SMART MOBILITY

Pawan Mulukutla

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What do we want from **our cities !**

Cities

GEHL ARCHITECTS
URBAN QUALITY CONSULTANTS

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We need **Mobility for all !**



P-166

What do we **See**?


WALL

Efficiency

- Congestion in Bangalore costs the city approximately Rs. 7,600 Crore per Year in lost economic output and excessive fuel use
- This is ~5% of the city's GDP

Sources:
Verma, A. and Rahul, T.M. (2013) "Economic Impact of non-motorised transport in Inidan Cities", Research in Transportation Economics 38(1)
Mckinsey Global Institute, (2011), "Mapping the Economic Power of Cities"

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Safety

- 120,000 people die due to road traffic accidents annually (highest in the world)
- Nearly 50% of these are pedestrians and other non-motorised transport users in million-plus cities
- Traffic accidents are the #1 cause of death amongst males aged 18-35

Sources:
WHO (2012) "Global status on Road Safety"
NCRBI Annual Accident Database

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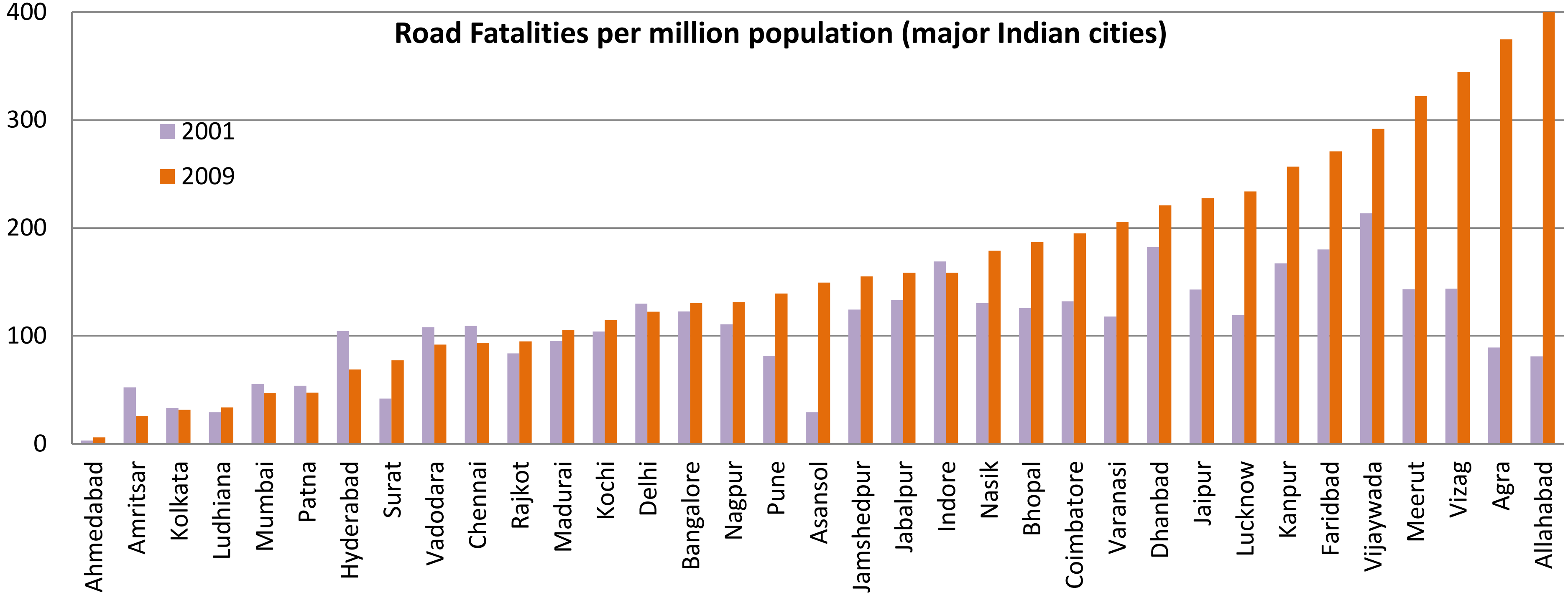
Safety



Sources:
Various – CDPs, CMPs, NCRBI Annual Accident Database

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Right to **Breathe !**

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Challenges

- *Population Growth-* 300 million additional people by 2030
- *Increasing motorization* -- Private motorized transport accounts for less than one-third of trips reported by C40 cities, but contributes to 73 percent of GHG emissions.
- *Traffic safety* - By 2030, traffic fatalities are expected to become the fifth leading cause of death globally.
- *Air quality* - Deteriorating air quality and harmful pollution are rampant in today's cities. Last winter, for example, New Delhi's air pollution was 60 times higher than the level deemed to be safe.

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We are facing a **Perfect Storm!**

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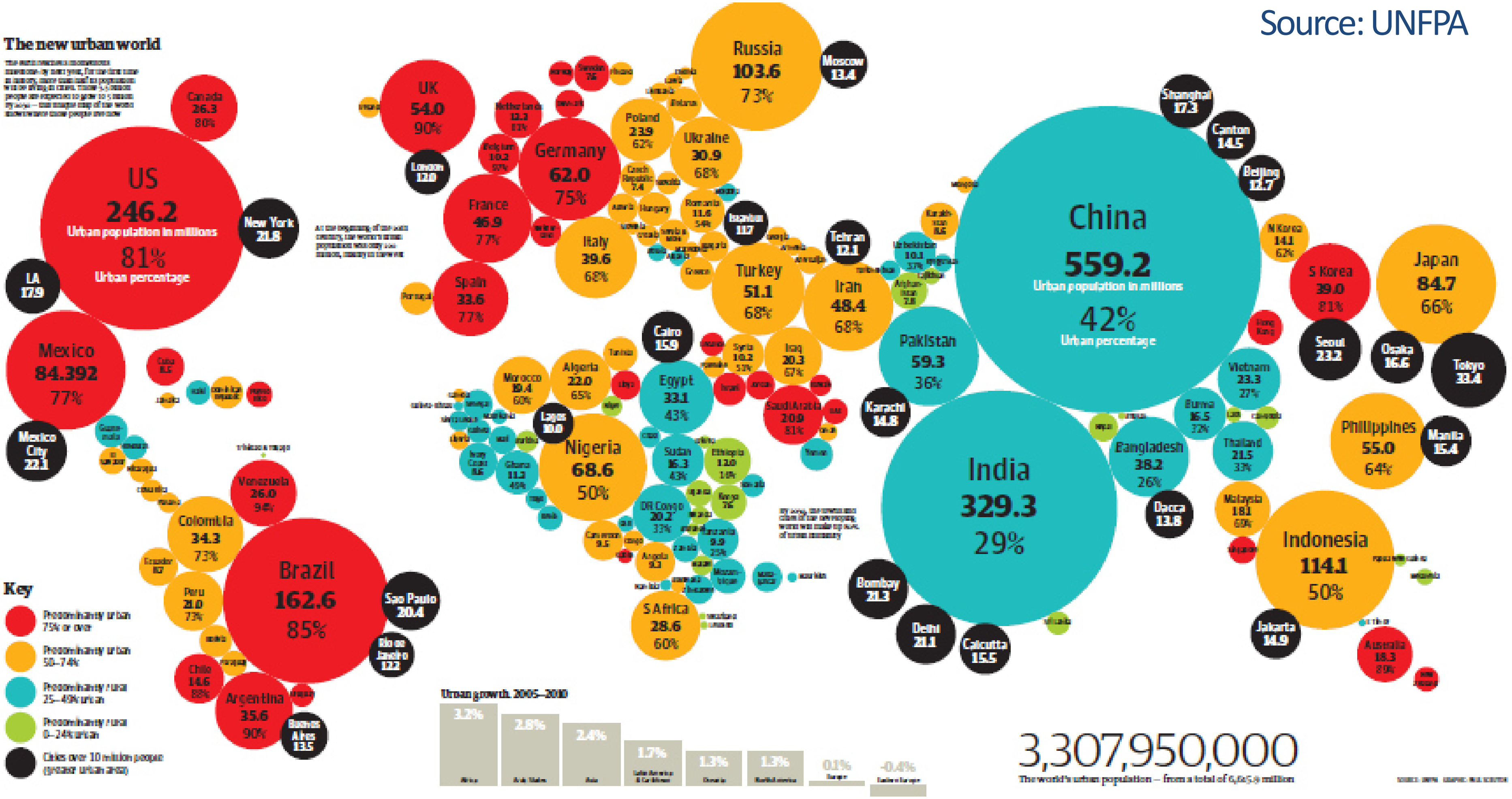
Global Urbanization- 2010

Source: UNFPA



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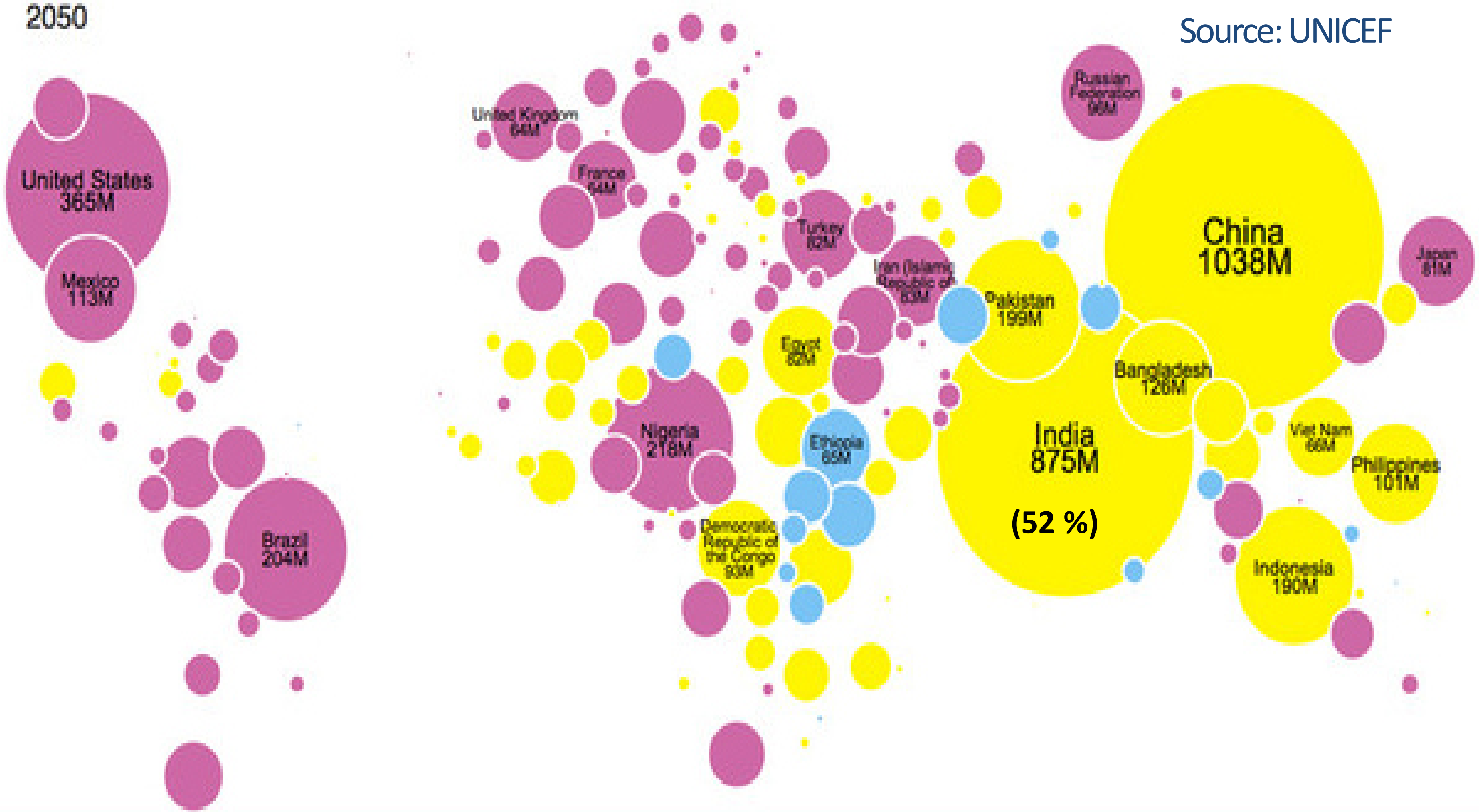
Global Urbanization- 2050



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Global Land Transport Infrastructure Requirements- 2050

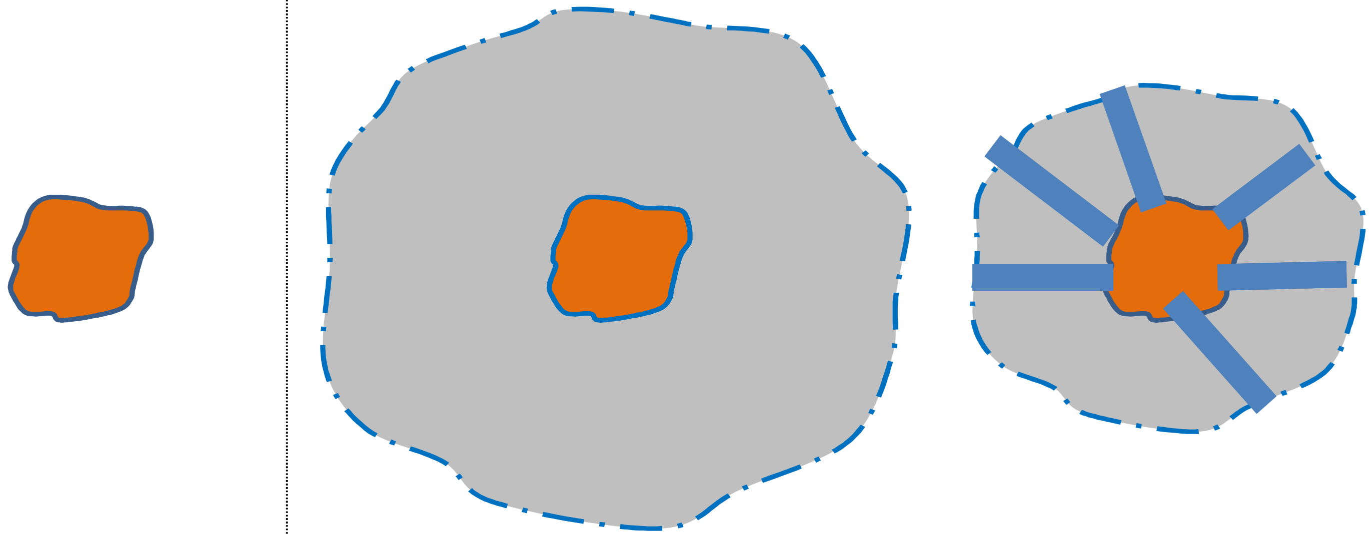
Alternative Scenarios	Transport infrastructure requirements, expenditure and investments	CO2eq emissions Million Ton
Emphasis on Private Transport (4 Degree Scenario)	25 million paved road lane km 335K rail track km 45-77K km2 Parking 250-350K km2 area USD 45 trillion investment (0.7% Global GDP) USD 120 trillion expenditures (2% Global GDP)	9,971
Emphasis on Public Transport AVOID- SHIFT- IMPROVE [23% less veh-km] (2 Degree Scenario)	15 million paved road lane km 535 K rail track km, +90 K HSR +25 K BRT (10 times) 27K km2 Parking USD 100 trillion expenditures (1.6% Global GDP, 20 trillion savings)	3,595 [36%]

Source: International Energy Agency

Scenario Building in Master Plans

Benefits, drawbacks and long terms implications of city level choices could be better understood

	Today	2041 Automobility	2041 Sustainable Transport



	Today	2041 Automobility	2041 Sustainable Transport
Population (millions)	**5.4**	**13.2**	**13.2**
Trips (millions/yr)	**5.6**	**39.75**	**39.75**
Area (Sq. Km.)	**1330**	**6484**	**3242**
Emissions (million Tons CO2/yr)	**0.33**	**12.32**	**1.97**
Traffic Fatalities (per yr)	**175**	**5,232**	**1,225**

Case: Ahmedabad, scenario estimated by EMBARQ India

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Yet, we are caught up in a **vicious circle !**

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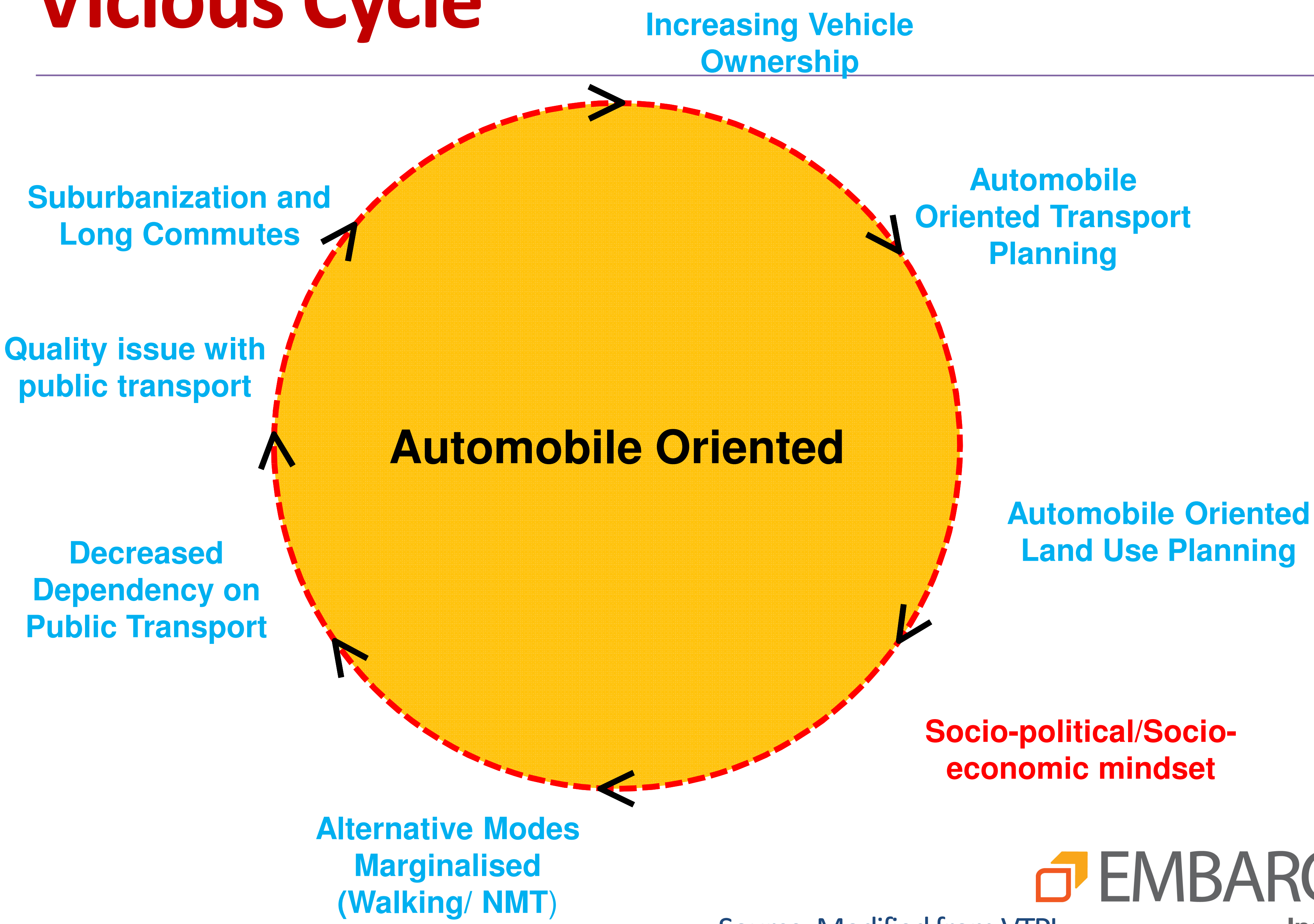
Vicious Cycle



Source: Modified from VTPI

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*“We need to **STOP** building cities as if everyone is 30 years old and athletic”*

- Mr. Gil Penalosa, Director 8-80 Cities

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We need to be **SMART** in identifying our priorities!

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Strategy for Smart Mobility

- AVOID- Dependency on private vehicle usage- reduce the length, need for, and number of trips in private modes

  "Avoid" cannot be achieved without smart, compact urban development and access to high quality sustainable transport

- SHIFT- "Shift" trips towards the most sustainable mode, almost always walking, cycling or public transport

- IMPROVE- Technology's place in transport, helping to improve fuel efficiency, route efficiency, and more

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Five Principles of Smart Mobility

- **30:30**
- **Buses as mass transit**
- **Parking**
- **Integration**
- Measure Performance

Five Principles of Smart Mobility

Principle 1-

- 30:30- No road wider than 30m and designed for speeds slower than 30kmph (Priority for building walking & cycling facilities)

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Safer Public Streets

- Creating a safe and pleasant environment for all modes

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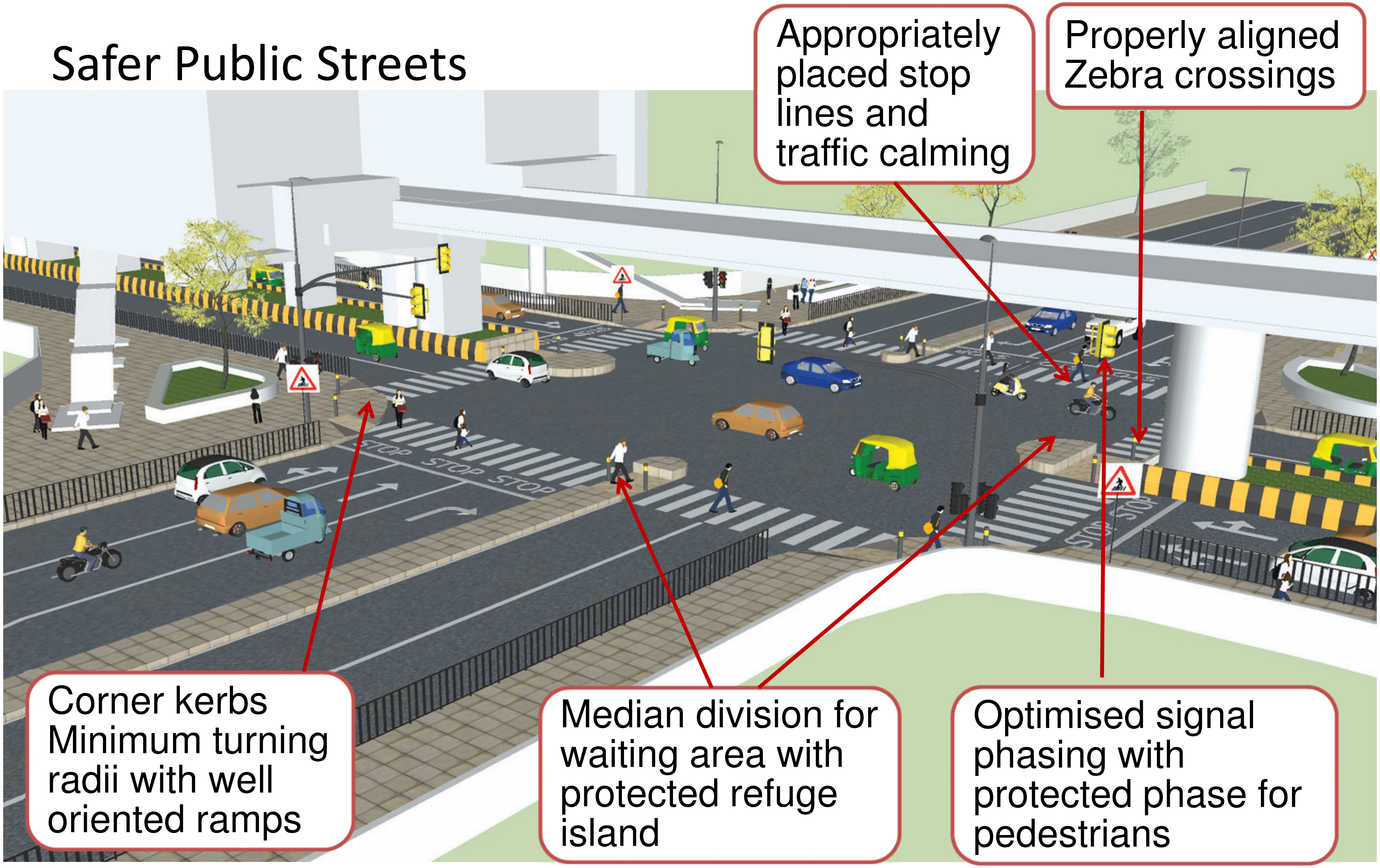
Safer Public Streets



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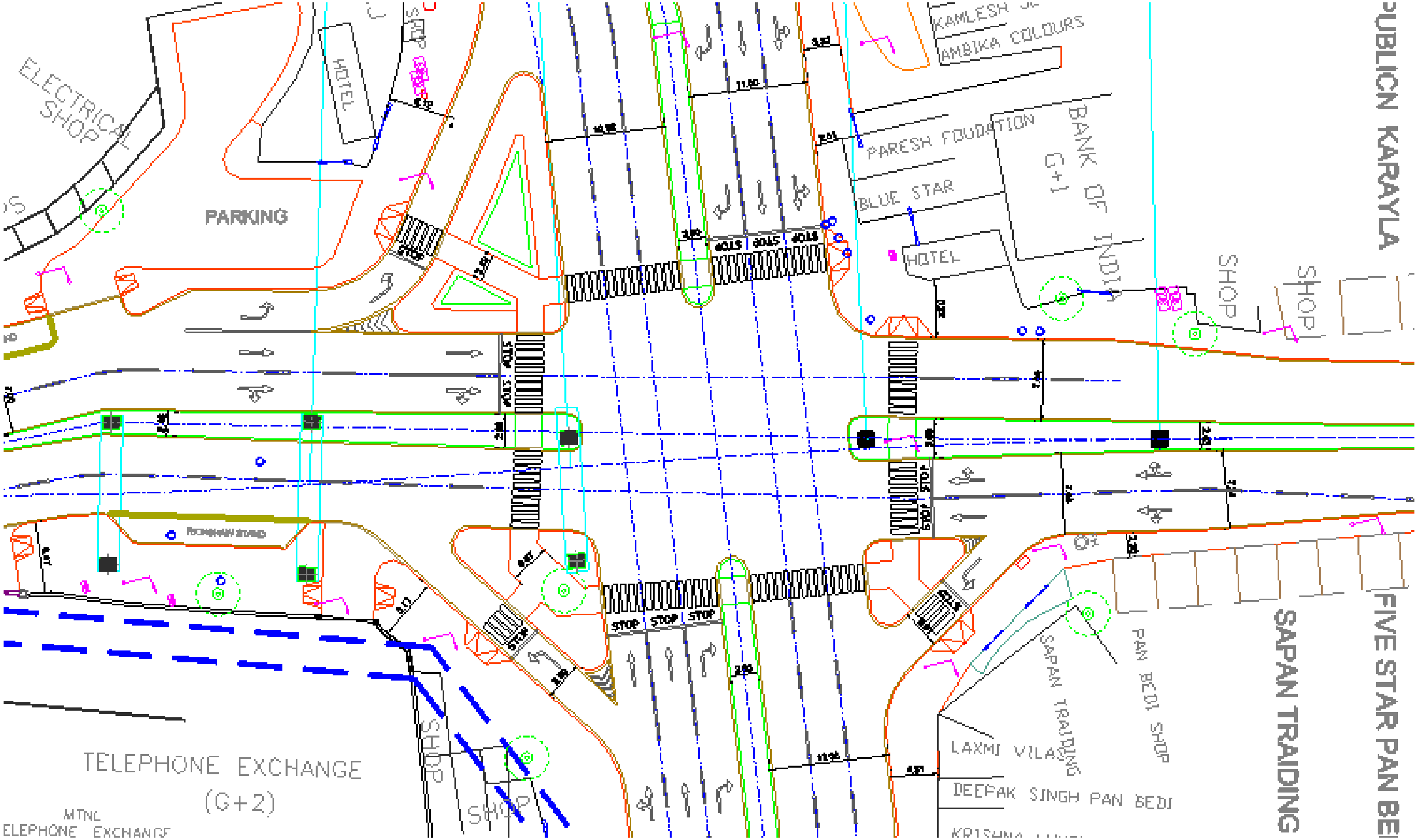
Safer Public Streets



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Safer Public Streets- Before Improvement

Safer Public Streets- After Improvement

Five Principles of Smart Mobility

Principle 2-

- Buses to deliver mass transport

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एम.वाय. अस्पताल M.Y. HOSPITAL
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हर निर्माण की जान
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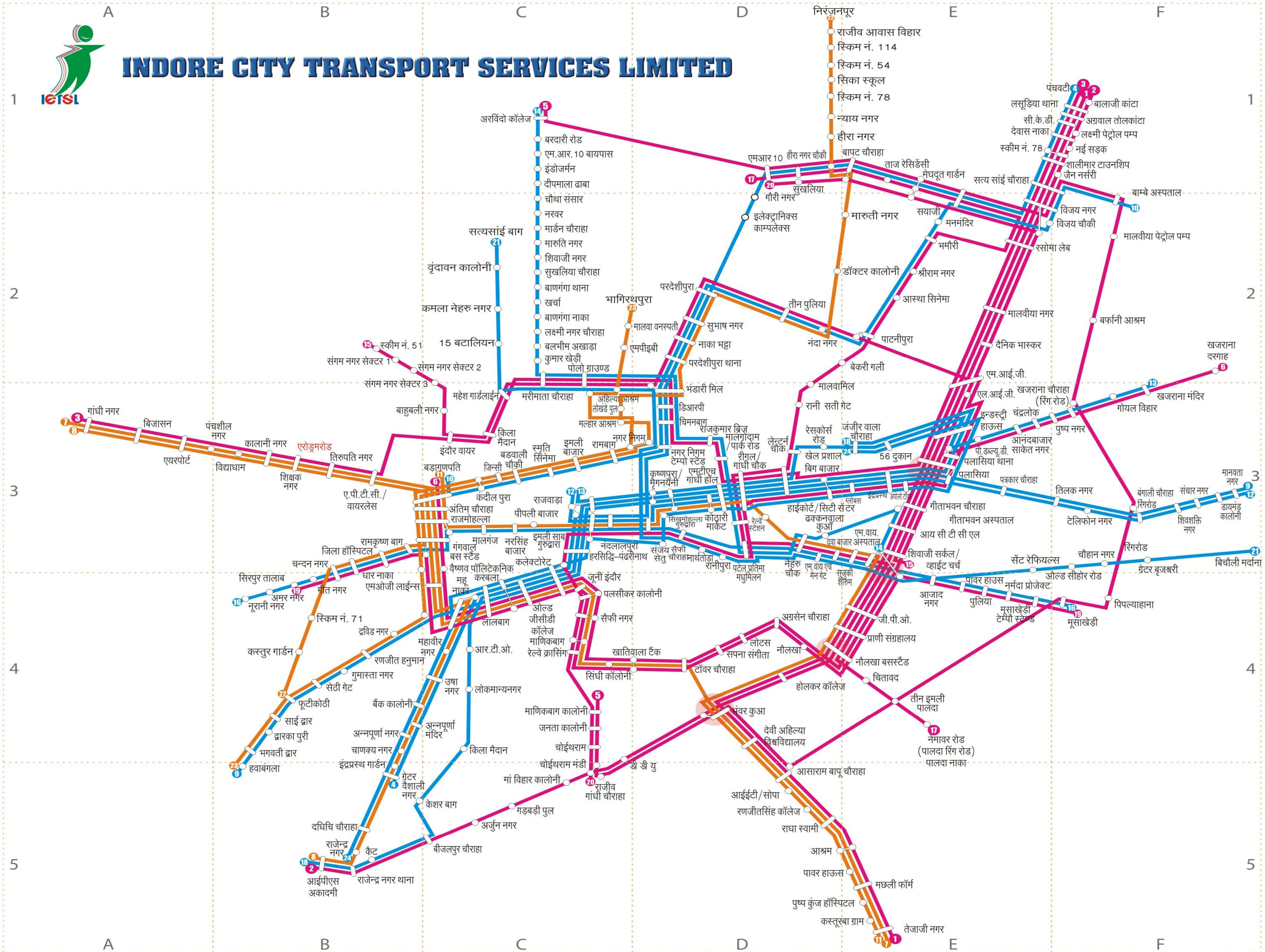

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अग्रवाल तोलकांटा
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इन्डस्ट्री हाऊस
चंद्रलोक
पुष्प नगर
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आय सी टी सी एल
शिवाजी सर्कल/ व्हाईट चर्च
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नौलखा
नौलखा बसस्टैंड
जी.पी.ओ.
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भंवर कुआ
देवी अहिल्या विश्वविद्यालय
तीन इमली पालदा
नेमावर रोड (पालदा रिंग रोड) पालदा नाका
आसाराम बापू चौराहा
आईईटी/सोपा
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पावर हाऊस
मछली फॉर्म
पुष्प कुंज हॉस्पिटल
कस्तूरबा ग्राम
तेजाजी नगर

Expert Technical Advice to iBus, Indore

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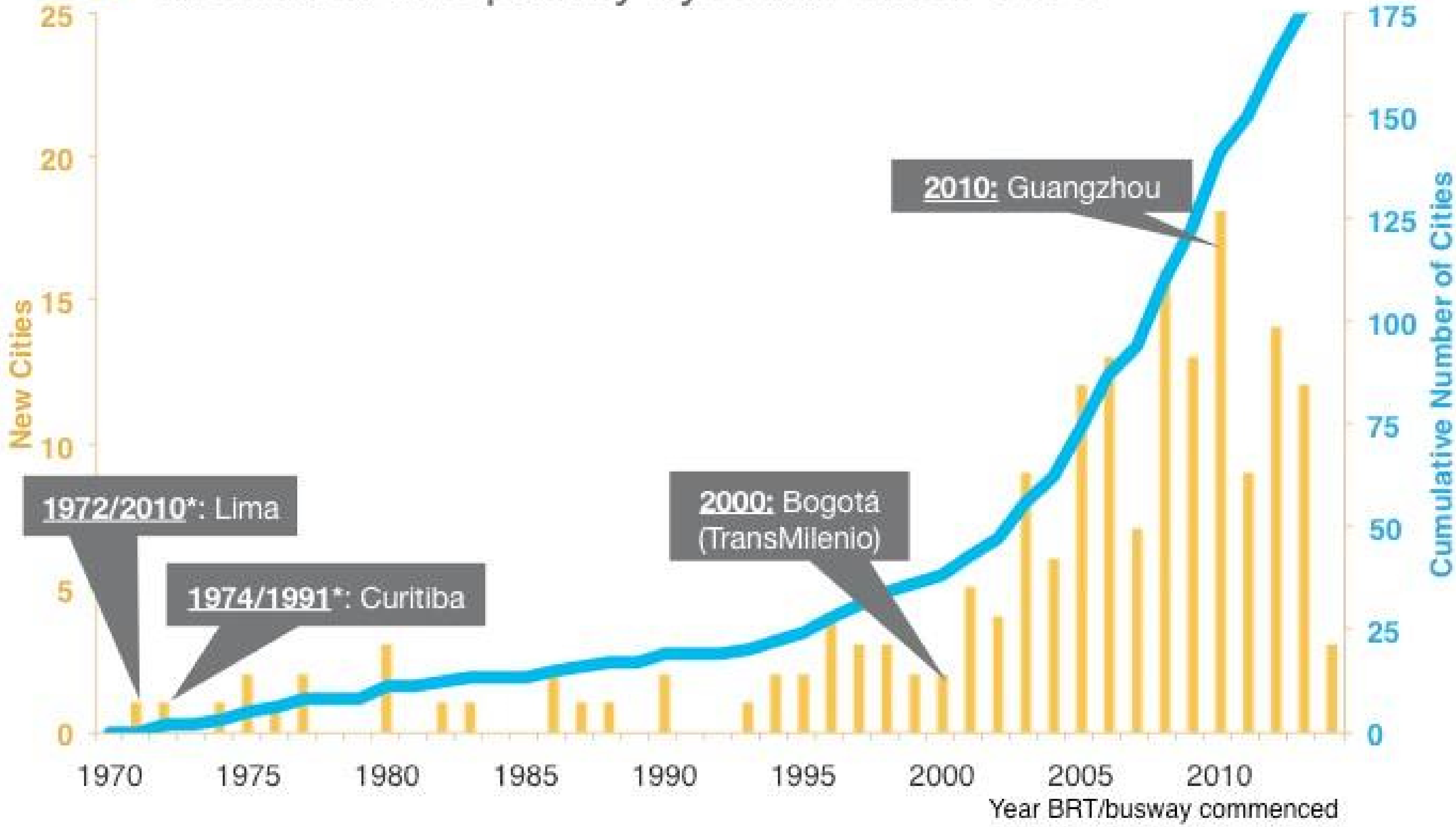
Comex

1999, Bogota Columbia

Bus priority systems in the world

› Growth of bus priority systems since 1970



BUS RAPID TRANSIT ACROSS LATITUDES AND CULTURES EMBARQ EMBARQ Brasil iea SIBRT

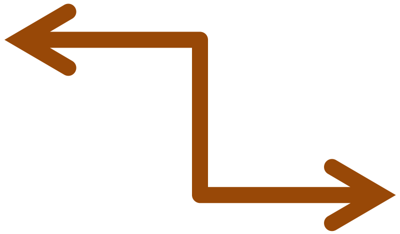
source: BRTdata.org, July 2014

2009, Ahmedabad - India


2010, Guangzhou - China

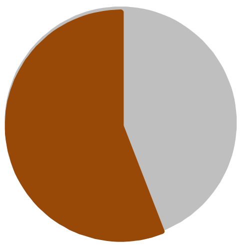
Introduction: BMTC

6,472 Buses (688 AC, 5655 Ordinary)



2,398 Routes

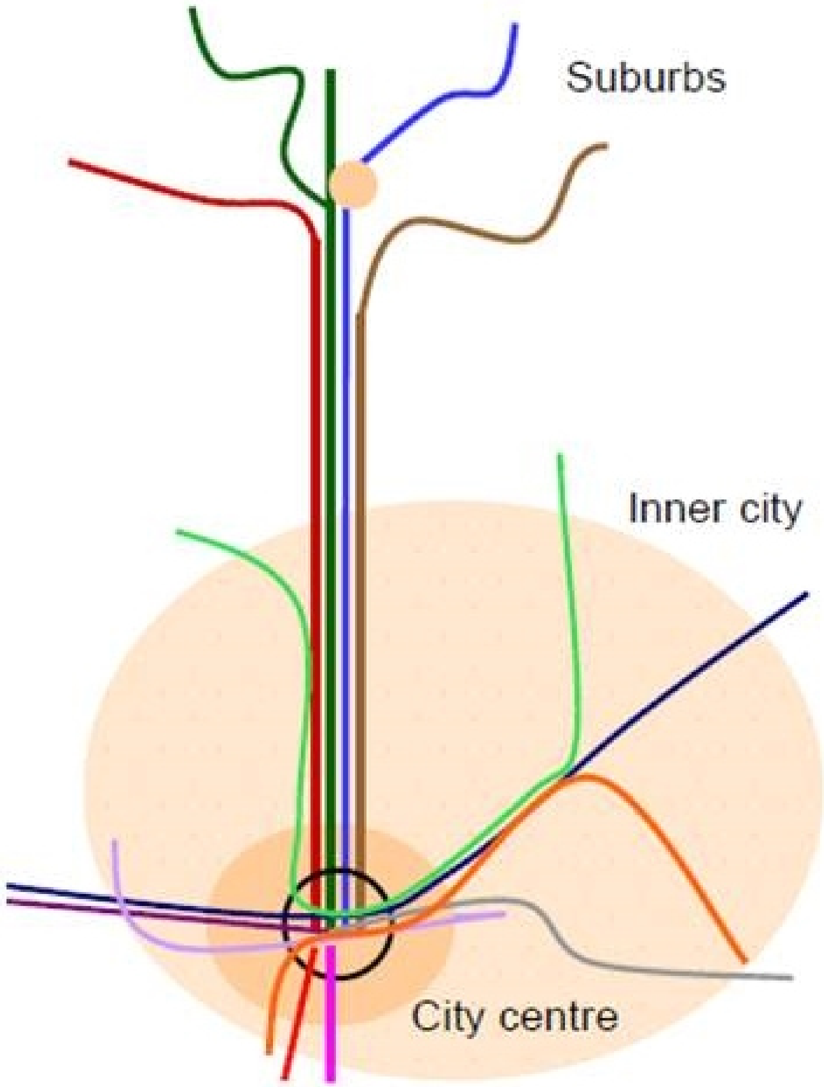
4.9 Million Passengers Daily



52% of Motorised Trips

Source(s): BMTC, Urban Mobility Indicators 2013

Introduction: Direct Services Model



- Bangalore, like most cities in India, utilises the 'Direct Services' model for bus transport
- This means every locality in the city is provided with its own bus route to the city centre, city market and other major destinations
- This model works well for smaller cities, but becomes increasingly inefficient for large cities

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Issues with the Direct Services Model

Very Large Number of Routes in System

- As the city grows, the number of bus routes increases exponentially
- BMTC now operates 2,398 routes. This is far higher than other cities such as Seoul (~400), London (~700) and Shanghai (~1000) with similar levels of bus ridership

Poor Service Levels on Individual Routes

- Fleet size cannot keep up with the exponential growth in route numbers
- BMTC operates 6,472 buses on 2,398 routes - 2.7 buses/route
- The majority of routes are served by only 1 or 2 buses – frequency on these routes is very low

Excessive Complexity for Users

- With 2,398 routes, the system is very complex and difficult for users to navigate. This is also a barrier to entry for new users
- Creating simple user information systems, like maps at bus stops, is almost impossible – many bus stops have 50+ routes passing through them

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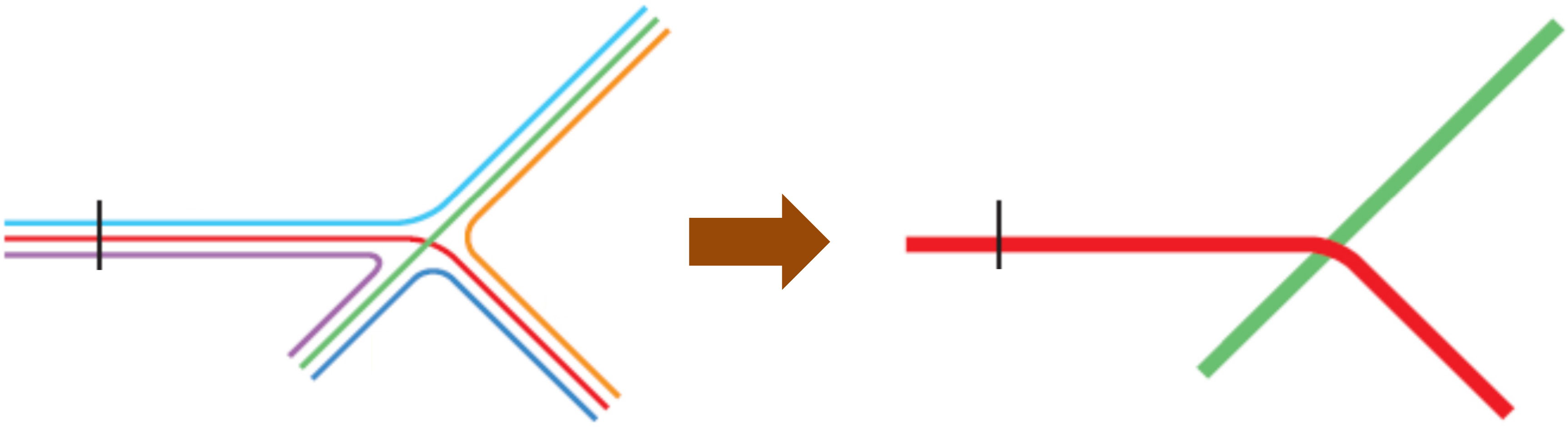
The Frequent Bus Network

Principle #1:

Individual Routes along Major Roads are rationalised into a small number of Very High Frequency Routes



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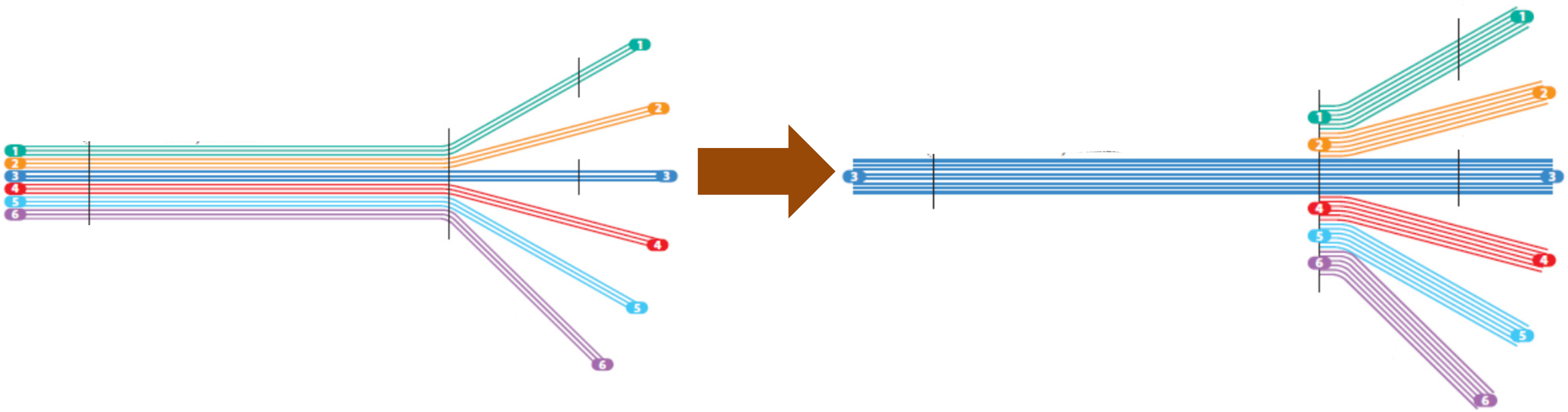
The Frequent Bus Network

Principle #2:

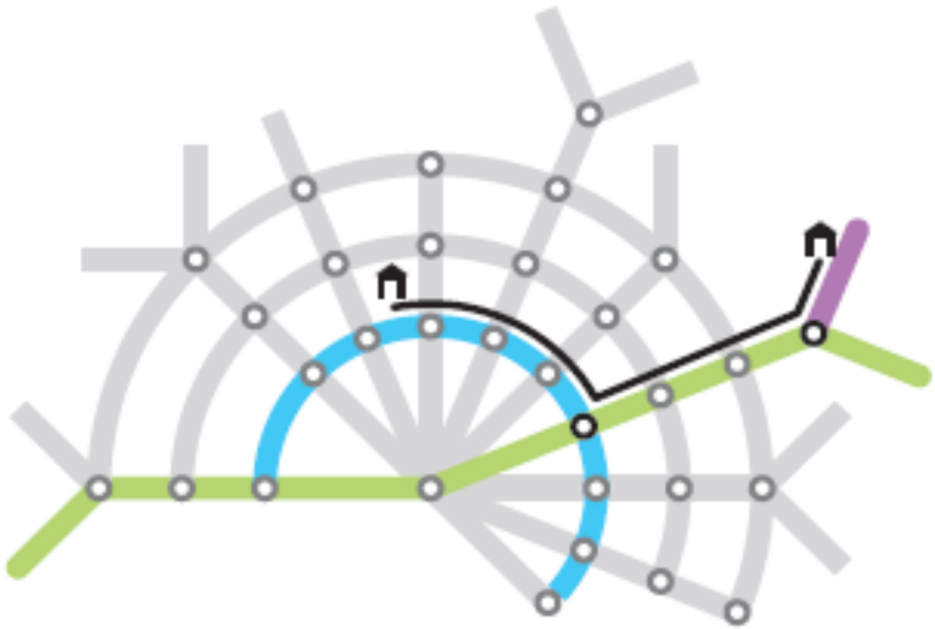
Travel Patterns that require moving beyond the main road are served by routes connecting to the Frequent Bus Network at interchange points



The Frequent Bus Network

Principle # 3:

Specific Travel Patterns are served not by direct routes, but by a collection of 'direction-oriented' services connected by transfers



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Implementing

The Frequent Bus Network in

Bangalore (BMTC)

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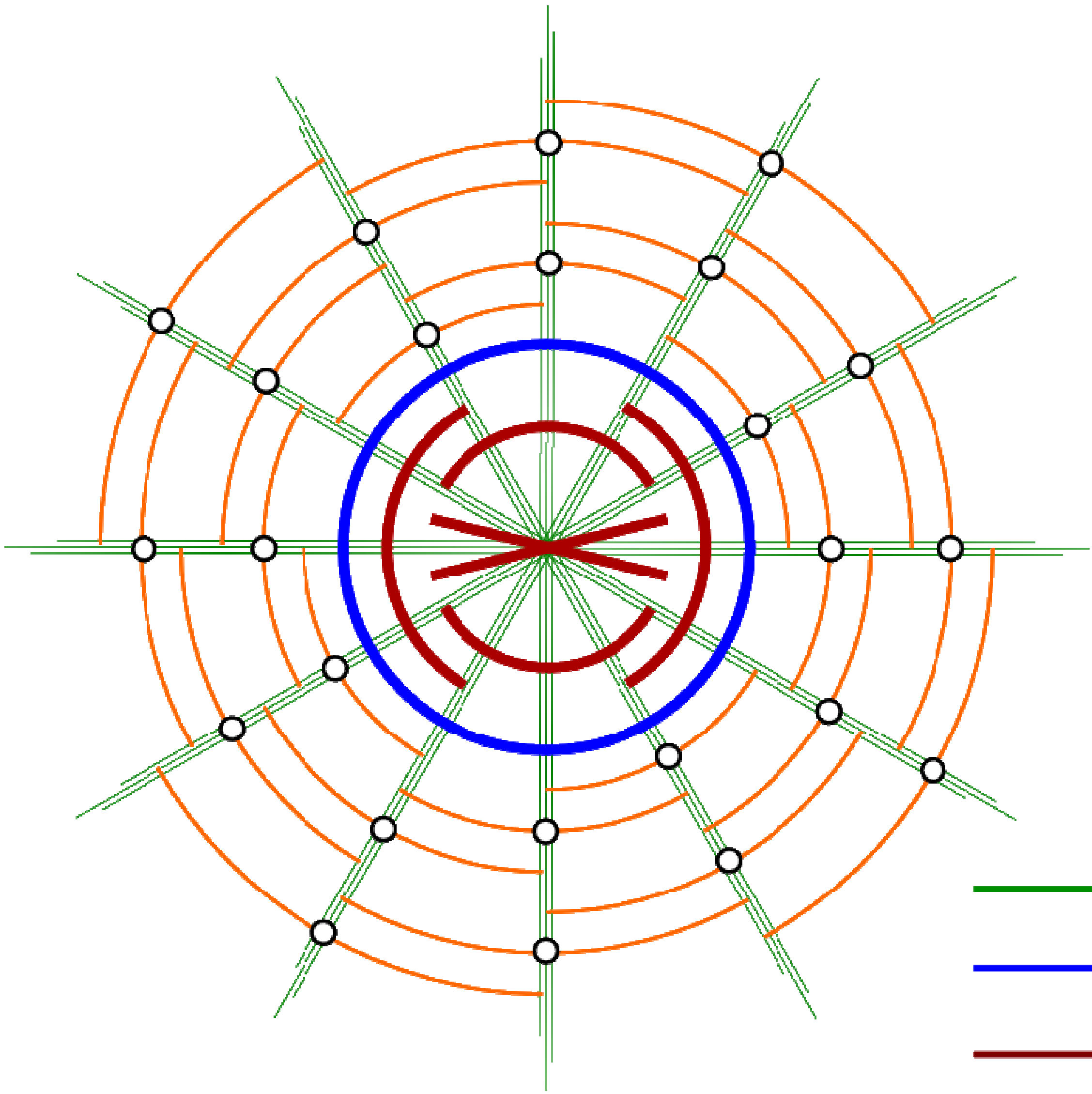
Step 1: The BIG Bus Network



The BIG Bus Network is a Connective Grid of

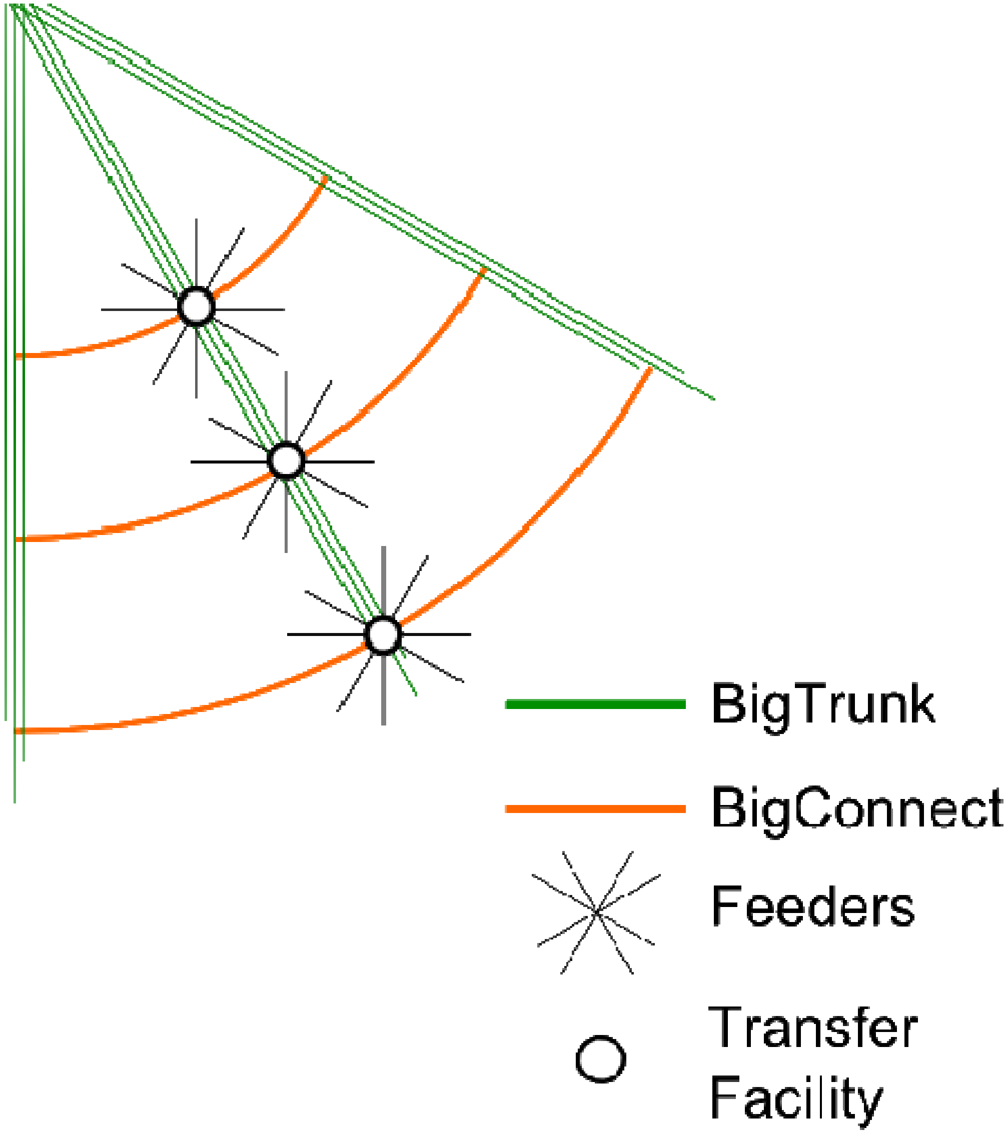
Very High Frequency, Direction-Oriented services along Main Roads

BIG

=

Bangalore Intra-city Grid

Step 2: Feeder Services



Localities which lie off of main roads are served with high frequency feeder services

i.e. Feeder services will connect localities to the BIG Bus Network

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Step 3: Integrated Fare System

- An integrated fare system will ensure transfers are convenient and cheap
- BMTC is procuring Electronic Ticketing Machines and a Smartcard Fare System for this purpose

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Step 4: Unified Branding

- Unified Branding of BIG Bus Network service components will ensure easy understanding of the system

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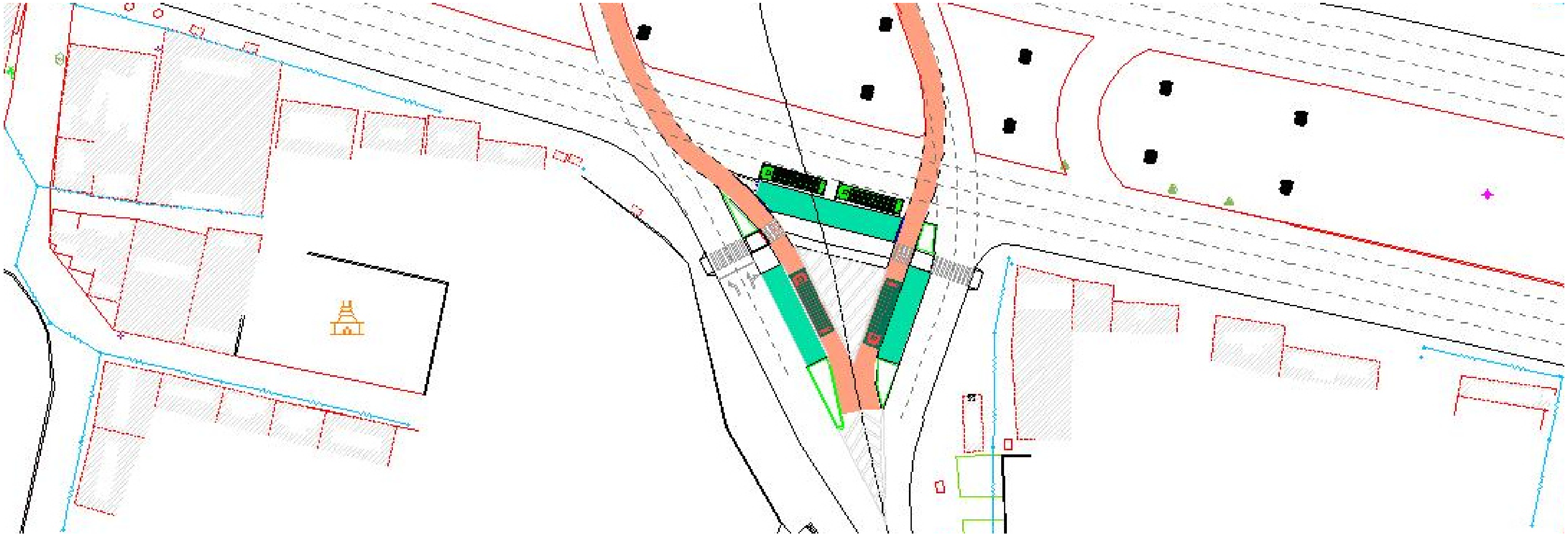
Step 5: Transfer Facilities



- High quality yet small footprint transfer facilities at interchange junctions will facilitate convenient and comfortable transfers

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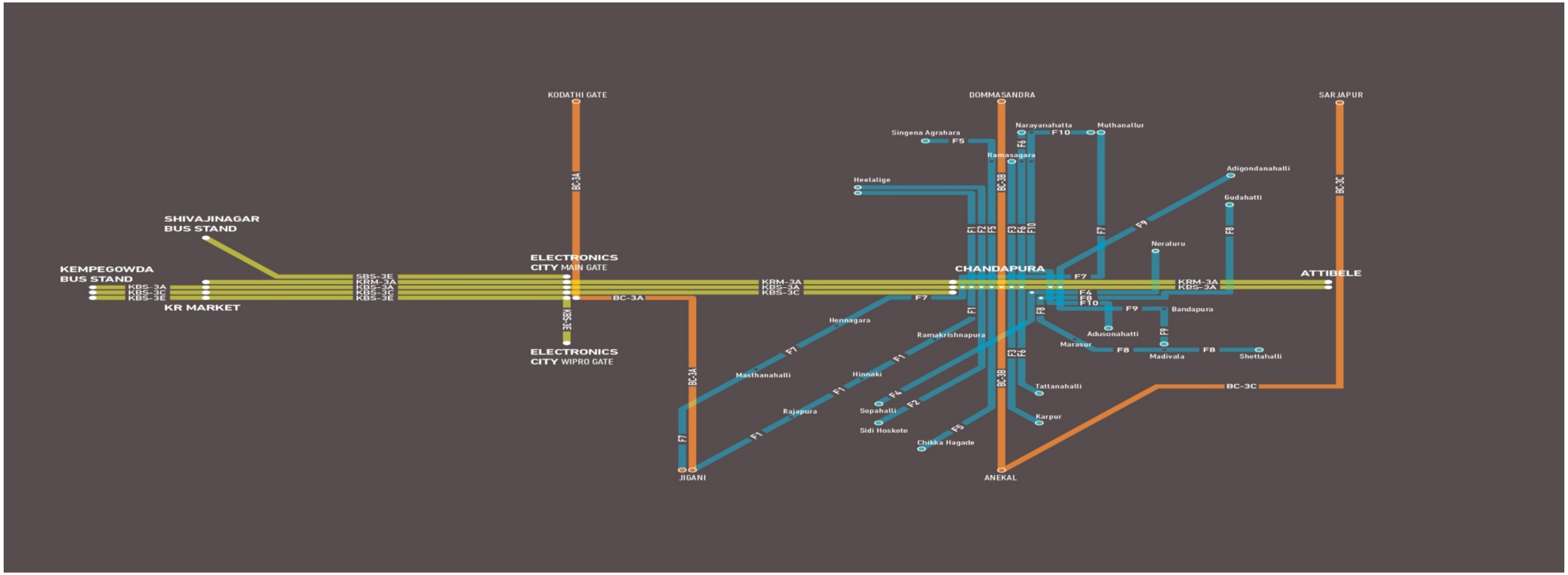
Step 6: User Information Systems



- Simplification of network structure will allow for the development of user information at bus stops and terminals

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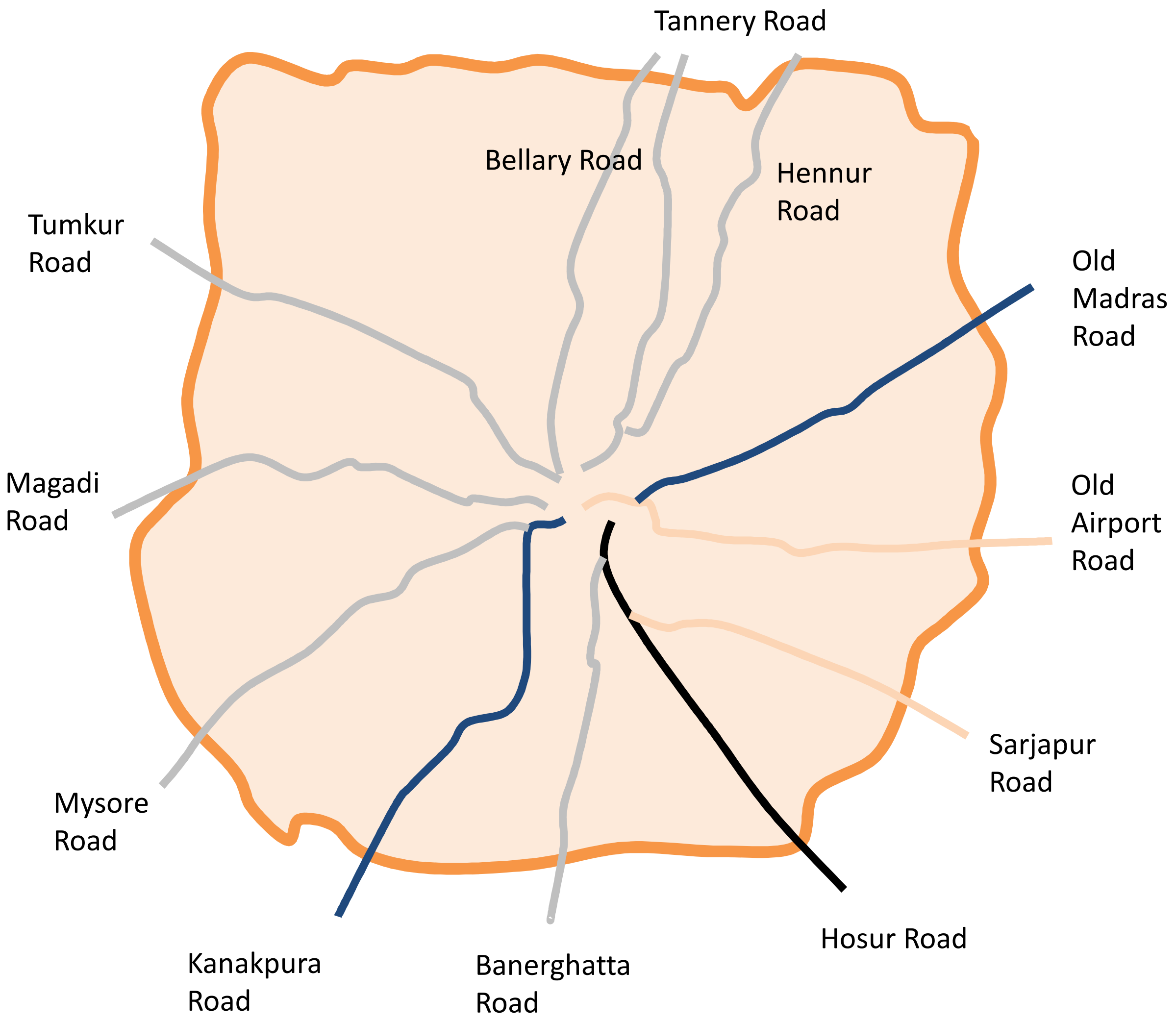
Implementation Progress



The BIG Bus Network has already been implemented on 3 of 12 major arterial corridors in the city –

Hosur Road,

Kanakpura Road

&

Old Madras Road

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Impact Thus Far*

aspect	indicator	before	after	change	
Simplicity	No. of Routes	*63*	*30*	*- 52.4%*	*same service coverage area maintained*
Service Quality	Average Wait Time (min)	*53*	*23*	*- 56%*	*across all bus stops in system, weighted by passenger volume*
Resources	Fleet Size	*262*	*262*	*0%*	*improvements achieved without additional fleet requirement*

- An Improved Public Transport experience for **2,15,000 passengers daily**
- **2.5 million passengers daily** are expected to benefit when expanded city-wide

*Hosur Road Corridor

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BigTrunk launched by CM Siddaramiah

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BigTrunk Launch at Vidhan Soudha

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BigTrunk on Road

June 2013
BEST - Mumbai
Ashok Leyland BIS III CNG Bus
Before Training KMPKg – 2.7
After Training KMPKg – 5.4 (100%)

Five Principles of Smart Mobility

Principle 3-

- Parking is priced. Paid off-street public parking, No on-street parking

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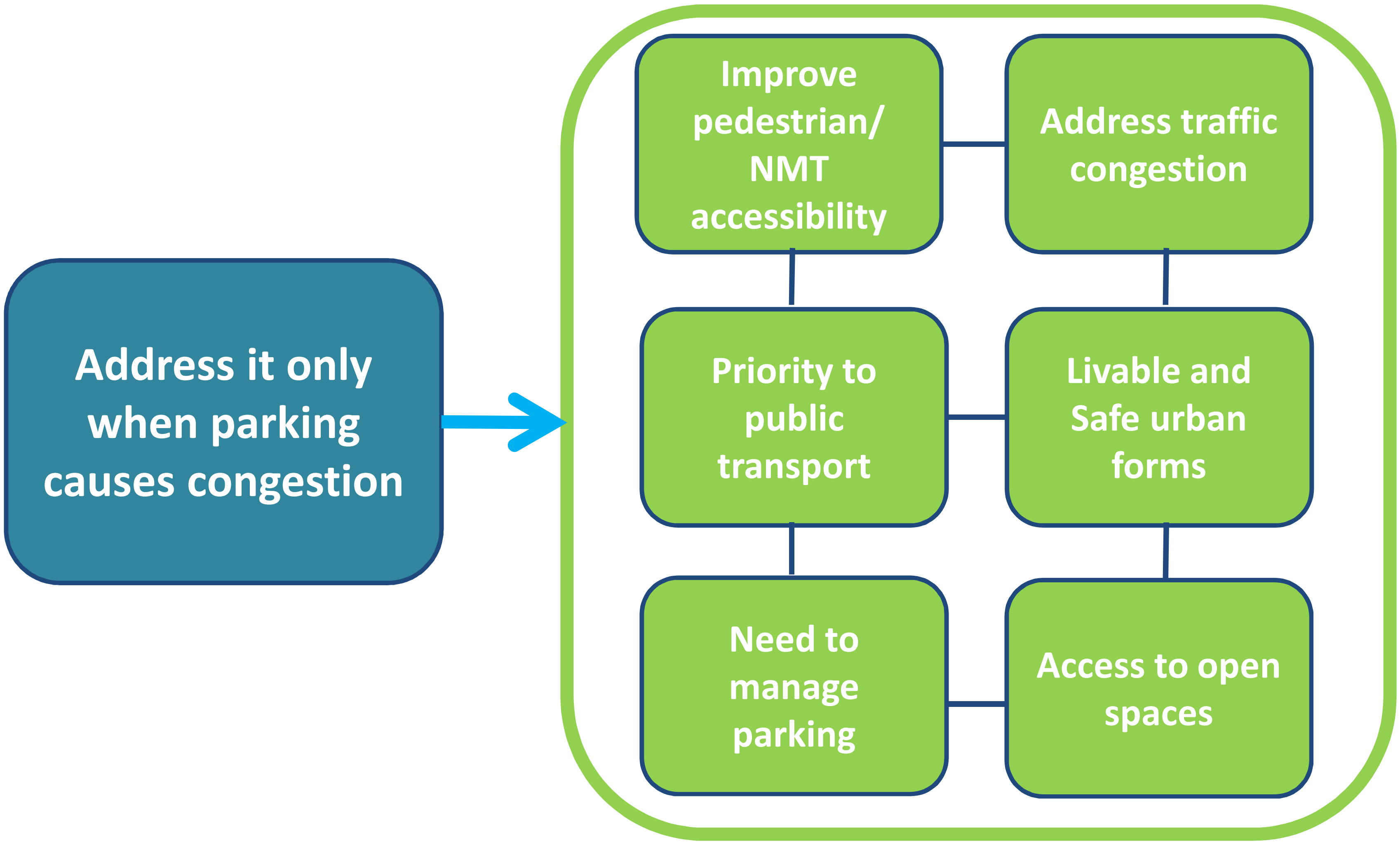
Photo Credit: EMBARQ India

Changing our Mindset



Local Area Approach needed for Parking

M.I.D.C.
Marol Industries
Association

Local Stakeholders

Strategies, Policies & Implementation

Municipal Corporation

Traffic Police Department

Five Principles of Smart Mobility

Principle 4-

- Integration across all modes (Fare, Physical, Service, Institutional and Information) . Cashless transactions as per open standards

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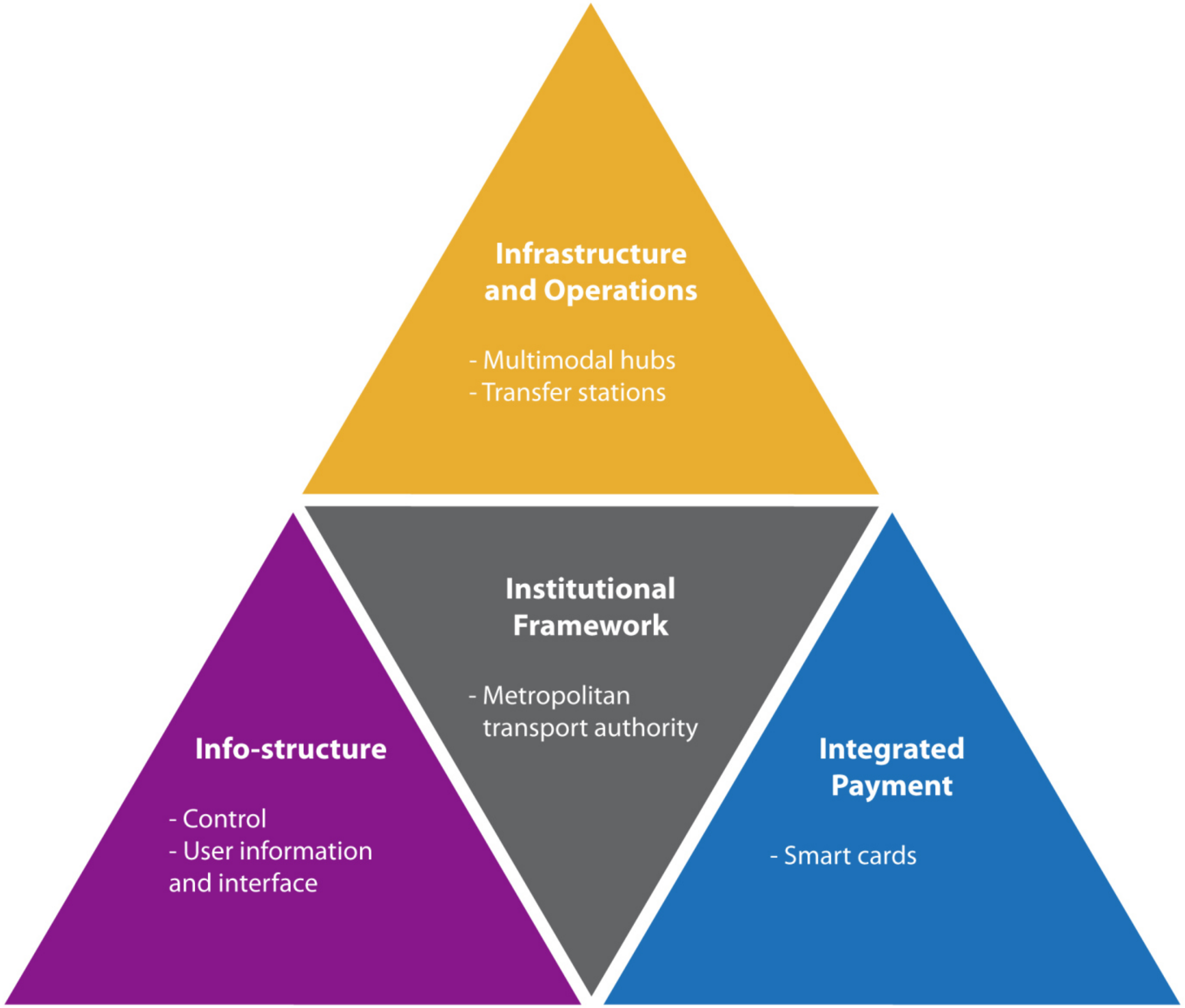
Multimodal Integrations



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Technology

Movement of the Indore BRTS is prioritised through TSP technology

AICTSL Surveillance System

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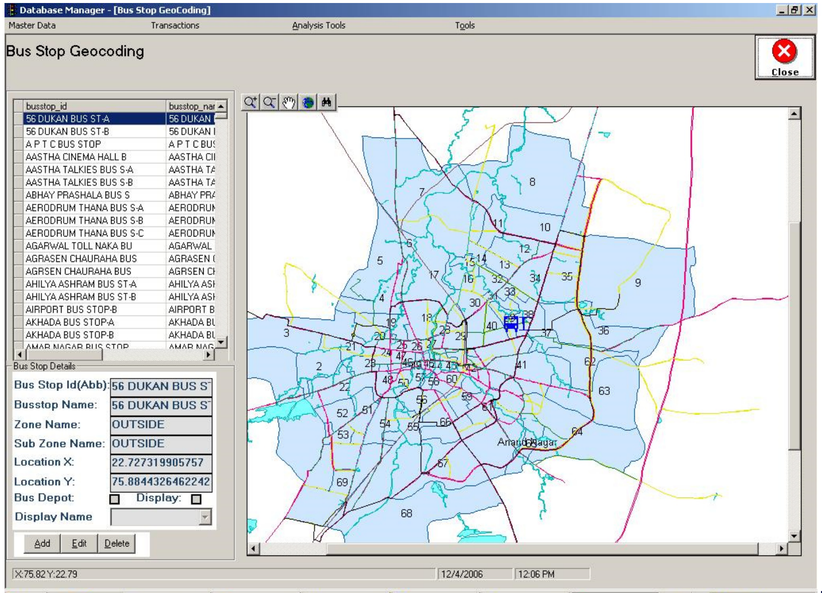
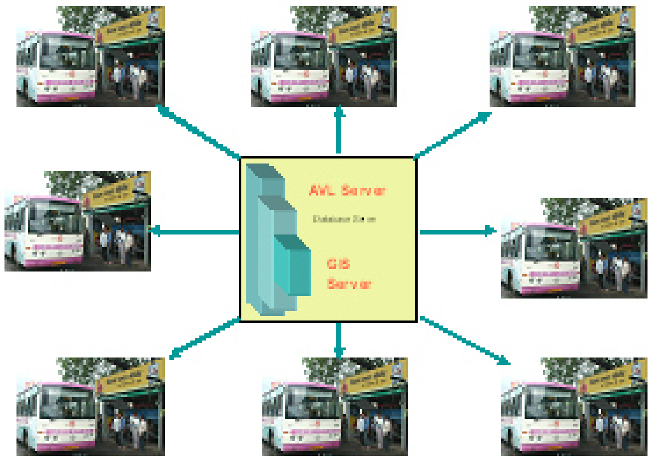
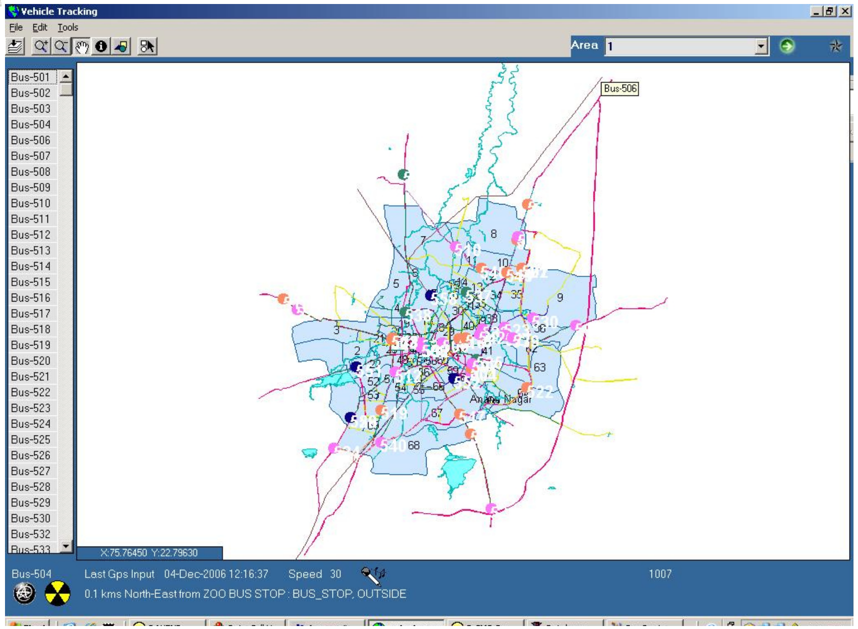
MicroFX


Database Manager - [Bus Stop GeoCoding]
Master Data
Transactions
Analysis Tools
Tools
Bus Stop Geocoding
Close
Bus Stop Details
Bus Stop Id(Abb):
Busstop Name:
Zone Name:
Sub Zone Name:
Location X:
Location Y:
Bus Depot:
Display:
Display Name
Add
Edit
Delete
12/4/2006
12:06 PM


A
B
C
D
T
P
FIX
LOW BAT
PILOT
NW
GPS
PC
GSM
AUX
TX
RX
ARYA OMNITALK
Autotrax


AVL Server
GIS Server


Vehicle Tracking
File
Edit
Tools
Area
Bus-504
Last Gps Input 04-Dec-2006 12:16:37
Speed 30
1007
0.1 kms North-East from ZOO BUS STOP : BUS_STOP, OUTSIDE

Key Enabling Factors for Multimodal Integration

Data standards	Development of common global standards such as General Transit Feed Specification (GTFS) GTFS allows transit agencies globally to share information in a standardized format with developers of multimodal trip applications
Technology advancements	Advancements in technologies for real-time vehicle tracking, and real-time information at transit stations and on mobile phones
Role of major technology companies	Investments by companies such as Google, IBM, Siemens, Cisco, and Panasonic to promote smart urban mobility Google Transit, which provides multimodal transit planning service, has expanded to over 250 cities in 67 countries, since its launch in 2005 in Portland, Oregon
Role of application developers	A growing community of start-up application developers, who are developing innovative apps using GTFS data, for multimodal trip planning.

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Graphic by EMBARQ.

Five Principles of Smart Mobility

Principle 5-

- Measure Performance of mobility through the following indicators
  - Road Fatalities
  - Time in Travel
  - Mode Share
  - Mode Share- NMT
  - Air Pollution

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What is being SMART ?

- Making data driven decisions on choice of infrastructure
- Knowing & understanding global innovations & trends
- Using open standards for data; Opening data up
- Using technology for resource efficiency
- Ensuring trained people resources are available

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New York


Major Goals
NEW YORK CITY
DOT
o Cut annual traffic fatalities by 50% (from 2007 level)
o Implement system of rapid bus lines
o Double bicycle commuting from 2007 to 2012
o Institute complete-street design policy
o Institute programs to treat streets as public space
o Reduce agency energy and vehicle use


he was
TOSHIBA
TDK
Kodak
Kodak
Bank of America
LAKEFRONT
ONLY


Injuries to motorists down 63%, pedestrian injuries down 35%

80% fewer people walking in the roadway in Times Square

From the gridlock to…


POLICE
U.S. ARMED FORCES
RECRUITING STATION
1500


THE LION KING
KING TUT
levi's
AÉROPOSTALE


ONE WAY

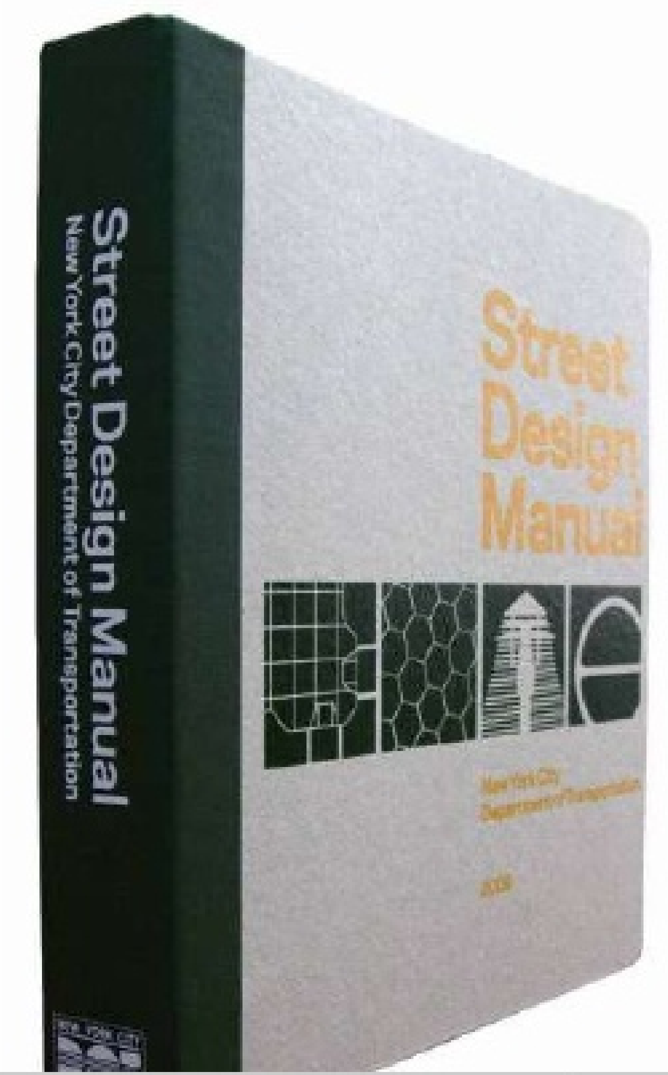

ONE WAY

200 Miles

3 Years

July 1st, 2006 - June 30th, 2009

This intersection marks the historic completion of 200 miles of new on-street



Curb Extension:

Curb Extension with Greenstreet/ Plantings

USAGE: WIDE

A CURB EXTENSION that is planted rather than paved (typically as a NYC DPR greenstreet), for example as a landscaped bioswale.

Curb extension with greenstreet, Murray Square, Manhattan

Landscaped curb extension in a residential neighborhood, Vancouver, Canada (Credit: Richard Drdul) (Photo for illustrative purposes only)

Benefits

Provides safety and traffic calming benefits as described in CURB EXTENSION (2.2.2)

Vegetation helps to mitigate air pollution and capture carbon dioxide from the air, improving environmental health and public health

Green cover reduces the urban heat island effect and decreases energy costs related to air temperatures

Landscaping provides visual improvement to the city streetscape

Can be designed to provide stormwater detention from sidewalk and street

Areas without sidewalk crowding where NYC DPR will maintain a Greenstreet or a committed partner other than NYC DPR will maintain the vegetated area

Design

See design guidance for CURB EXTENSION

Pedestrian crossings must remain paved

If curb extension is designed to capture stormwater, catch basins should be located on the downhill side of the curb extension with greenstreet rather than the uphill side

If work includes tree planting, consider the location of utility


citibike
citibike
citibike
00003

How to Scale-up ?

- Strength of Regional and Local Govts- Political Will and technical Capacity
- Finance- Opportunity for private sector towards sustainable, low-carbon solutions
- Data and Technology

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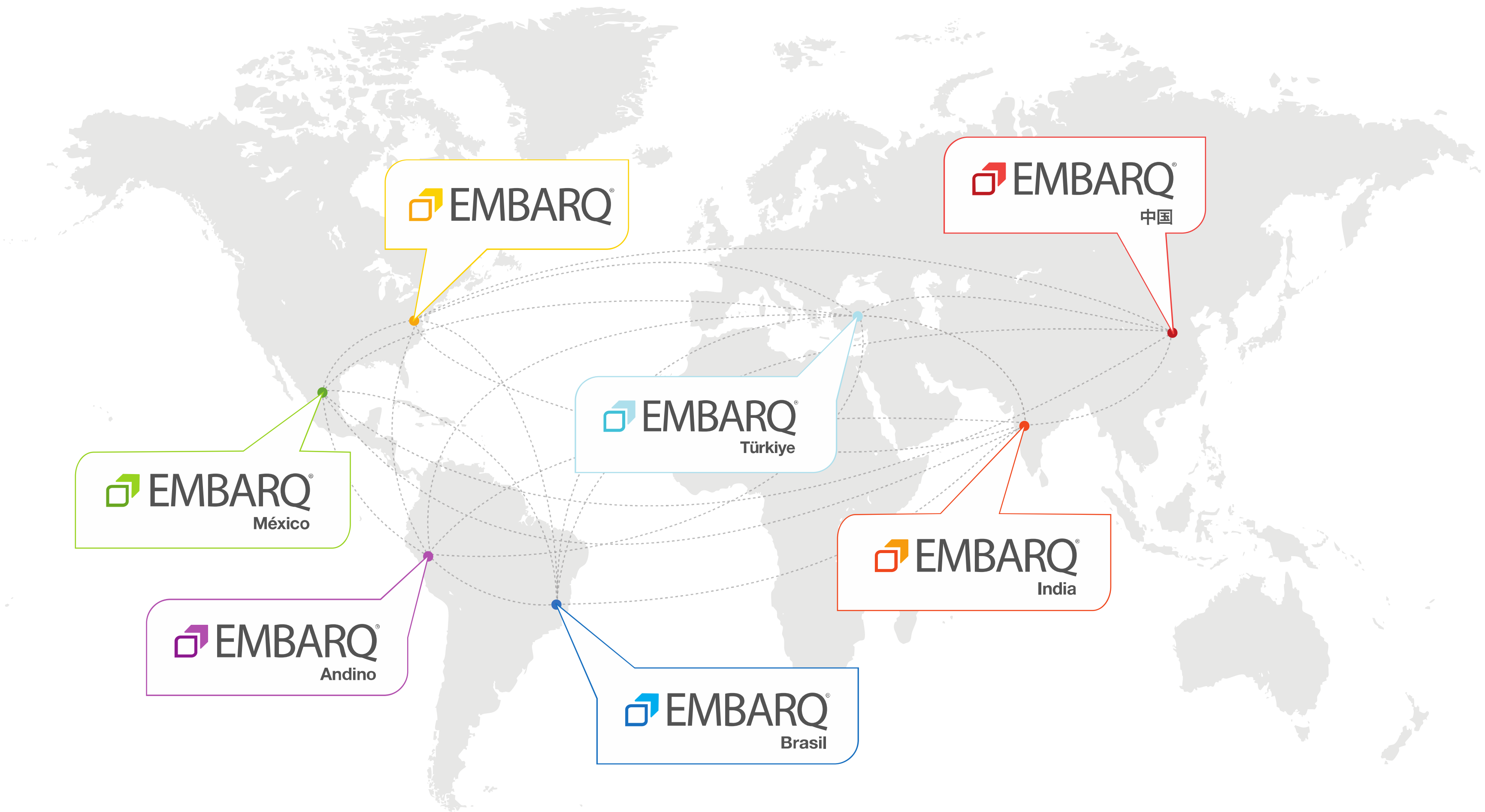
Thank you!



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