public transportation optimization

Mentored By

SANTHOSH S

THATCHAYINI.S

SHALINI.J

SIVAKUMAR.R

SURENDHAR.P

TOPIC-

Innovations In Public Transportation

Made By- **Shrikrishna Kesharwani**

Roll No:- **22CEM3R23**

Under the Guidance of - **Dr. C.S.R.K. Prasad Sir**

M.Tech , First Year

Transportation Division

Department of Civil Engineering

NIT Warangal

Academic Year- 2023

NITW

FLOW OF PRESENTATION

INTODUCTION

WHAT IS
PUBLIC TRANSPORT ?

Public transport is a system of transport for passengers by group travel systems available for use by the general public unlike private transport, typically managed on a schedule, operated on established routes, and that charge a posted fee for each trip.

NEED FOR PUBLIC TRANSPORTATION

Public transportation is important in urban areas as it provides accessible, affordable, and sustainable transportation options, reduces traffic congestion, and has economic benefits.

TRAFFIC CONGESTION

RISING FUEL COSTS

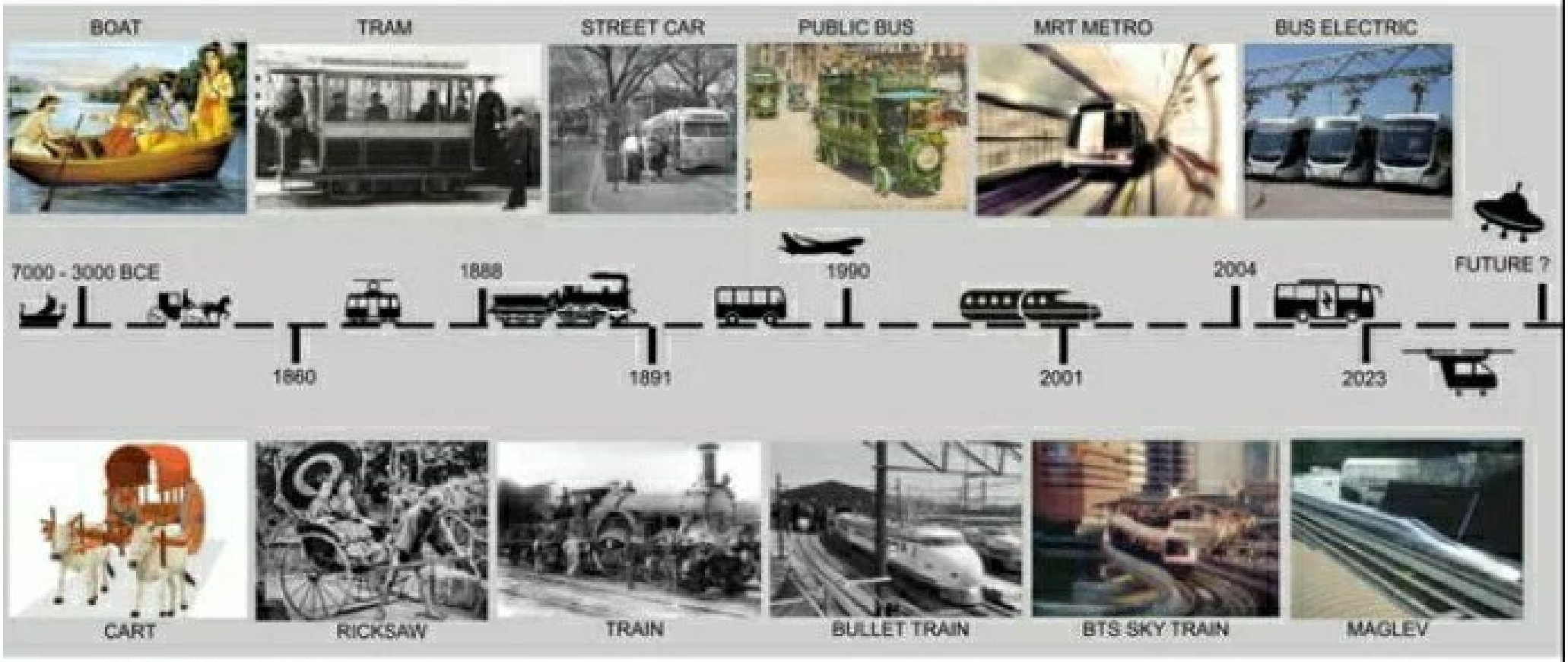
LIMITED PARKING

EQUITY ISSUES

ENVIRONMENTAL CONCERNS


NITW
SPACE REQUIRED TO TRANSPORT 60 PEOPLE
BUS
BICYCLES
CARS

EVOLUTION OF PUBLIC TRANSPORTATION



POLICIES FOR PUBLIC TRANSPORTATION

SOURCE:- Government of India. (1996). Urban development plans formulation and implementation (UDPFI) guidelines.

UDPFI, 1996
Modal Split by Public Transport

City Size	Recommended Modal Split for PT, %
Below 1 million	30%
Around 1 million	35%
1.5 million	40% +
3.0 million	50% +
6.0 million	70% +
9.0 million	75% + (85% with a Mass Transit System)

URDPFI Guidelines, 2015

Compact City Approach

By mixing uses of land to an optimum level, decreasing trip generation and high population density making mass rapid transit systems technically and economically viable.

SOURCE:- Ministry of Urban Development, Government of India. (2015). Model Town Planning Scheme and URDPFI Guidelines.

NITW

National Urban Transport Policy (2014)

- Planning for MRT
- Common MRT Technologies
- Water Transport
- PT for Hill Cities
- Promoting Technologies for PT Modes
- Choice of MRT mode
- Multi-Modal Integrated MRT Network
- Role of Para-transit
- Battery Operated Low Capacity Vehicles
- Regional & Sub-Urban Connectivity
- First and Last mile connectivity
- Quality and pricing of PT
- Use of Clean Fuel and Clean Vehicle Technology

PUBLIC TRANSPORT ORIENTED DEVELOPMENT (NTDPC, 2032)

Improving public -transport accessibility in existing settlements

New public transport oriented settlements

Renovation of railways stations

Renovation of areas surrounding stations

CHALLENGES FOR INNOVATION IN PUBLIC TRANSPORTATION

BENEFITS

CHALLENGES

- Innovation in public transportation refers to the implementation of new technologies and strategies to enhance the efficiency, safety, and accessibility of transportation systems.
- These may include electric buses, mobile payment systems, real-time tracking and monitoring, autonomous vehicles, and data analytics.

Innovations In Public Transportation

ELECTRIC AND HYBRID BUSES

ADVANTAGES

1. Environmental benefits
2. Cost savings
3. Quieter rides
4. Potential for renewable energy
5. Improved energy efficiency

DISADVANTAGES

1. Higher upfront cost
2. Limited range
3. Charging infrastructure requirements
4. Potential challenges in extreme weather conditions

CONTACTLESS PAYMENT SYSTEMS

ADVANTAGES

1. Convenience
2. Faster boarding times
3. Reduced cash handling costs
4. Improved data collection

DISADVANTAGES

1. Limited access
2. Potential for fraud
3. Infrastructure requirements
4. Potential for technical difficulties

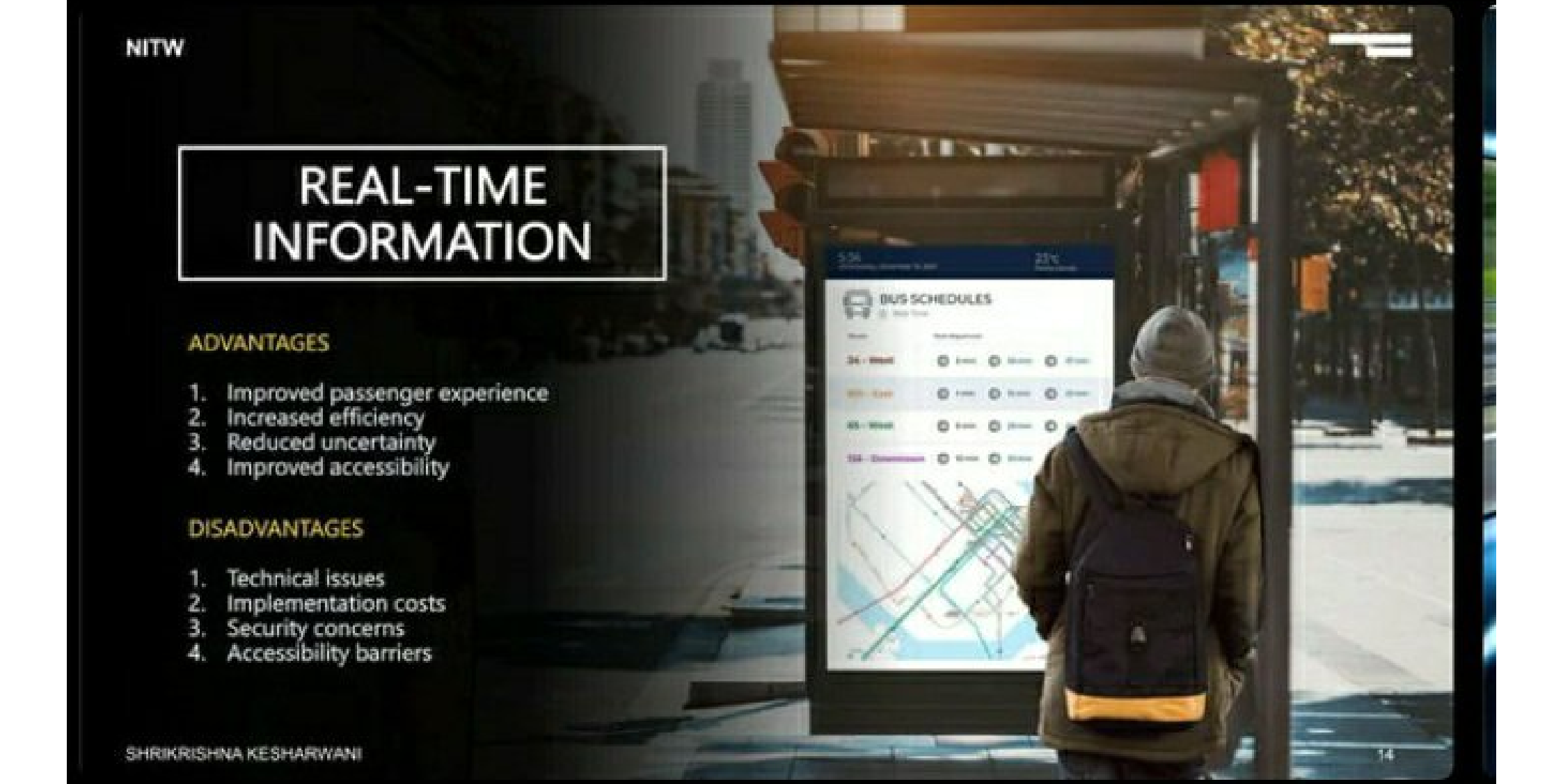
REAL-TIME INFORMATION

ADVANTAGES

1. Improved passenger experience
2. Increased efficiency
3. Reduced uncertainty
4. Improved accessibility

DISADVANTAGES

1. Technical issues
2. Implementation costs
3. Security concerns
4. Accessibility barriers



AUTONOMOUS VEHICLES

ADVANTAGES

1. Improved safety
2. Increased efficiency
3. Reduced operating costs
4. Improved accessibility

DISADVANTAGES

1. Technical issues
2. High upfront costs
3. Safety concerns
4. Job displacement


NITW
INTEGRATED FARE SYSTEMS
ADVANTAGES
1. Convenience
2. Cost savings
3. Increased ridership
4. Improved data collection
DISADVANTAGES
1. Implementation costs
2. Technical challenges
3. Equity concerns
4. Privacy concerns
SHRIKRISHNA KESHARWANI
SOURCE - Luathia et al. (2019)
16

MOBILITY AS A SERVICE (MAAS)

User friendly

User experience is key to an app's success and requires constant development

Variable

MaaS trip planner combine multiple modes of transport incl. public transit, car-/bike-sharing, carpooling and DRT

MaaS

Your guide through the mobility jungle

Modular

MaaS apps can be implemented in steps due to modular software

Dynamic

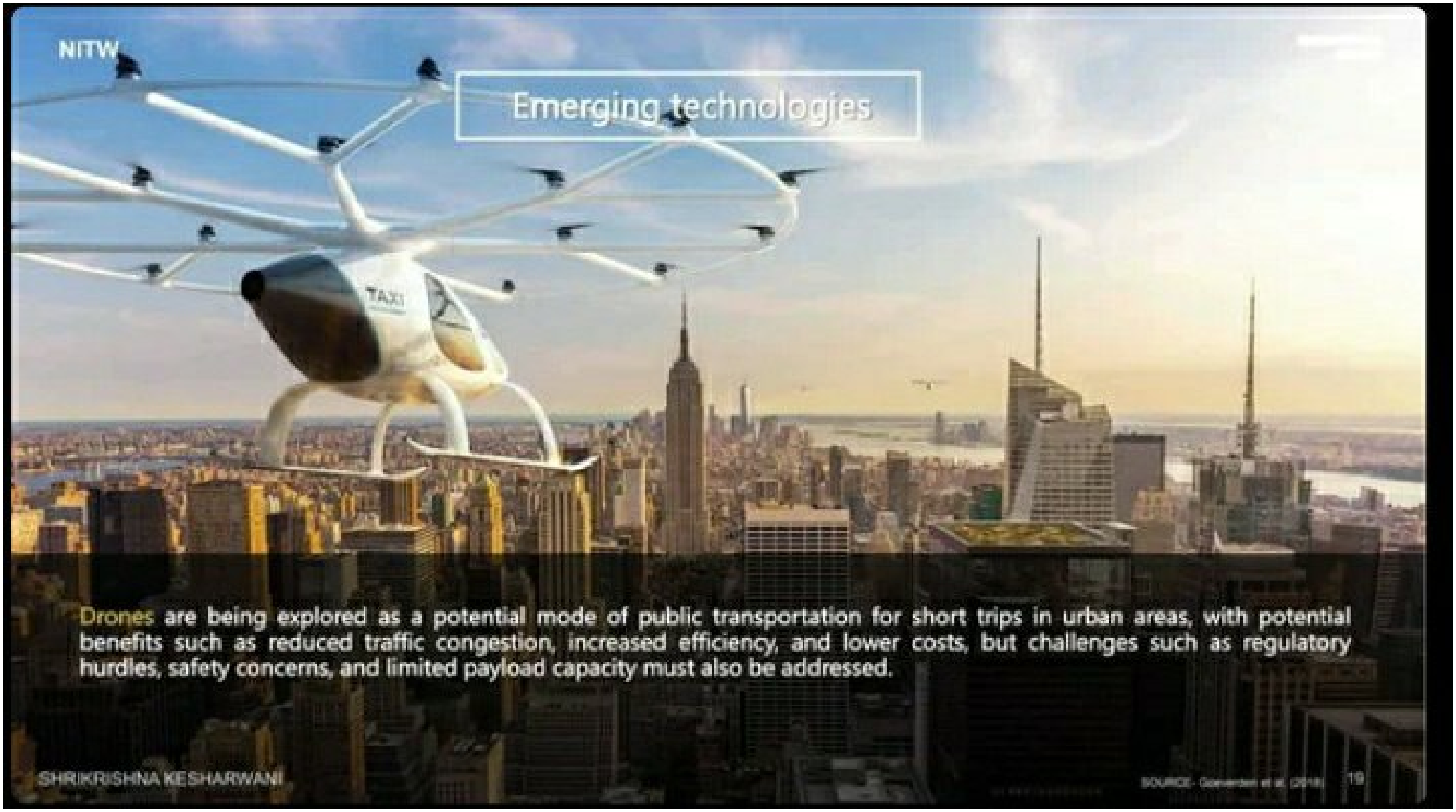
New mobility services expand the mobility landscape

Sustainable

MaaS reduces the carbon footprint with low-emission modes of transport

Mobility as a service (MaaS) is a type of service that, through a joint digital channel, enables users to plan, book, and pay for multiple types of mobility services, eg- Travel Buddy app of London, UK


NITW
Emerging technologies
Virgin hyperloop one
Hyperloop is a proposed mode of transportation that uses high-speed trains or pods to travel through a low-pressure tube or tunnel, allowing for speeds of up to 700 miles per hour or more, with potential benefits such as increased speed and efficiency, reduced congestion, and cost-effectiveness, but challenges such as technical, safety, cost, and accessibility concerns must also be addressed.
SHRIKRISHNA KESHARWANI
SOURCE: Goeverden et al. (2018)
18


NITW
Emerging technologies
TAXI
Drones are being explored as a potential mode of public transportation for short trips in urban areas, with potential benefits such as reduced traffic congestion, increased efficiency, and lower costs, but challenges such as regulatory hurdles, safety concerns, and limited payload capacity must also be addressed.
SHRIKRISHNA KESHARWANI
SOURCE - Goevaerken et al. (2018)
19

NITW

LITERATURE REVIEW AND CASE STUDIES

SHRIKRISHNA KESHARWANI

NAME	AUTHOR	OBSERVATIONS
Innovative land use and public transportation policy	Rabinovitch (1996)	Examines the successful approach of Curitiba, Brazil, to urban planning and public transportation as an integrated system, highlighting the importance of incremental change and prioritizing effective transport over particular vehicles.
Innovative Solutions for Public Transport; Curitiba, Brazil	Friberg (2000)	• Discusses how Curitiba, Brazil has successfully created a privately owned public transport system through innovative solutions and long-term planning, making it a model for other cities to consider. • The success is due to practical reasons such as efficiency, coverage, and affordability, but the increasing number of cars may pose a threat to the system's success and the city's environment.
Sustainability and Urban Public Transportation	Sinha (2003)	• Suggests that changes in land use, pricing mechanisms, and technological innovations can be effective in slowing or reversing the growth in private automobiles and making public transit more attractive and viable. • Additionally, the paper highlights the need for a comprehensive approach involving multiple factors such as land use, transportation planning, pricing, technology, and management innovations to achieve sustainable transportation systems in cities worldwide.,
New Urban Public Transportation Systems: Initiatives, Effectiveness, and Challenges	Ceder (2004)	• Auckland, a sizable New Zealand city that is dealing with worsening traffic congestion and pollution. • Auckland develop a combination of rail and tube systems throughout time, together with feeder and distributor bus lines.

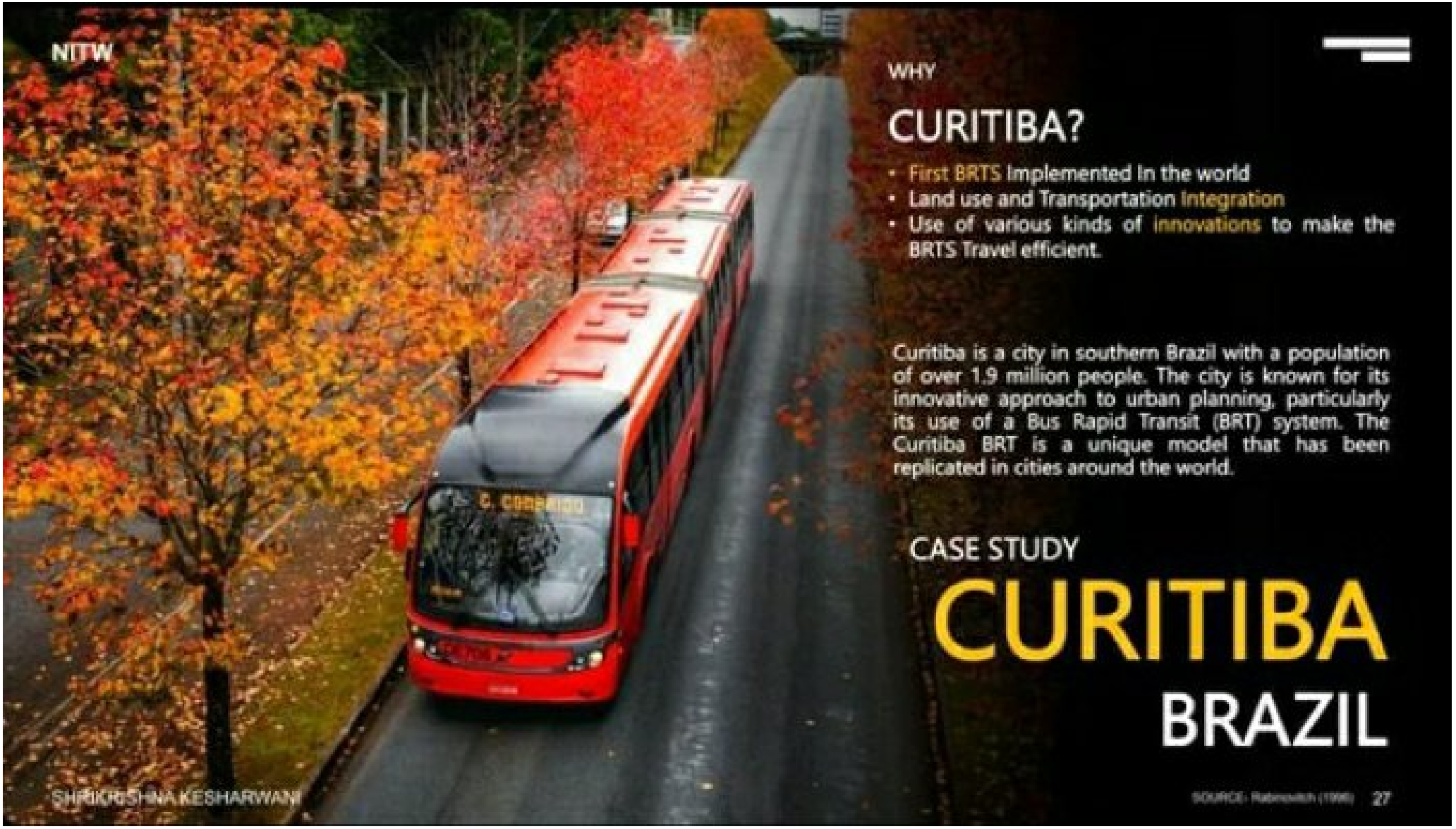
NAME	AUTHOR	OBSERVATIONS
Sao Paulo Metro: A successful public transportation system	Pereira (2004)	• Discusses the Sao Paulo Metro in Brazil, its development, and its benefits as a successful public transportation system. • It highlights the positive impact it has had on reducing traffic congestion, air pollution, and noise levels in the city, as well as improving accessibility and mobility for residents, contributing to their overall well-being.
Sustainability, public transportation and Technological innovations	Sinha (2004)	• Discusses how technology can help make public transportation more eco-friendly. • The paper explores different technologies, such as electric buses and intelligent transportation systems, that can reduce greenhouse gas emissions and make public transportation more efficient, but also highlights the challenges that come with implementing these technologies.
Opportunities for innovation in public transport: Effects of regulatory reforms on innovative capabilities,	Ongkittikul & Geerlings (2006)	• The paper talks about how changes in the rules and regulations of public transport can affect the ability of the industry to come up with new and better ways to serve people. • It looks at different types of innovations, like making better technology or training workers better, and compares how these things have happened in different countries..
Innovative public transport oriented policies in Seoul	Lee et al. (2006)	• Discuss a number of policies, including those that promote the use of public transport, such as Bus Rapid Transit, Bus Management, Skip Stop Systems in Subways, and New Fare Systems in Public Transport, as well as those that discourage it, such as the elimination of an urban motorway, Tunnel Pricing, and Parking Policy.

NAME	AUTHOR	OBSERVATIONS
Bus Public Transport Energy Consumption and Emissions versus Individual Transportation	Silva et al. (2008)	Discusses a study comparing the energy consumption and emissions of urban diesel buses and light duty vehicles, concluding that the more efficient mode of transport depends on the number of passengers being transported.
Electric buses: An energy efficient urban transportation means	Kühne (2010)	Suggests investigating the use of modern trolley bus systems in Germany for sustainable urban transportation due to their environmentally-friendly and energy-saving nature, ease of integration, and high efficiency in improving existing networks and connecting new areas.
Users' preferences towards innovative and conventional public transport	Site et al. (2011)	The paper looks at what people like more, new or old public transport systems, with a focus on a new system being tested in Rome, and shows that people prefer newer systems that are comfortable.
Innovative Concepts in First-Last Mile Connections to Public Transportation	Lesh. (2013)	Discusses the challenges in public transportation and proposes innovative solutions (like bike-sharing programs, on-demand shuttle services, autonomous vehicles, mobility hubs, and improved pedestrian infrastructure) to improve access and mobility, reduce vehicle miles traveled, and address environmental concerns..
Public transportation systems for urban planners and designers: the urban morphology of public transportation systems	Stojanovsk (2013)	Discusses the importance of designing public transportation systems that reflect the urban morphology of a city, and the role of urban planners and designers in creating such systems.

NAME	AUTHOR	OBSERVATIONS
The role of passenger-centric innovation in the future of public transport	Camacho et al. (2016)	• Emphasizes the importance of passenger-centric innovation in public transport, which focuses on enhancing the service based on passengers' evolving needs, desires, and values. • It calls for an interdisciplinary approach to research and design to overcome barriers and achieve a future where passenger-centric innovation is valued in the public transport industry.
Innovative public transport in Europe, Asia and Latin America: a survey of recent implementations	Pasquale et al.(2016)	• The paper surveys recent innovative solutions implemented in urban public transport in Europe, Asia, and Latin America, and discusses the need for collaboration between regions to overcome barriers such as lack of knowledge on priorities and lack of standardization and interoperability. • Standardization and interoperability can help reduce costs of investments and make up for chronic infrastructure deficits.
Moving Citizens and Deterring Criminals: Innovation in Public Transport Facilities	Bacarreza & Urrego (2016)	• The paper explores the relationship between public transport innovations and crime reduction in cities through case studies of innovative transport systems from different cities around the world. • The authors find that innovative public transport facilities can help deter crime and enhance the safety and well-being of commuters.
Transport innovations and their effect on cities: the emergence of urban linear ferries worldwide	Tanko & Burke (2017)	• The paper discusses a new type of transportation system called "urban linear ferries" that operate on waterways in cities. • Potential benefits of urban linear ferries in reducing travel times and improving access to waterfront areas, and provide examples of cities where they have already been implemented.

NAME	AUTHOR	OBSERVATIONS
The transition to zero-emission buses in public transport -The need for institutional innovation	Bakkera & Konings (2017)	Explores the role of institutions in the implementation of zero-emission buses in public transport, and suggests institutional innovation as a means of overcoming the barriers to their large-scale adoption.
Analysis and modelling of performances of the HL (Hyperloop) transport system	Goeverden et al. (2018)	The Hyperloop system has potential as a sustainable mode of transport, but its low capacity and high infrastructure costs may limit its application to the premium passenger market, and further research is needed to improve its operational, financial, and social/environmental performances.
Public Transportation Education: Inventory and Recommendations on Curricula	Beiler (2018)	• Explores the current state of public transportation engineering courses in the US and provides recommendations for future course development. • The study suggests that the inclusion of new topics and the development of courses for undergraduate students can attract and prepare future public transportation engineers, leading to improved accessibility and availability of public transportation courses.
Public transport innovation platform boosting Intelligent Transport System value chains	Lusikka et al. (2019)	The paper discusses the use of open innovation platforms in public transport to create more value through collaboration and presents a new added value description, the "Value Ramp," for testing and development of ITS in a real operating environment.

NAME	AUTHOR	OBSERVATIONS
Investigating the preferences of individuals on public transport innovations using the Maximum Difference Scaling method	Tsafarakis et al. (2019)	• The paper explores what people in Europe like and dislike about public transport, and how it can be improved. • The findings can help make public transport better and more attractive to people.
Evaluation of innovative ideas for Public Transport proposed by citizens using Multi Criteria Decision Analysis (MCDA)	Nalmpantis et al. (2019)	• Discusses how citizens can generate innovative ideas for public transport through participatory techniques and the need to rank these ideas for implementation. • The paper used the Analytic Hierarchy Process to rank the ideas based on feasibility, utility, and innovativeness, providing valuable insight into integrating innovation with public transport to make it more attractive and increase its use.
Public Transportation Analysis Based on Social Media Data	Zhang et al.(2019)	• Explains how social media data can be used to analyze public transportation issues. • The researchers collected data from social media, analyzed it, and proposed ways to improve the Nanjing subway system based on their findings such as improving metro operation management, station safety management, auxiliary facility management, and emergency handling.
Service innovation in digitalized product platforms: An illustration of the implications of generativity on remote diagnostics of public transport buses	Chowdhury et al. (2021)	• It explains how digital technology is enabling companies to create new services • Suggests that to do this successfully, companies need to involve customers and have a mindset that focuses on providing services instead of just selling products.



WHY

CURITIBA?

- First BRTS Implemented In the world
- Land use and Transportation Integration
- Use of various kinds of innovations to make the BRTS Travel efficient.

Curitiba is a city in southern Brazil with a population of over 1.9 million people. The city is known for its innovative approach to urban planning, particularly its use of a Bus Rapid Transit (BRT) system. The Curitiba BRT is a unique model that has been replicated in cities around the world.

CASE STUDY

CURITIBA

BRAZIL

SOURCE: Rabinovitch (1996)

BACKGROUND

The Curitiba BRT system was developed in the 1970s, during the city's urban planning renaissance. The system was designed to be a cost-effective alternative to traditional rail-based transit systems.

The BRT system consists of dedicated bus lanes, stations with level boarding, and prepaid fare collection. The system's buses are also equipped with features such as air conditioning, Wi-Fi, and bike racks.

1974 : First two BRT corridors were opened.

1979 : Feeder and interdistrict buses integrated with BRT, creating the Rede Integrada de Transporte (RIT).

1982 : All five major BRT corridors were all functional.

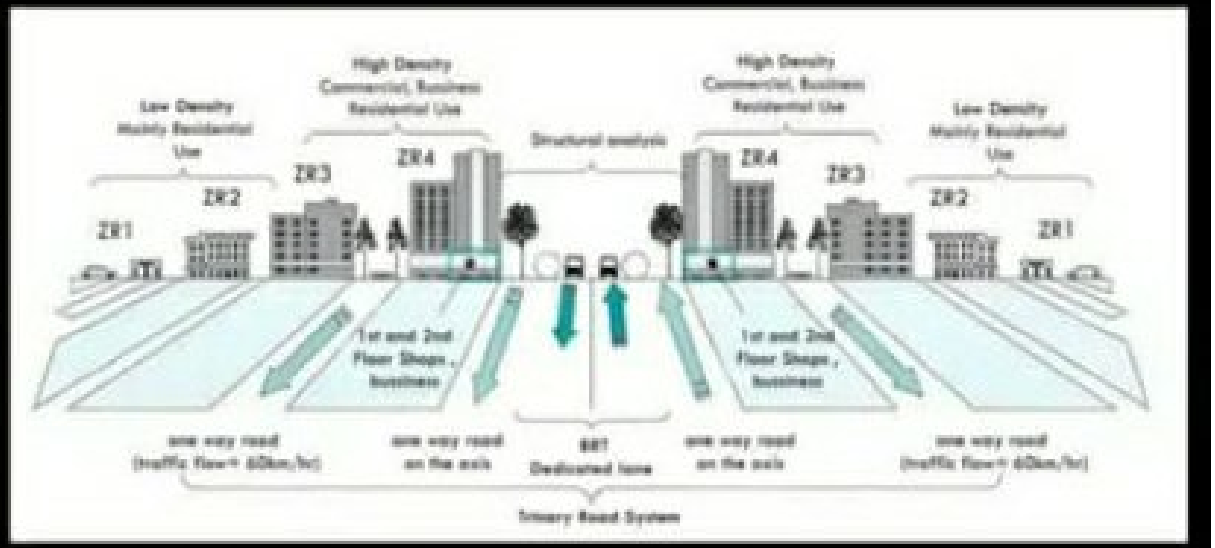
1992 : Iconic circular boarding platforms introduced, along with the use of biarticulated buses to increase system capacity.

2009 : New "Green line" BRT corridor was opened.

Started	1974
Busway length	72 Km
Daily Passengers	>20,00,000
Avg. Speed	25 km/hr
Headway	• 50- sec. headway at peak times times • 2 to 3 minutes at other times at at the central station
Bus/Bus stops	2000 bus 200+ bus tubes 25 terminals
Management	Contract basis but owned by govt.
Features	• Bus Colouring Hierarchical network busways on the local streets. • Land use control along the busways

TRINARY ROAD SYSTEM

With less traffic congestion, buses and vehicles could travel around the city more effectively because to the system's network of roadways. The idea of three highways running parallel to one another in each direction is the foundation of the trinary road system.



SOURCE- CURITIBA, BRAZIL BRT CASE STUDY. (n.d.). Retrieved May 4, 2023.

NITW ECO-FRIENDLY EV FOR PUBLIC TRANSPORT

SUMMARY

- The collection of papers explores various aspects of sustainable urban transportation, including the use of trolley bus systems, open innovation platforms, zero-emission buses, the Hyperloop, , the application of new business models, the use of data and technology, and environmental measures and energy-efficient modes of transport.
- The papers suggest that institutional innovation, collaboration, and further research are necessary to overcome barriers and improve the operational, financial, and environmental performances of these sustainable transportation options.
- Case study examines Curitiba, Brazil's Bus Rapid Transit (BRT) system, a cutting-edge urban transportation technology that is largely regarded as a success in the transportation sector.
- Public transportation is an essential service that provides access to mobility for millions of people around the world.
- The challenges facing public transportation in India and around the world are significant, but there are also many opportunities for innovation and improvement.
- By investing in infrastructure, technology, and quality of service, we can create a more efficient, sustainable world.


NITW
THANKYOU
SHRIKRISHNA KESHARWANI
END