALTERNATIVES			
	e-rickshaws (with Lead-acid batteries)	e-rickshaws (with Li-ion batteries)	e-autos (Battery swap technology)	e-autos (BEV)
Users	Wont meet current IPT travel needs and city's terrain issues	Wont meet current IPT travel needs	Will be an effective replacement to current IPT	Will be an effective replacement to current IPT
Operators	Multiple models available in market	Limited models	Limited market ready models	High capital cost
	Limited range and vehicle life	No battery and maintenance supply chain	High upfront investment	Limited market ready models
	No permit requirement			Heavier vehicle compared to swap-based auto
City Government	Limited charging infra needs	Limited charging infra needs	Need investments in charging infra	
	Difficult to regulate due to lack of permit needs	Difficult to regulate due to lack of permit needs	Relaxing permit regulations to allow fleet operators	
			Integrated power and transport planning	

Low-Carbon IPT: Thinking beyond e-rickshaws

- Operational requirements of IPT

Parameter	Type of Service		
	Point to Point Service	Shared Services	Goods auto rickshaws
Seating Capacity	4	6	NA*
Loading Capacity	NA	NA	1 tonne
Daily Mileage	100-120 km	150-200 km	100-150 km
Hours of operation	10-12 hrs/ day	10-12 hrs/ day	10-12 hrs/ day

- E-rickshaws have a limited mobility application- to serve short trips
- Beyond a certain number they can hinder pedestrian and cyclist movements
- Need to operate in a regulated market
- IPT user trip lengths in Udaipur are long-require faster and more sturdy vehicles

Institutional arrangements for Low-Carbon IPT

GOVERNING AGENCY	ROLE OF AGENCY		
	POLICY	PLANNING	REGULATION
Traffic Safety Committee	Relax number of permits for electric IPT Co-ordination across transport and power departments		Create 'Public Transport Fund' for Bus and electric IPT
Udaipur Municipal Corporation	Bulk procurements Industry engagement Low-interest financing	Increase parking fee for 2-wheelers Create street infrastructure for IPT	Financing within 'Smart Cities' projects
Road Transport Authority (RTA)		Review number of IPT permits based on travel demand	Allow fleet operators for electric IPT Lower permit fee for shift to EVs

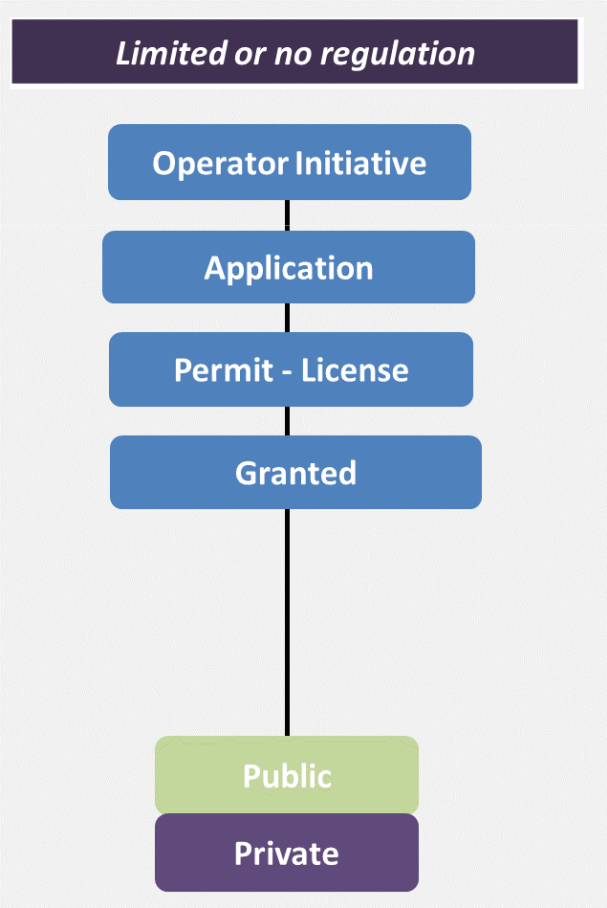
Integrated Bus and IPT network planning

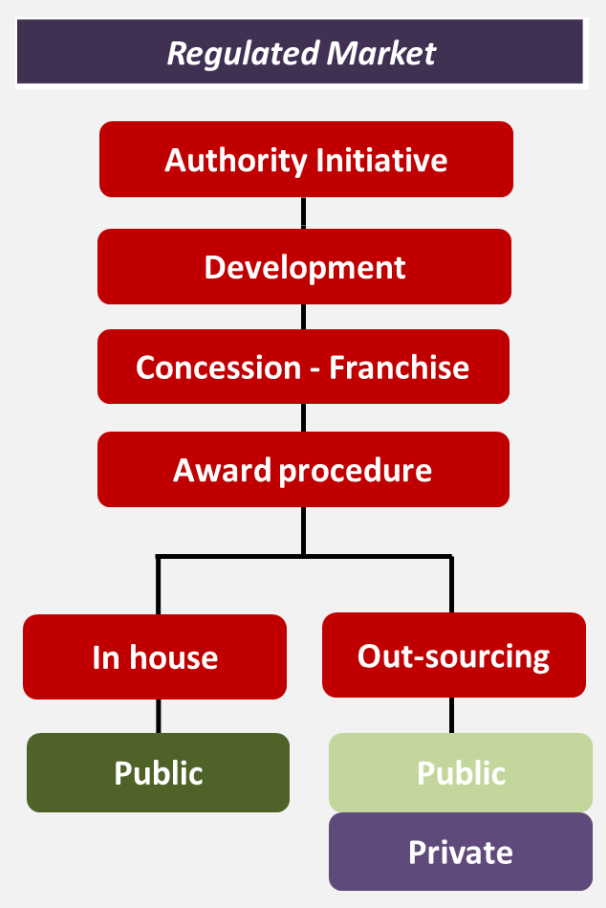
- Bus network to provide sub-urban connectivity
- Current plan- 21 routes for 37 buses
- Recommended- 6 routes
  - Allocate 6-7 buses per route
  - Minimum frequency of 4 buses per hour
- Proposed bus network map

- IPT network to be complementary to bus routes
- Reduce current 25 routes in consultation with the IPT operators, based on bus network
- Prop

IPT regulatory frameworks

- Current permit system is market driven
- Limited service in low-demand areas and off-peak hours
- UMC/ RTA need to re-visit permit regulations
- Provide incentives for low demand areas





Source: UITP, 2018

Industry readiness for IPT electrification

Current scenario

- Availability of vehicle models
  - E-rickshaw models commercially available
  - Majority of E-autos under certification
  - '6 months' before commercial model launch
- Price of models
  - No specific detail
  - Likely to be 50-75% higher than diesel/ CNG variants
  - Need city level tenders to clarify costing
- Key barriers
  - Good performance of traditional models
  - No city-level incentives for electrification
  - Financing costlier vehicles complicated
    - Current financing at 20-36%

Top 5 asks from the Government

- Facilitate low-cost financing
- Deploy charging infrastructure according to IPT needs
- Provide subsidy to vehicles
- Relax regulations on permits and fleet ownership of IPT
- Provide bulk-orders (more than 100 vehicles) for a 5-10% cost reduction

Action plan for 100% electrification of IPT in Udaipur

- Short term actions (3-6 months)
  - Initiate procurement of 100 e-autos for Udaipur
  - Co-ordinate actions on charging infrastructure deployment through PPP
  - Integrated bus and IPT operations planning for efficient services and infrastructure utilisation
- Medium term actions (6 months-2 years)
  - Create city-wide IPT charging infrastructure
  - Initiate state level procurement of more than 500 e-autos for deployment across cities
  - Ensure restriction on conventional vehicle permit restriction and encourage e-autos
  - Establish 'Public Transport Fund' for Udaipur to fund bus and electric IPT initiatives
- Long term actions (beyond 2 years)
  - Create financing facility for e-autos to provide low cost loans to operators
  - Corporatisation of IPT sector under the 'Udaipur Smart City Ltd.'
  - Establish Project Monitoring Unit to track progress on 100% electrification target of IPT and facilitate statutory and financial initiatives towards its implementation

A few remaining questions

- **Can we go for Retrofits instead of new vehicles?**
  - Not recommended
  - 80% vehicles less than 8 years old. Engine replacement happens after 4-5 years
  - So age of retrofit will be approx. 3 years only
  - Technology for retrofits likely to be similar to e-rickshaws, which are inferior to e-autos
- **How can we finance e-autos when diesel or CNG autos cant get financed?**
  - Current loans for diesel/ CNG autos are between 20-36% interest rate
  - High interests due to high rate of defaults on EMIs
  - Need for better banking habits among operators advised by financiers
- **How can the city Governments accelerate 'electric IPT'?**
  - Recognise IPT as a formal mode of transport
  - Facilitate bulk tenders and efficient financing models
  - Corporatise IPT sector to bring operational efficiency and improved financing
  - Prioritise electric auto permits over conventional vehicles

THANK YOU