The Great Migration - India by 2030 and beyond

Harnessing Technology for Better Urban Transportation in India

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The World is Changing… Massive Economic Rebalancing

THE WORLD'S TOP 10 ECONOMIES

1820	
China	**28.7%**
India	**16.0%**
France	5.4%
U.K.	5.2%
Prussia	4.9%
Japan	3.1%
Austria	1.9%
Spain	1.9%
U.S.	1.8%
Russia	**1.7%**

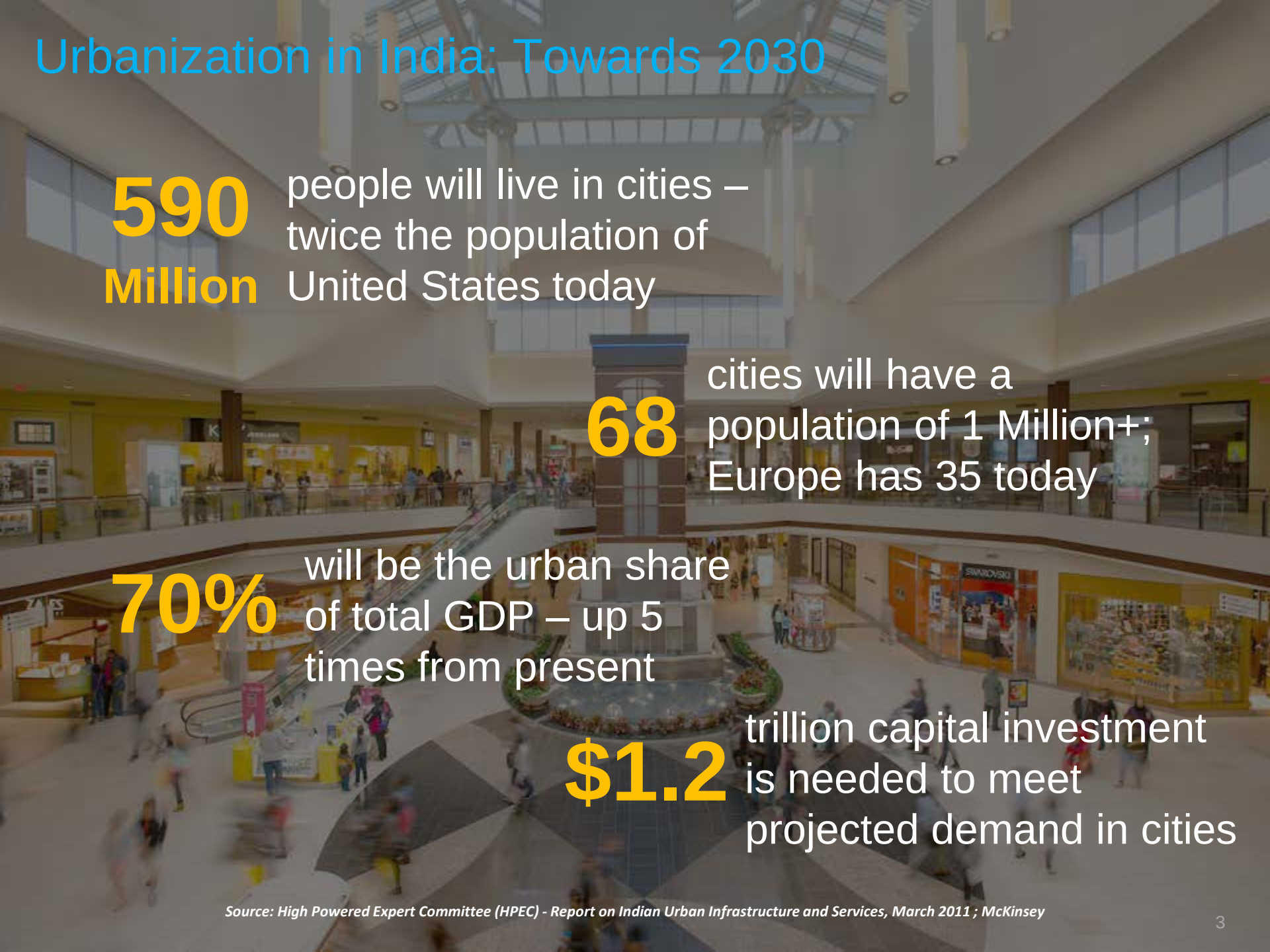
1999	
U.S.	30.0%
Japan	14.5%
Germany	6.6%
U.K.	4.7%
France	4.7%
Italy	3.8%
China	**3.8%**
Spain	2.0%
Canada	2.1%
Mexico	**1.6%**

2010	
U.S.	24.3%
Japan	8.7%
China	**8.6%**
Germany	5.7%
France	4.6%
U.K.	3.7%
Italy	3.6%
Brazil	**2.7%**
Spain	2.5%
Canada	2.3%

2050	
China	**32.7%**
U.S.	17.8%
India	**17.4%**
Brazil	**5.3%**
Mexico	**4.3%**
Russia	**4.0%**
Indonesia	**3.2%**
Japan	3.1%
U.K.	2.4%
Germany	2.3%

Source: World Bank/Angus Maddison. The World Economy: Historical Statistics; World Bank; IMF

Urbanization in India: Towards 2030



590 Million people will live in cities – twice the population of United States today

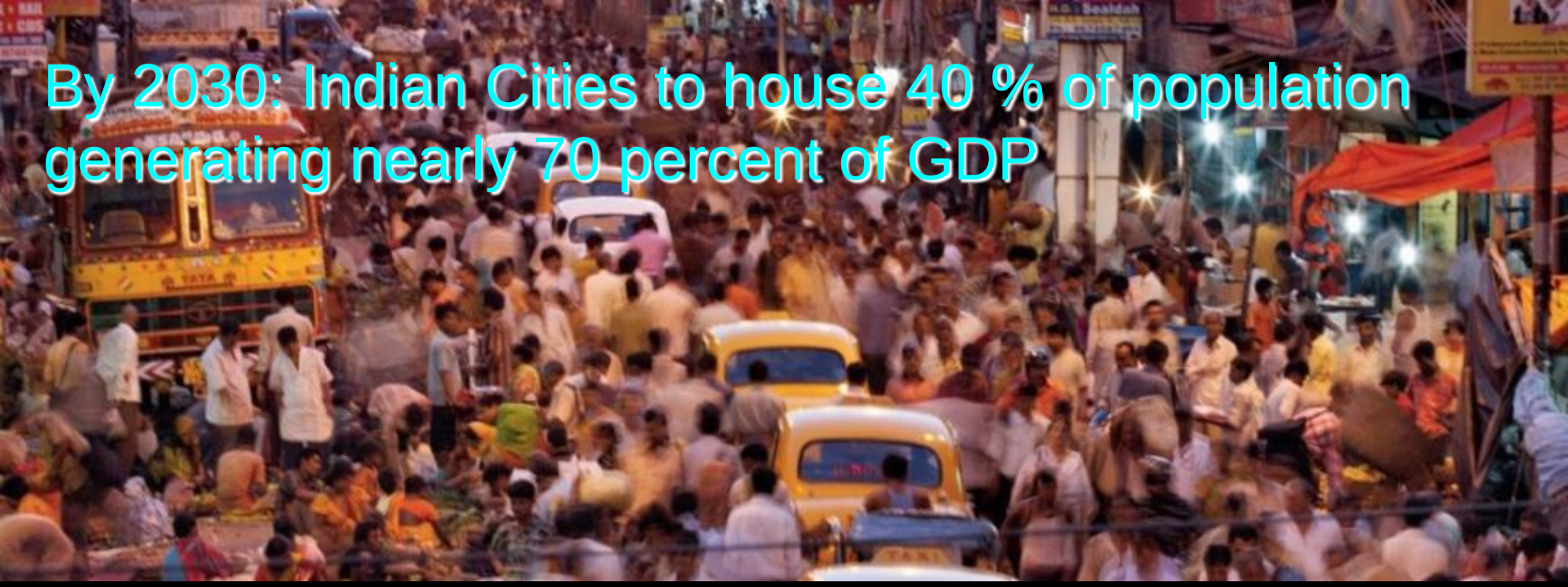
68 cities will have a population of 1 Million+; Europe has 35 today

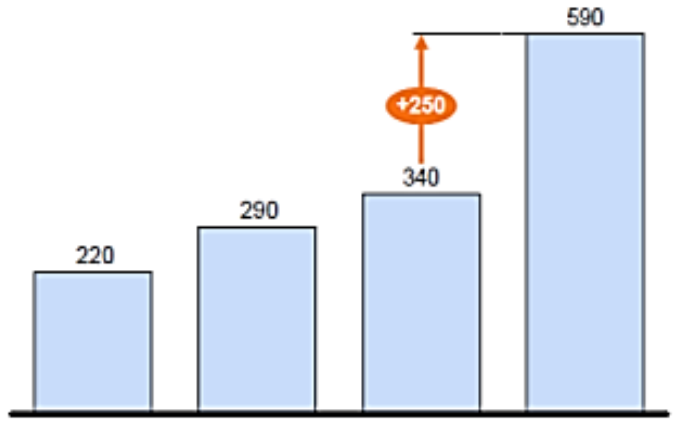
70% will be the urban share of total GDP – up 5 times from present

$1.2 trillion capital investment is needed to meet projected demand in cities

Source: High Powered Expert Committee (HPEC) - Report on Indian Urban Infrastructure and Services, March 2011 ; McKinsey

By 2030: Indian Cities to house 40 % of population generating nearly 70 percent of GDP

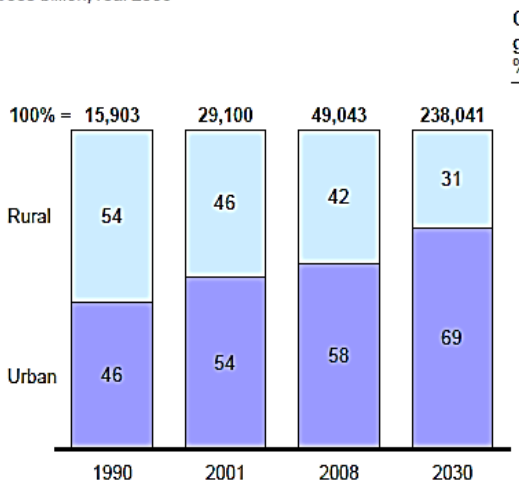




	1991	2001	2008	2030
Total population Million	856	1,040	1,155	1,470
Urbanization rate[1] %	26	28	30	40

Cities will account for nearly 70 percent of India's GDP by 2030

Share of India's GDP
%; rupees billion, real 2008



SOURCE: India Urbanization Econometric Model; McKinsey Global Institute analysis

India Infrastructure Challenges

Over 3 million teachers needed within the next 10 years

1 million new hospital beds required by 2020

Traffic will increase 5-fold by 2020

Increase power generation capacity to 800 GW by 2031 from the current capacity of 228MW

India with 18 % of the world's population, but has only 4% of world's renewable water resources.

Source: Intelligent Urbanization: Roadmap for India, Booz & Co; United Nations Population Division; National Telecom Policy 2012

Growing urbanization breeds similar problems in cities around the world…

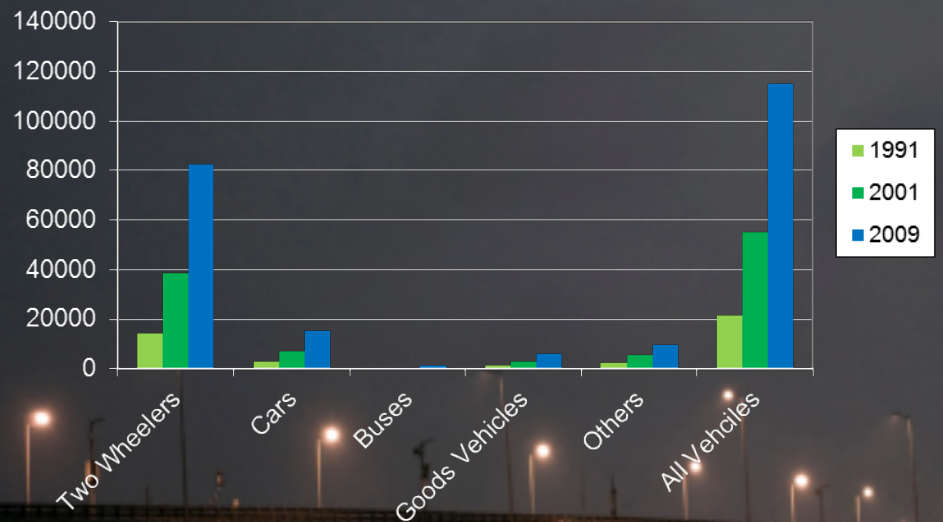
- Increases Pressure on Urban Infrastructure
- Fewer Resources to Cope with Change
- Results in increased Crime Rates
- Concentrates Urban Poverty and Reduces Access to Services
- Creates Sustainability Challenges
- Adds to Traffic Congestion & Pollution
- Forces the Formation of Urban Slums

India Urban Infrastructure Investment Estimate

Source: Report on Indian Urban Infrastructure and Services by The High Powered Expert Committee (HPEC), March 2011

Growth in Transportation and ensuing challenges

Total number of registered motor vehicles in India: 1951-2009 (in thousands)



Growth in freight volume is 9.1% and personal transportation is 10.8% in the last decade; road length increased only by 4.0%.

Source: Transport Research Wing, Ministry of Road Transport & Highways, GoI

Transportation Challenges

In January 2014, Delhi's average daily peak reading of **PM2.5 –** the most harmful type of particulate matter – reached close to 500, **20 times the level deemed healthy** by the WHO

Loss of **$11B** per year on traffic congestion

CO_2 emissions from transport in India was **161.5 MMT** as of 2010. This the fourth largest emitter after China, the US and the European Union.

Every 3 minutes, an Indian dies in a road accident, a total of 497,000 road accident were reported in 2011.

Such congestions costs massively in terms **of lost work hours, carbon emissions, accidents, fuel & stress**

Response from the Indian Government

Bus rapid transit systems, metro rails, and monorails for improving urban mobility.

The Jawaharlal Nehru National Urban Renewal Mission (JnNURM), launched in 2005 is a city modernization scheme to improve urban transport by adding 15,260 buses

Ahmedabad Bus Rapid Transport System (BRTS) is one of the success stories of JnNURM

Mumbai Monorail

Delhi Metro

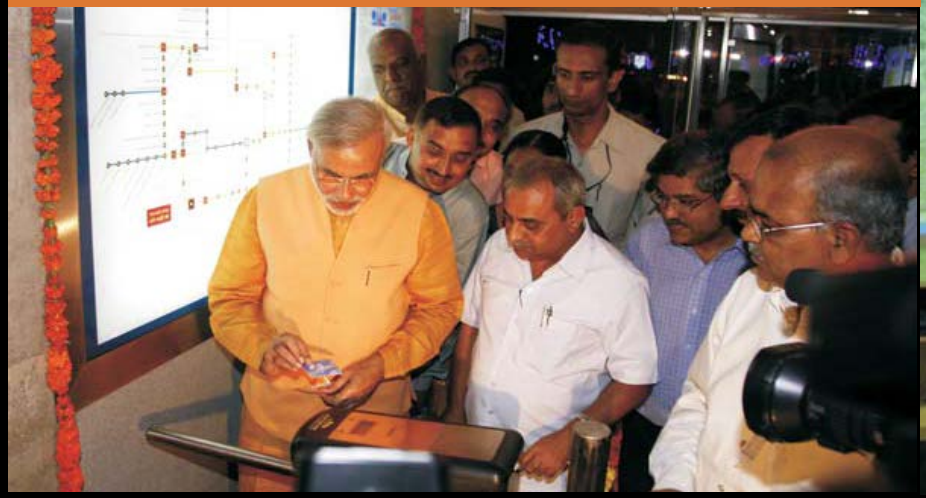
Ahmedabad BRTS

The Ahmedabad Bus Rapid Transport System (BRTS)

Ahmedabad (BRTS) has transformed the daily commute of its citizens by leaps and bound. Not by just introducing more buses, but also by **deploying and reaping the full benefits of innovations** in Integrated Transportation Management System (ITMS) like:

- Automated vehicle location system (AVLS)
- Vehicle scheduling and dispatching system (VSD)
- Fleet Management System (FMS)
- Passenger Information System (PIS)
- Electronic Fare collections and Smart Cards
- Passenger announcement (PA) and others.

Hon'ble Chief Minister of Gujarat, Mr.Narendra Modi inaugrated the system - on 14th October, 2009.



BRTS Control Center

The Ahmedabad BRTS …

- Passenger traffic has jumped to 622% per day (from 18,000 people in 2009 to 130,000 today).
- Half of the passengers were users of cars, 2/3-wheelers (motor cyclist and auto rickshaw commuters).
- The service has become dependable (95% of departures and 65% of arrivals are on time).
- Travel speed has improved from average peak hour speeds of 17-18 kilometers an hour to 24 kmh.
- Air pollution has declined due to buses that run on compressed natural gases and accidents rates are lower.

Safe and Accessible for all

World class infrastructure - sustainable urban development

Bagged many international awards to its credit, including "Outstanding Innovations in Public Transportation" award from UITP, Germany

Transportation Policy Recommendations

Replicate: Build and bring up share of public transportation in urban mobility to basic international standards (from current 22% to 50%) by replicating successful models like Ahmedabad BRTS.

Drive Efficiency: Government can also further improve the model by introducing performance driven funding disbursement.

Harness Smart Technology Innovations: Leverage digital instrumentation, intelligence, and integration into transportation to predict demand in real time, optimize the supply on the fly, leverage mobility for updating passengers, safety and rapid emergency response.

Cross leverage: Infrastructure for traffic management like the cameras and traffic command center should be leveraged for accident detection and emergency response, monitoring and sharing suspicious activities with law enforcement agencies, and water infrastructure and disaster management.

"The best way to predict the future is to create/invent it."

… Moliere/Kay