A UMI Conference Presentation

on

Sustainable Mobility : A Review of Policies for Pricing, Taxation and Incentives

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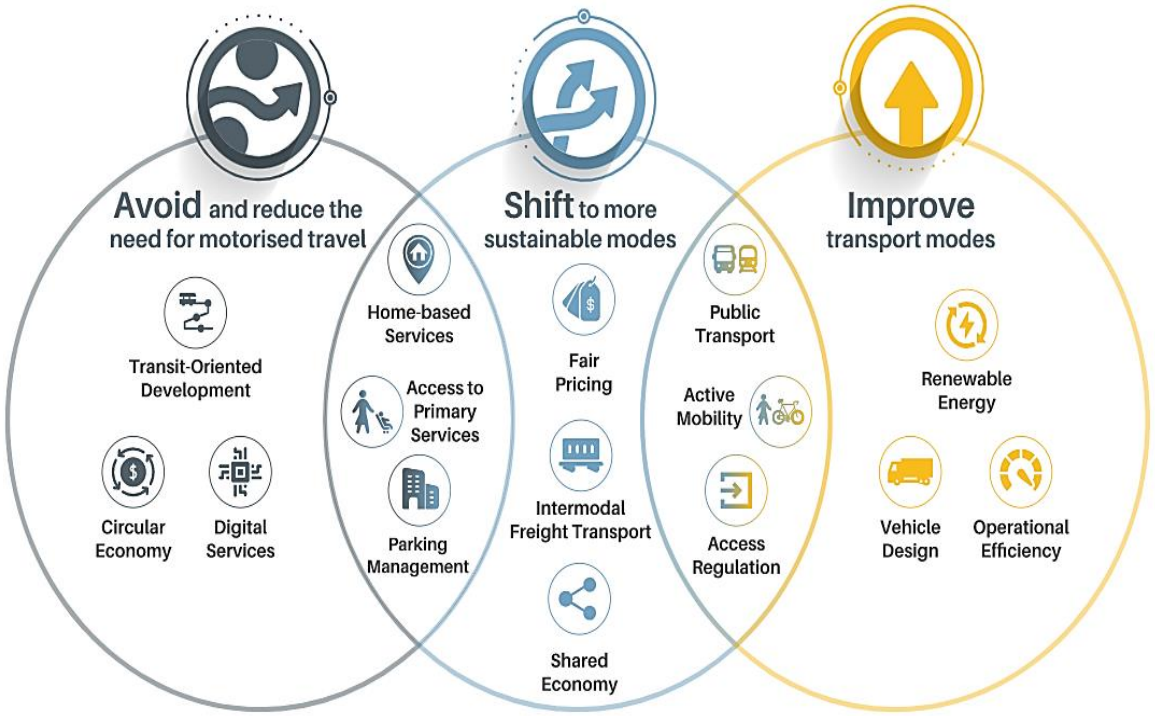
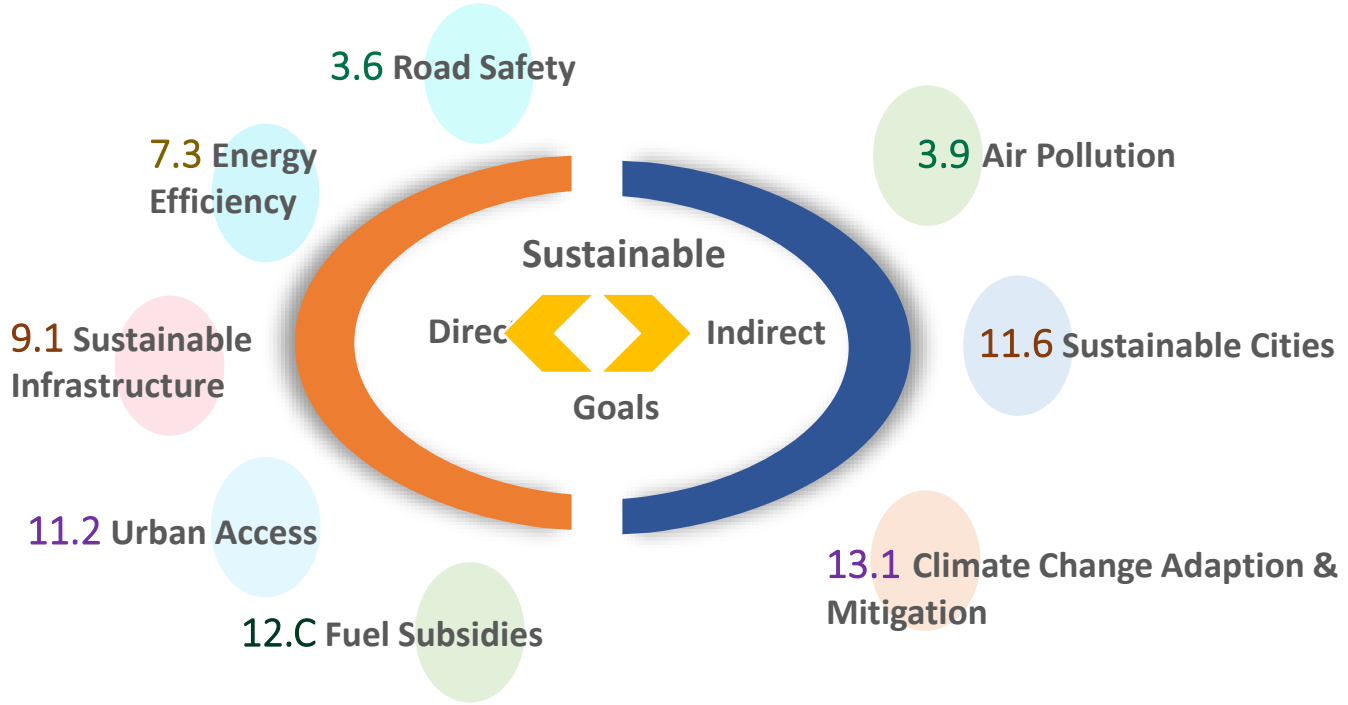
Introduction to Sustainable, Low Carbon Transport

- Paris Agreement on climate change (i.e. a baseline 2-degree Celsius scenario (2DS) moving towards a 1.5-degree Celsius scenario
- The Strategic actions have a direct relevance for the implementation of transport related targets under the SDGs, Six out of the 17 SDGs contain direct or indirect transport targets.
- To have a sector-wide impact, Strategies should address passenger transport, should also have relevance to the 'Avoid-Shift-Improve' concept.

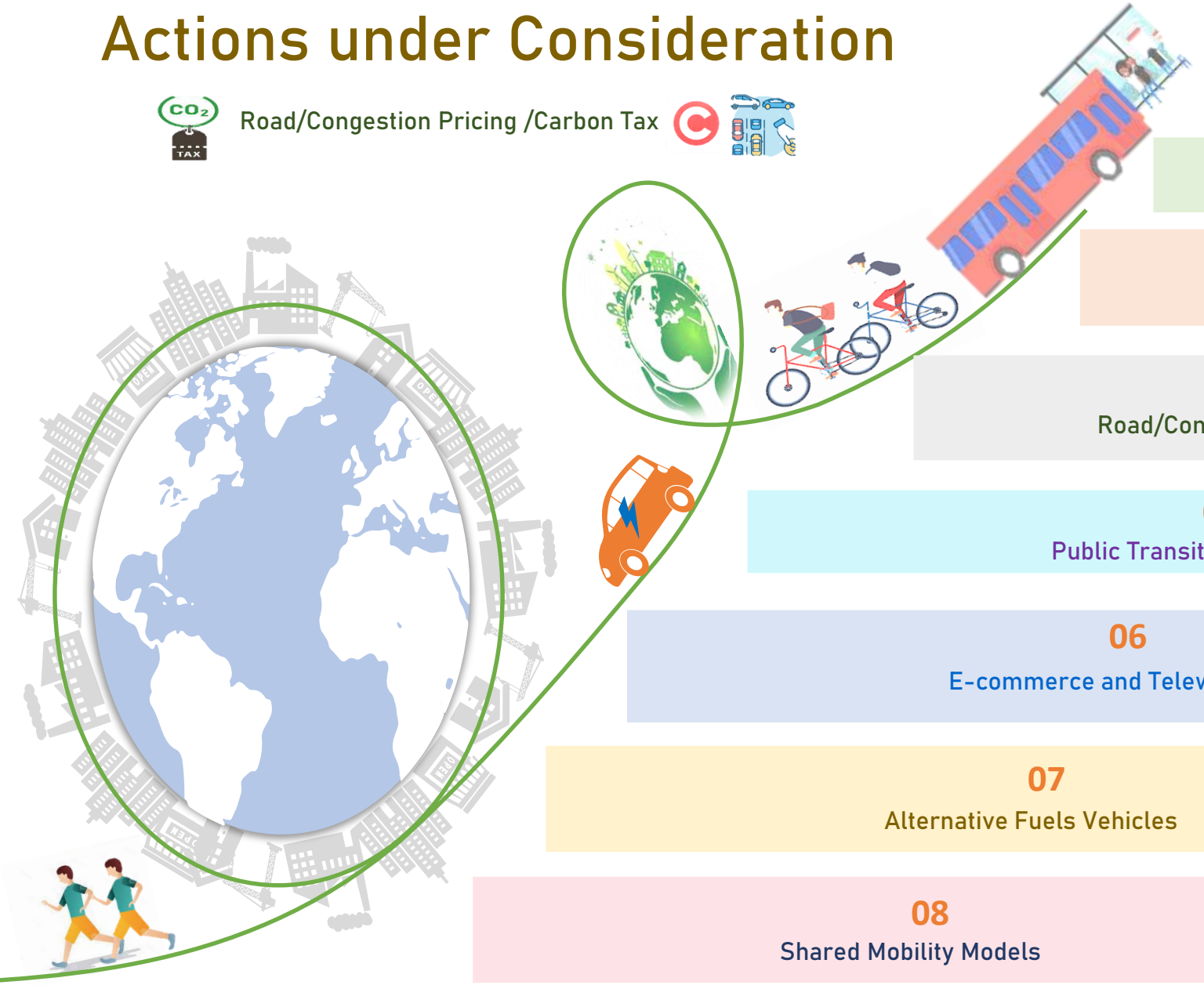




*SLOCAT, (2021). Transport and Voluntary National Reviews 2021: Achieving the Sustainable Development Goals in Times of Change

Actions under Consideration

Road/Congestion Pricing /Carbon Tax



Environmental

- **01** Cycling Promotion
- **02** Eco-Driving

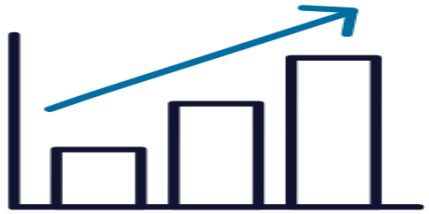
Socio-economic

- **03** Equity
- **04** Road/Congestion Pricing /Carbon Tax
- **05** Public Transit Improvement
- **06** E-commerce and Teleworking

Technological

- **07** Alternative Fuels Vehicles
- **08** Shared Mobility Models
- **09** Intelligent Transportation System (ITS)

Indian Automobile Market by Vehicle Type



Purchase tax exemption/Car Scrappage

Emission

POLICIES

Road Pricing

Traffic Delays

- congestion charge schemes could help the UK government meet its emission targets as well as its climate change

(Beevers and Carslaw 2005)

expensive charge collection charges

(Jansson 2010)

- economy-ecology factors, proving that price differentiation at specific times of the day.
- advantageous because they discourage traffic

(Coria et al., 2015)

Pollution by driving

- vehicle emission rates are affected by vehicle attributes, fuel properties, and driving-related variables.

(Becker et al., 2015; Coria and Zhang, 2017)

- benefits to air quality from a fictitious urban road charging scheme in Madrid by

Pedro Muñoz Miguel, Simón de Blas, and Elizabeth García Sipols 2017

Negative impact on the environment and the likelihood of accidents

- a road pricing model that considers the perspectives of road users, the government, and the ETC agent
- GSI-based road pricing models in static and dynamic scenarios to more accurately reflect environmental and safety concerns

(Chang et al. 2018)

- two-phase minimal emission programming method which is useful for providing effective road network management support.

(Lv et al., 2019)

Road Pricing

Benefits

- Congestion cost reduction
- Increased bus speed
- Benefits to the Environment
- Total recorded benefit

Costs

- Costs of implementation
- Bus subsidies
- Total recorded costs

which links are best for tolling points

- forecast links for tolling points in the context of the generalized second-best network congestion pricing problem

(Verhoef 2002, Camporeale et al., 2019)

City	Year	Toll (€ 2015)	CO2 Reduction (%)
Auckland (NZ)	2008	4.45	-9.80%
Bedford (UK)	2000	0.53	-2%
Cambridge (UK)	2000	1.61	-1.40%
Cambridge (UK)	2016	Cars within the cordon: 0.93	-8%
		Cars crossing the cordon: 6.61	
Copenhagen (DK)	2001-2003	Peak hours: 10.32	-(1/3%)
		Off-peak hours: 5.16	
Edinburgh (UK)	2015	1.29	-12.30%
Hereford (UK)	2000	3.21	-14.20%
Kingston (UK)	2000	5.36	-4.60%
Leeds (UK)	2005	4.98	-2.00%
Lincoln (UK)	2000	0.53	-4%
London (UK)	2003	8.29	-19.90%
Milan (IT)	2012	Residents:2.05	-15%
		Non-Residents: 5.13	
Northampton (UK)	2000	6.42	-1.60%
Norwich (UK)	2000	1.08	-2%
San Francisco (USA)	2010	2.24	-7%
Singapore (SG)	1998	_	_
Stockholm (SE)	2006	1.23-2.46	-13%
Wellington (NZ)	2005	1.28-5.10	-16%
Wien (AT)	2012	_	-4%
York (UK)	2000	3.21	-5%
Impacts of distance-based road pricing on CO2 emissions			
Cambridge (UK)	1995	0.76	-36%
Edinburgh (UK)	2015	0.88	-18%
Leeds (UK)	2005	0.4	-12%
Santa Clara (USA)	2010	_	-17%
Switzerland (CH)	2001	_	-6%
Sydney (AUS)	2015	0.07	-4.70%

	Per day (1,000 e)	Per year (million e)
Benefits		
Congestion cost reduction	272	68
Increased bus speed	124	31
Benefits to the Environment	20	5
Total recorded benefit	414	104
Costs		
Costs of implementation		172
Bus subsidies	18	5
Total recorded costs	707	177

(Prud'homme and Bocarejo 2005)

Parking Policy

how parking characteristics interact during the planning and designing

- Psychological & socio-economic characteristics of drivers, parking facility and guidance, an alternative mode, and the influence of parking regulations are some factors that influence a driver's choice behavior and demand for parking

(Parmar, Das, and Dave 2020)

price techniques

- (destination) area-based, imposing various costs on different parking zones managing park-and-ride systems

(Verhoef 2002)

parking pricing model

- a trip origin-destination-based spatial parking pricing model with a generic methodology to reduce parking fees

(D'Acierno, Gallo, and Montella 2006)

- an ideal cost for parking that varies by location and time of day

(Zong, He, and Yuan, 2015)

Different parking pricing strategies

- practical recommendations for urban parking managers and build a holistic benefit that combines average cost and failure rate

(Mei et al. 2020)

Taxation and Incentives

An economic model

- intricate link between price, passenger travel, modal split, production costs, and deficit (Storchmann 2001)
- depending on the fuel type, emissions standard, and technical fuel efficiency of a vehicle (Montag 2015)
- by transforming certain (fixed) car use expenses into (variable) prices at each trip. (Gallo 2011)

purchase tax exemption

- A discontinuity in the age of subsidized automobiles
- environmental consequences of car scrappage schemes focusing on energy usage, CO2 emissions, and air pollution during vehicle use investigated.

tax, toll, or fare options

- Ultimate effect will depend on how tax, toll, and fares are utilized to produce public money. Some policy solutions may facilitate the progressive sharing of more public money (Steinsland et al., 2018)

how numerous financial mode choice and trip duration

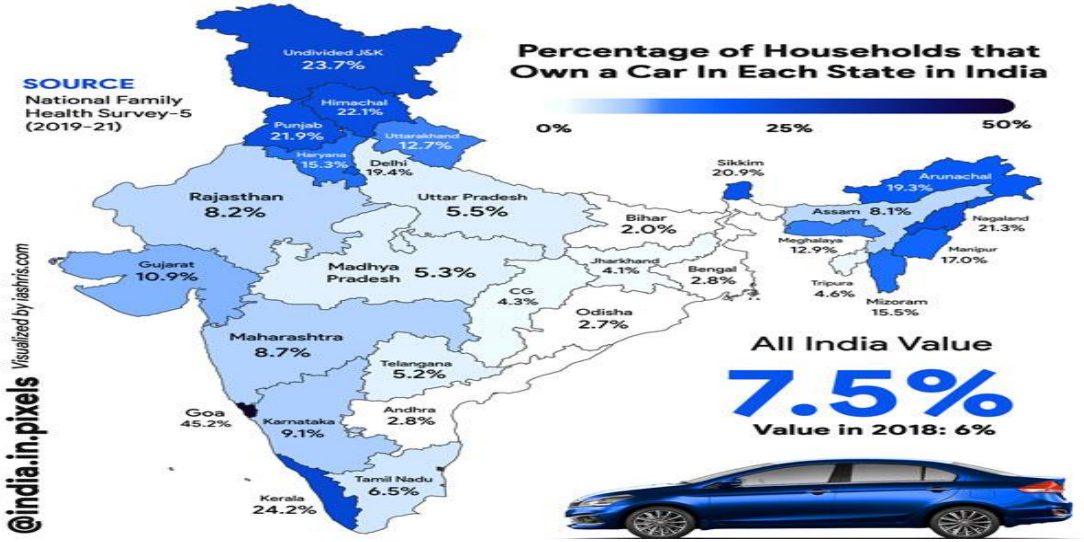
- The influence of financial incentives and control factors on PEV uptake in Europe based on registration shares (Münzel et al. 2019)
- The incentive for scrapping a polluting car or purchasing a low-emission car are additional financial tools that support sustainable mobility (Ewing and Sarigöllü 1998)
- Subsidies will be decreased and eventually withdrawn. Alternative incentive regimes were computed, and consumer preferences for various incentives were analysed by Ma, Xu, and Fan 2019

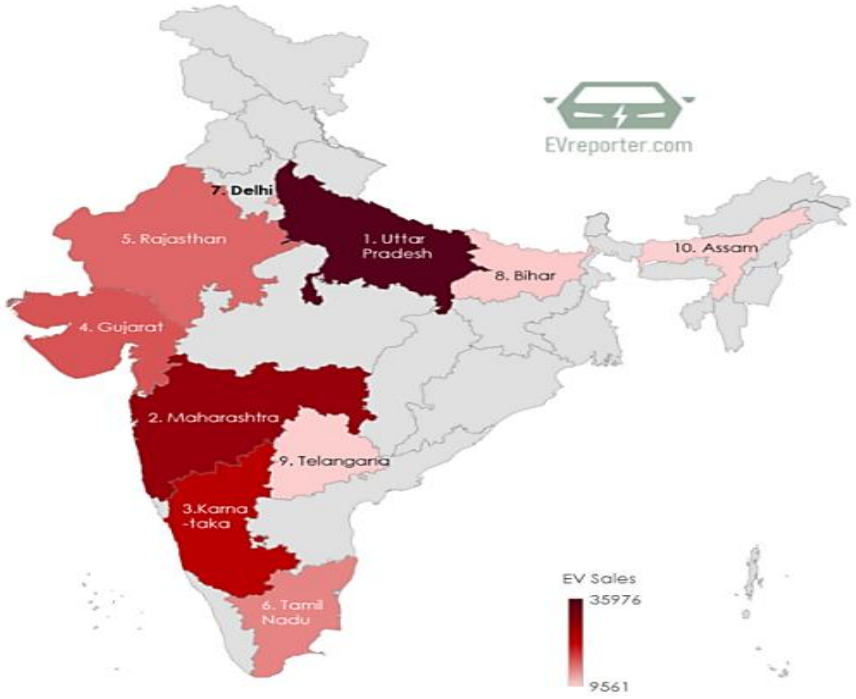
An overview of policies in India

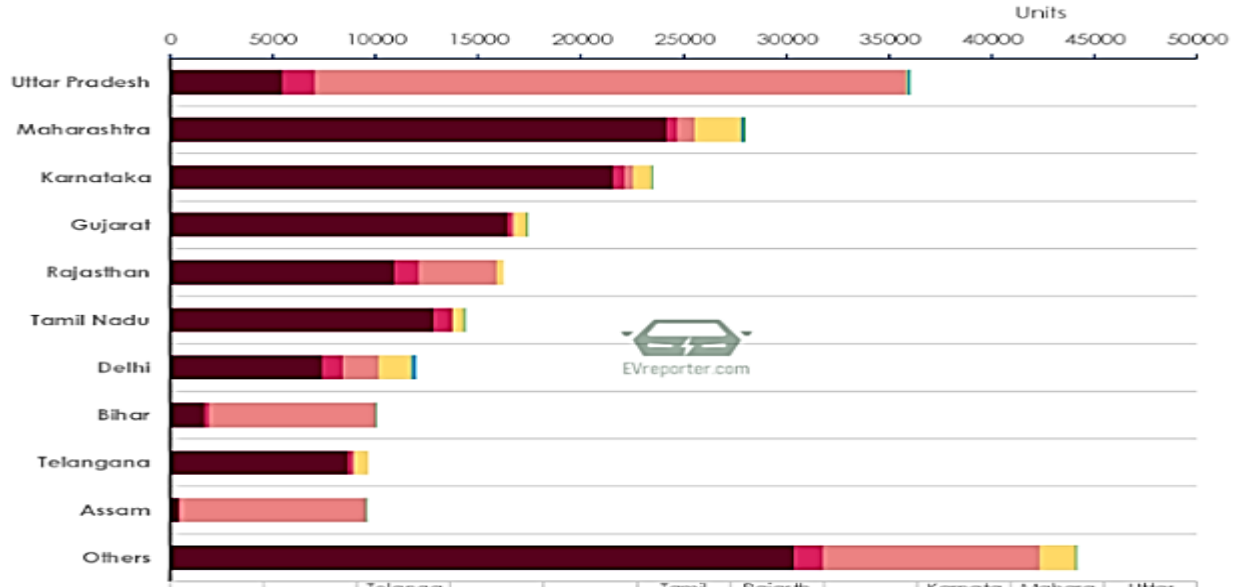
Key challenges :

1. Baseline scenario predicts a rise in private car use from 32% i n 2010 to 59% in 2050, at the expense of a decline in the share of the transportation market occupied by public transit, which falls from 42% to 22%(OECD/ITF 2015).

2. Solution: Road or congestion pricing can be used successfully in highly automobile-dependent urban centers. The most important regulations and technical details of EV adoption in India were examined by (Singh, Singh, and Vaibhav 2021, Sud and Aiyengar 2016)







	Others	Assam	Telangana	Bihar	Delhi	Tamil Nadu	Rajasthan	Gujarat	Karnataka	Maharashtra	Uttar Pradesh
2W	30339	380	8604	1648	7353	12802	10904	16424	21547	24162	5442
3W Cargo	1421	94	235	197	1060	924	1174	183	600	526	1595
3W Passenger	10596	9064	127	8129	1748	11	3812	111	404	860	28773
4W	1705	18	704	36	1581	555	347	671	909	2231	54
e-Bus	33	0	0	0	203	0	0	0	2	126	103
Others	14	5	0	2	0	66	0	17	5	3	9

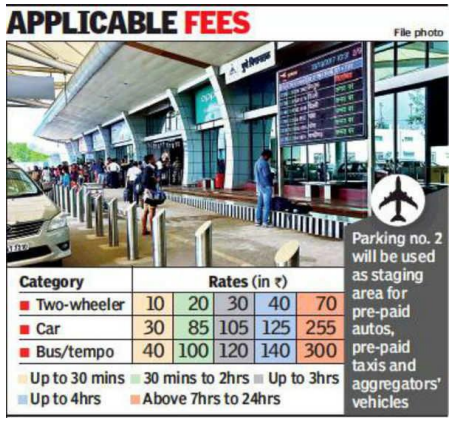
An overview of policies in India

Connaught Place(Before/After)

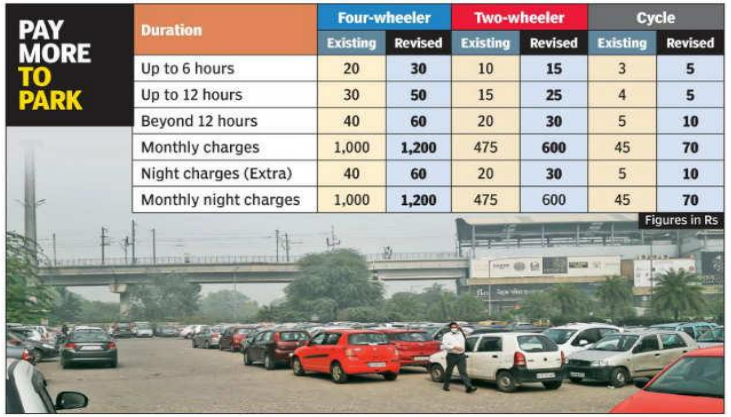
- A congestion fee is a fee placed on private vehicles that enter high-traffic areas such as Connaught Place, Nehru Place, ITO, etc. (Mishra 2000)

Electronic Road Pricing (ERP)

- ERP in India has been studied With the help of the Safety-as-a-Service (Safe-aaS) platform by Bharathy, C. M., Subramaniam, T. P., Deepakraj and Swetha 2016
- Diff-Price differential pricing system to provide users with personalized safety services at the best price while maximizing the profit (Roy et al. 2022, Bouchelaghem and Omar 2019)



Pune Airport Parking Fees



Duration	Four-wheeler		Two-wheeler		Cycle	
	Existing	Revised	Existing	Revised	Existing	Revised
Up to 6 hours	20	30	10	15	3	5
Up to 12 hours	30	50	15	25	4	5
Beyond 12 hours	40	60	20	30	5	10
Monthly charges	1,000	1,200	475	600	45	70
Night charges (Extra)	40	60	20	30	5	10
Monthly night charges	1,000	1,200	475	600	45	70

Delhi Metro Parking Charges

Parking costs in Surat are listed in (Parking Policy for Surat city 2018)

- Parking fees in various Indian cities and locations are listed in Corporation 2016
- Delhi's parking regulations can be changed by increasing parking fees in institutional and CBD locations. Additionally, hourly parking fees should be charged rather than flat fees for parking (Sud and Aiyengar 2016).

- Higher taxes on second cars for families and the implementation of a congestion fee can significantly alter the purchasing patterns (Sud and Aiyengar 2016).

Discussion

1. To promote sustainable mobility, as it is a declared aim of all governments, users, and operators in developed and many developing nations. However, despite the significant social and economic effects of pricing, taxes, & incentive policies, the transportation sector has yet to cut its greenhouse gas emissions significantly.

2. The review of the literature has shown, even from a basic examination of the publishing sites of the referenced articles that achieving sustainable mobility goals involves multiple measures from user to the operator, from trip cost to journey time to revenue generation, from social to economic, from region to city, etc

3. To stop or slow the growth of private vehicle traffic in metropolitan areas, car-restricted parking regulations and upgrades to public transportation are essential. Parking restrictions can decrease the number of private cars on the road, which is better for the environment since they generate less noise, air pollution, and driver stress.

4. Residents and commercial traffic have easier access than commuters, who can use public transit and park-and-ride options more readily. Increasing parking availability does not solve parking issues. Improvements in parking policies, strategies, and a focus on sustainability will assist transportation planners in developing a sustainable parking eco-system.

5. Furthermore, in some issues, only passenger transportation-related details have been mentioned, but goods transportation-related details have been ignored because they demand their study. more attention was placed on road travel, while air, rail, and marine transport, all of which have significant environmental implications, were overlooked.(Future Research)

6. As indicated earlier, we believe that price, taxing, and incentives will have the greatest influence on achieving global sustainability goals. Consequently, we anticipate that future research will concentrate substantially on developing new technologies

Conclusion

1. Sustainable mobility is a major focus of transportation policy at all scales of government and latitudes. At the same time, the degree to which it is prioritized varies widely according to each country's level of environmental consciousness

2. This trend has been closely followed by research in socioeconomic policies and other policies, from sharing mobility to equality and enhancing the quality of public transport, from economics to industrial and information engineering, by approaching the issue from various perspectives, analysing data, and suggesting various solutions.

3. The process of interpreting government regulations distorts the idea of policy integration and consistency. It's also important to identify with local actors, structures, and regimes.

4. These issues are all obstacles that could lead to inconsistencies between national, regional, and local policies as well as gaps between declared goals and actual accomplishments. The policy environment and institutional structures are just as crucial to the effectiveness of sustainable transport policies as a consistent combination of measures.

5. The development of road pricing policy, with parking and distance-based pricing, is the future, at least in metropolitan areas. This technology may help transportation sustainability. Taxes and fees should be implemented in regions with a significant relationship to the externality in the issue.

6. Governments can choose from various effective policy instruments that reduce carbon emissions from road transportation and address climate change. Implementing these will necessitate political will and dedication. Delaying these choices is not recommended.

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