LOW-CARBON URBAN DEVELOPMENT
SOLUTIONS FOR TRANSFORMATION

URBAN PATHWAYS CONFERENCE, BERLIN

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DIRECTOR- URBAN DEVELOPMENT, WRI INDIA
2015-2030 – UNPRECEDENTED URBAN GROWTH – ESPECIALLY IN S. ASIA & AFRICA
MEDIUM-SIZED CITIES WILL GROW THE MOST

Note: N = 1,692 urban agglomerations (populations ≥ 300,000 inhabitants).

Sources: United Nations (2014); World Bank country classification.
MORE OF THE POOR WILL LIVE IN CITIES

Source: Ravallion et al., 2007c: 8. Note: Example trend based on data from India.
Urbanization will not be accompanied by economic growth everywhere.
The fastest-growing cities will have the least public resources.

Source: Authors’ compilation from various sources. Note: Budget data represent years 2010 to 2016.
THE EXTRAORDINARY URBANIZATION CHALLENGE

• Globally, 800 million per decade
• India’s urban population will double to 800 million by 2050

Source: UN Habitat; UN World Urbanization Prospects 2014 Revision; Image: Harvey Barrison
Rapid growth & urban transformation

Urban population expected to almost double from 420 million in 2015 to over 800 million by 2050;

India's population split – 1980, 2015, 2050

- **1980**: Urban population 161 million, Rural population 538 million; 23% of population urbanized
- **2015**: Urban population 420 million, Rural population 862 million; 33% of population urbanized
- **2050**: Urban population 814 million, Rural population 806 million; 50% of population urbanized

But recent research has shown that official figures underestimate India’s “hidden and messy” urbanization

SOURCE: World Urbanization Prospects, 2014
Appropriately compact, connected, & coordinated cities can be more productive, socially inclusive, resilient, cleaner, & safer: Driving low carbon urban development is a $17 trillion global economic opportunity to 2050 based on energy savings alone.

Source: Leeds University for New Climate Economy
URBAN INDIA'S FUTURE

620,000 premature deaths p.a. due to poor air quality

India’s GHG emissions: about \( \frac{1}{2} \) originate in urban areas

Environmental degradation cuts India’s GDP by $80 billion

75% of India’s 2050 infrastructure is yet to be built

Delhi has the worst air quality of any major city in the world according to the WHO1

Presenting India’s renewed urban focus

- Smart Cities Mission
- Swacch Bharat Mission
- AMRUT Cities
- Housing for All
- HRIDAY Cities
- Metro Rail Projects

WORLD RESOURCES INSTITUTE
23% of global GHG emissions are from transport

70% of GHG emissions come from cities

GLOBAL CLIMATE CHANGE TARGETS ARE NOT POSSIBLE WITHOUT THE TRANSFORMATION OF CITIES
Among top 100 cities contributing to global economy

75% from service sector; $500 bn from IT & real estate

Globally 9th highest number for foreign investment projects

Image Source: Tripadvisor, Livespace.com
Bengaluru Update!

Disparate Growth of Bengaluru

Recently: Most Dynamic City in the world!

An Economic Powerhouse

16th Rank in Overall Economic Strength
- Economist Intelligence Unit (ElU) Hot Spots

Beyond great weather!

146th Rank in Quality of life among global cities
- Mercer Index 2015

7-10% Growth in vehicular population
5004 Road accidents per year (one of the highest)
66% Lakes that are sewage fed
71% Ground water unfit for consumption
2nd Rank in Air pollution
BENGALURU’S WATER STRESS

- Around 2.2 million no piped supply (25%)
- Areas outside former BMP area at most stress
- Self-provision by buying water or groundwater extraction

Photo Credit: John Loo/Flickr
URBAN RISKS – LAND SUBSIDANCE

- City is Sinking
- City Subsidance – 2.34cm to 3.17cm (average 2.73cm)
- Excessive groundwater pumping
- Reduced recharge potential
URBAN RISKS –
VEGETATION CHANGE

• City’s Vegetation Changing (2014-17)
• Loss is higher outside BMP
• Loss due to Urbanization
• Gain around lakes due to weeds
URBAN FOOTPRINT

• 466% increase in the built up area of Bangalore from 1973 to 2000

• As per 2014 data over 5,000 acres of Bangalore was under development in the periphery, designed to be car dependent, relying on diesel-fueled power and would survive on purchased water.

Image Data Source: Global Land Survey and LandSat (USGS), Open Streets Map, NHAI, BBMP, BDA
ENERGY CONSUMPTION

- 1406 kwh/person/annum
- Much higher than average in peripheries
Transport sector institutions

Source: Deepak Baindur, IIHS
CONGESTION

Flyovers

Lack of pedestrian safety + traffic jams

Incomplete Metro

Burdened BMTC -> inefficiency
SPRAWL

Growth in peripheries

100,000 gated residential developments

Distant
Disconnected
Dispersed
INEFFICIENCY

3400 MW peak demand - dropping hydro reserves

gap in demand and supply – 900 MW

1/3 power in KA to come from RE
MESSY – QoLIFE, GOVERNANCE, DECISIONS MAKING

• Lack of Services [Water, Solid Waste, Transport, Energy]
• Proliferation of private solutions [Water Tankers, Diesel Generators, Motorcycles, Unmanaged Land Fill Sites and now Air Purifiers]
• Highest Growth in Urban Peripheries
• Land values escalating, disincentivises good governance and land value capture becomes private good
WILL REMAIN MESSY FOR 20+ MORE YEARS

- Once in 200 years period of transformation
- Strong mismatch between demographics (30% Urban) and political representation (10% Urban)
- Unprecedented escalation in land values
How do you drive implementation in messy conditions with multiplicity of institutions, no clear decision making and lack of capacity to plan and implement?
TACKLE 3 PROBLEMS TO ACHIEVE LOW-CARBON DEV.

Congestion

Sprawl

Inefficiency

Mobility

Urban Planning

Energy

BUSINESS-AS-USUAL IS UNSUSTAINABLE
URBAN PLANNING
HOW WE BUILD CITIES MATTERS

ATLANTA

Population: 2.5 million
Urban area: 4,280 km²
Transport carbon emissions: 7.5 tonnes CO₂ per person

HOW WE BUILD CITIES MATTERS

**ATLANTA**

Population: **2.5 million**
Urban area: **4,280 km²**
Transport carbon emissions: **7.5 tonnes CO₂ per person**

**BARCELONA**

Population: **2.8 million**
Urban area: **162 km²**
Transport carbon emissions: **0.7 tonnes CO₂ per person**

COMPACT, CONNECTED, AND COORDINATED CITIES SAVE MONEY

4% GDP Copenhagen spends on transport

Image: Wikimedia Commons/Bob Collowait; Source: The New Climate Economy
INDIA’S SPRAWL IS DIFFERENT

9 m² per person in Mumbai

42.5 m² per person in Urban China

Source: Sholomo Angel
Inevitable Urban Expansion in Indian Cities

- Rapid growth in satellite towns of Delhi (Gurgaon, Noida, Grt Noida, Faridabad etc)
- Mumbai, little movement in peripheries, but witnessing inner city redevelopment
- Pune capitalising on Mumbai’s slow down, attracting new economies like IT/ITES

Source: Generated by WRI India using data from Bhuvan NRSC
Solution 1: Transit Oriented Development (Scales)
TRANSIT-ORIENTED DEVELOPMENT (TOD)

- **Walkable**: Proper integration of non-motorized modes of transit
- **Mixed-use**: Planned mix of commercial and residential buildings
- **Mixed-income**: Inclusive TOD through affordable housing
- **High-density**: More housing units near transit stations to increase transit ridership
- **Access to Mass Transit**: Residents must have access to reliable transit
- **Access to Opportunities**: Jobs, services, housing, recreation, public space
SAFE ACCESS APPROACH

In the safe access approach the needs of “PEOPLE” lie at the centre of the strategies developed for station accessibility plans and station area improvements.
NAYA RAIPUR- SECTOR DESIGN

- Project type: Green field
- Demonstration Site: Sector 31 - Residential Site admeasuring 60.3 hectare.
- 16,000 population as per proposed Master Plan.
- Project worth is INR 300 Crore.

Need for the project:

- To integrate TOD principles in Designing the city.
- To preserve natural terrain and water networks.
Layered approach to Sector Design

1. Existing Terrain
2. Riparian Corridors
3. Road network
4. NMT Network
5. Amenities and Commercial Areas aligned to the NMT and open spaces
6. Final layout
Objective – Demonstrate TOD around BRT station in Navanagar area and scale it to the rest of the stations along the entire corridor of BRT in Hubli-Dharwad.
• Partnered with DULT to develop Navanagar node of proposed BRT & safe access to BRT from significant public space
• Moving towards implementation (final GFC complete, tender out)
• Team on committee for advising Hubli-Dharwad Plan
MANEK CHOWK – AHMEDABAD: PUBLIC SPACE DESIGN

- Project to improve a public space in a historic neighborhood Chowk
- Final report submitted to municipal corporation
- Project included in municipal budget
Solution 2: Landuse and Transport Integration
METRO LINES AND STATIONS IN BENGALURU

- Length of Metro lines in Ph.I (active): **31.52** Kms
- Length of Metro lines in Ph.I: **42.3** Kms
- Number of Stations in Ph.I (active): **30**
- Number of Stations in Ph.I: **41**
- From Mysore Road Terminal to Baiyappanahalli and Sampige Road to Nagasandra the Metro lines are active
- The Southern arm of Phase I is to be opened soon
LOCATIONS OF JOBS IN BENGALURU

- Details of various companies (primarily white collared) were obtained from fundoodata.com
- Out of the list of 6000 odd companies, 4132 were spatialized using the address
- The number of jobs in each company was estimated based on the data
- Total number of Jobs (Median est) in Bengaluru: 10,06,600
REGIONAL ACCESSIBILITY (60 MINS)

<table>
<thead>
<tr>
<th>JOBS</th>
<th>POPULATION</th>
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<tbody>
<tr>
<td>0 – 20 %</td>
<td>2,44,661</td>
</tr>
<tr>
<td>20 – 40 %</td>
<td>4,68,235</td>
</tr>
<tr>
<td>40 – 60 %</td>
<td>9,63,473</td>
</tr>
<tr>
<td>60 – 80 %</td>
<td>22,57,396</td>
</tr>
<tr>
<td>80 – 97 %</td>
<td>45,09,957</td>
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</tbody>
</table>

• Majority of the public are having good access to jobs within 60 minutes in normal case scenario
ACCESS FROM / TO CHINASWAMY STADIUM

• The access from M Chinnaswamy stadium was calculated as a single point analysis (Isochrones)
• The departure time is placed between 9 PM and 11 PM
• Such a departure time was chosen to create a scenario of people coming out of the stadium after a cricket match
• Analysis shows that many areas are not accessible at the given time
Solution 3: Strategic Spatial Planning
Bangalore is adding more than the combined population of all the 11 corporations in Karnataka.
Move from traditional land-use approach for planning and development towards a strategic spatial planning approach.
Duplication and Non-conformity with other department’s databases
Solution 4: Managing Urban Expansion
Population Growth
1901-2011

Source: Census 2011
Population Growth 2031

- 20.3 million (projected as per RMP-2031, BDA)
- 9 million (as per 2011 census in BDA)

Source: Census 2011
Zipf’s Law: Bangalore, a clear case of primacy. Hubli-Dharwad and Mysore, the second and third largest cities in the State are only $1/10^{th}$ the size of Bangalore.
Develop peripheral and satellite ring roads as area-based development projects rather than mere road projects by integrating land-use and transport.
Expansion of Bengaluru beyond its Metropolitan Region: Case Chikkaballapura

Approaches to plan Chikkaballapura as a satellite for Bengaluru

- Clear city structure, connectivity network to support organised expansion
- Support walking and cycling & accessibility to public transport
- Conserve the natural water systems to sustain life forms
- Plan equitable access to public facilities, utilities and transport services
- Plan open spaces and green areas as relief for better micro climate.

Land surface temperature in Chikkaballapur to inform location of gardens and open spaces.

Legend

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Legend</th>
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</thead>
<tbody>
<tr>
<td>High: 36.21 °C</td>
<td>Highways</td>
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<tr>
<td>Low: 24.38 °C</td>
<td>LPA Boundary</td>
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<tr>
<td></td>
<td>Settlement Boundary</td>
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</table>
Fig. 4: Vinzol II TP scheme, showing the process of plot reconstitution
Integration of gated communities in the peripheries
Solution 5: Participatory Community Planning
NIPC - City wide challenge

scale:
City level (BBMP)

primary stakeholders:
Community associations, BBMP, organising and funding partners

Community engagement type:
Community led formulation and implementation

Funding mechanisms:
CSR funded
Adopt local area planning that allows for improved infrastructure and services for new and existing wards.
Solution 6: India’s 100 Smart Cities
Sustainable Development - Smart Cities

Objective

Economic Viability
Creating jobs
Boosting key industries
Attracting new business

Leadership & Good Governance
Empowered & proactive leadership

Environmental Sustainability
Preserve natural resources
Minimize impact

Social Vibrancy
Quality of life
Social inclusion

<table>
<thead>
<tr>
<th>Social Infrastructure</th>
<th>Smart Healthcare</th>
<th>Smart Education</th>
<th>Telemedicine Applications</th>
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<tr>
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<td>Electronic Records Management</td>
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<td>Hospital and Clinic Asset Management</td>
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<td>Remote monitoring for disabled</td>
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<td>E and Integrated Learning</td>
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<td>Knowledge Sharing Network</td>
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<td>Virtual Infrastructure/Campuses</td>
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<tr>
<th>Smart Utilities</th>
<th>Smart Water</th>
<th>Smart Waste</th>
<th>Smart GRID</th>
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<tr>
<td></td>
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<td>Smart Metering, Monitoring and network management</td>
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<td></td>
<td>Waste Management, Automatic notification, collaboration of authorities for waste collection &amp; treatment</td>
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<td></td>
<td></td>
<td></td>
<td>Smart transmission &amp; distribution network &amp; Smart meters (It uses information and communications technology to predict and adjust to network changes autonomously to improve reliability and connect to new sources of generation)</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Intelligent Transport and Connectivity</th>
<th>Physical Infrastructure</th>
<th>Digital Infrastructure</th>
<th>Multimodal transport network, BRTS, Metro Rail, Tram, Inland Waterway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Buildings</td>
<td>Optimize building operation and management</td>
<td>Energy efficient building, Automation driven etc</td>
<td></td>
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<tr>
<td>Public Safety</td>
<td>Optimize response time in case of emergency</td>
<td>Surveillance of public systems, secure public transactions and administration</td>
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<tr>
<td>Governance</td>
<td>Encourage and capture feedback from citizens</td>
<td>Use of multiple channels, including the phone, websites, mobile applications, and even social media tool for monitoring and program management</td>
<td></td>
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</table>
Smart Cities

- Long term planning – with a focus on livability, mobility and sustainability
- Using technology for bringing efficiency in service delivery and integration of urban services
- Adaptability to alternate forms of financing
- Citizen engagement
ALMOST ALL CITIES FAIL AIR QUALITY STANDARDS

PARTICULATE MATTER PER M3 FOR TOP 50 CITIES – HIGHER PARTICULATE MATTER MEANS WORSE AIR QUALITY

SOURCE: Mortality data from World Health Organisation: http://apps.who.int/gho/data/node.wrapper.ENVHEALTH3
URBANIZATION CHALLENGE IN INDIAN CITIES

Traffic Fatalities (2013)

- Pedestrians: 9.1%
- Cyclists: 3.5%
- Motorized Two-Wheelers: 28.6%
- Motorized Three-Wheelers: 41.2%

Total Traffic Fatalities: 140,000

Data from MoRTH

Chart 1.1: Compound Annual Growth Rate 1994-2003 and 2004-2013

Image source: WRI India
Workers lose **8 days** per year sitting in traffic
HIGH QUALITY PUBLIC TRANSPORT AFFECTS CITY PRODUCTIVITY

MASS TRANSIT PLAYS A MAJOR ROLE IN REDUCING URBAN EMISSIONS, AND LEADS TO BETTER GROWTH

Note: * Determined by composite rankings against a range of indicators. Based on ranking of 24 international cities with #24 being the top rank. For more information on these see PwC Cities of Opportunity available at http://www.pwc.com/us/en/cities-of-opportunity/
HIGH QUALITY PUBLIC TRANSPORT AFFECTS QUALITY OF LIFE

Note: * Determined by composite rankings against a range of indicators. Based on ranking of 24 international cities with #24 being the top rank. For more information on these see PwC Cities of Opportunity available at http://www.pwc.com/us/en/cities-of-opportunity/
MOVING PEOPLE: AVOID-SHIFT-IMPROVE (ASI) APPROACH

Avoid
- Quantity and length of motorized trips

Shift
- To the most efficient modes

Improve
- Technology and Operations

Emission Reduction + Co-benefits
Solution 1: Complete Streets
RECLAIMING INDIA’S STREETS-- RAAHGIRI DAY

Photo: Flickr/EMBARQ Sustainable Urban Mobility
Redesign roads to make them safer for all users esp. pedestrians and cyclists

Source: thehindu.com, henrikvaluer.wordpress.com
Complete streets program in Indian cities
Solution 2: Buses and BRT
SEARCH FOR LOW COST HIGH QUALITY PUBLIC TRANSPORT

Bus Rapid Transport Takes Off

In 2017, Bus Rapid Transit serves:

- **206 Cities**
- **34 million passengers per day**

* Busway / BRT year commencement
Source: BRTData.org, March 2016
BIG Bus Network
1. Route Network Optimization & Redesign (circular & trunk)
2. Gearing up towards 3,500+ buses and 2.5 million riders daily
3. Feeder network, transfer facilities, user information systems
4. Financial Modelling, Subsidies, Fare & Fare Integration
BRT IN MEGACITIES

Istanbul

Seoul

Sao Paulo

México City

Rio de Janeiro

Bogotá
BRT IN MEGACITIES

IMPACTS IN MEXICO COUNTRY

- 400,000 Tons CO₂ per year

3 Million users per day

373 Km BRT

30% fewer crashes

40% Time saved by passengers

121 Lives saved per year
AHMEDABAD, INDORE, SURAT, RAJKOT, INDORE BRT
Solution 3: Multi-modal Integration
Integrate various modes of public transport and intermediate public transport through schedule, fare, and physical integration

Key Building Blocks of Multimodal Integration

- Infrastructure and Operations
  - Multimodal hubs
  - Transfer stations
- Institutional Framework
  - Metropolitan transport authority
- Info-structure
  - Control
  - User information and interface
- Integrated Payment
  - Smart cards

Source: WRI - EMBARQ India in association with Directorate of Urban Land & Transport, Karnataka
Solution 4: New Sustainable Mobility
Progressive regulations for emerging shared mobility options like ridesharing, carpooling, shared bicycles, and taxi aggregators

WHAT ARE THE TRENDS IN NEW MOBILITY VENTURES IN INDIA?

Shared Mobility is creating new markets
- Ride Share / Car Pool
- Vehicle Share
- Park Share

Ride-sourced Platforms are disrupting informal markets
- Car
- Auto-rickshaw
- Van/Bus

Commuter Experience is driving new businesses
- Driver Training
- Transit Apps
- Easy Payments

Product Innovation is changing human behavior
- Vehicle Design
- E-Mobility

Connected Mobility is optimizing systems and processes
- Fleet Management
- Vehicle Tracking
- Connected Cars / IoT

market potential | stakeholder analysis | business model | barriers | enablers | impact analysis

Shared Mobility
is creating new markets.

Ride Sharing is evolving but continues to have low ridership. Global companies like Uber and Sidecar have entered India.

The global B2C space is growing with entry by Hertz, Enterprise Rent-A-Car, Ask, Daimler, BMW and U-Haul. This market is still nascent in India. However, the self-drive car rental space is an upcoming one.

Park Sharing is in early stages in India. While there are some B2C models aggregating parking spaces and offering an on-demand valet, there are currently no P2P models.
SHARED, ELECTRIC AND AUTONOMOUS WILL HAVE FAR REACHING IMPLICATIONS

- Transport (emissions, shifting demand, access, equality, safety)
- Labor (contract with labor, redundancy)
- City planning and management (data ownership shifting)
- Energy (emissions, equality of access)
- Real estate (parking space, curb space)
Solution 5: User Pays Principle
PROGRESSIVE TRANSPORT POLICIES

(Congestion Charge London)
Ensure car-users pay the full cost of driving, including the costs of parking and congestion.

Source: economicsonline.co.uk; parking-net.com
Solution 6: Public Bikeshare System
SHARING ECONOMY TAKES OFF
PBS SYSTEMS IN INDIAN CITIES

- AMRITSAR
- BHUBANESWAR
- BHOPAL
- BENGALURU
- BENGALURU
- BENGALURU
- BHUBANESWAR
- CHENNAI
- KOCHI
- MYSURU
- PANAJI
- PUNE
- PUNE
- PUNE
- VADODRA
- UJJAIN
- VISHAKHAPATNAM

- WRI Intervention Cities (including Bhopal)
- Cities with functional PBS systems
- Other Cities considering PBS systems
INDIA’S CLEAN ENERGY AMBITIONS

From 3 gigawatts to 100 gigawatts solar power by 2022
INDIA’S TARGETS TO REACH 100GW SOLAR BY 2022

Notes: FY = All years in chart are fiscal years from April 1 to March 31; GW = 1,000 MW.
Sources: Bloomberg New Energy Finance (BNEF); The Economic Times.
INDIA’S TARGETS TO REACH 100GW SOLAR BY 2022

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Solution 1: Energy Efficiency
Energy efficiency for cities

• LED implementation

• Demonstrating new business models—pooling roof-space for larger procurement size to vendors

• Aggregating demand for energy efficiency & RE among companies—industrial parks, (Mahindra World City, Chennai)

• Residential rooftop solar adoption to meet targets under solar policies
- Identify and overcome information, technical, and financial barriers to installation of rooftop solar PV
- Focus on energy-efficiency and demand-side management via by promoting the use of energy efficient appliances and user education
Solution 2: Renewable Energy
Renewable Energy for cities

• **Global coordinator** the UN SE4All Global Building Efficiency Accelerator (BEA)

• **Supporting Rajkot city** in designing a building efficiency policy, and implementing demonstration projects

• Working in **Kochi smart city** to align solar cities and smart cities clean energy objectives and projects

• **Developed guidebook** for accelerating building efficiency for policy makers
• Facilitate the procurement of renewables by large electricity consumers to reduce their dependence on diesel and other pollutants

• Promote increased public participation in BESCOM’s decision-making

184 MW Installation – Coco cola, Infosys
100 MW – Mahindra World City
400 MW – Policy Intervention
500 MW – Rooftop
Solution 3: Circular Economy
India: Municipal wastewater

70% of wastewater (sewage) is released untreated into water bodies

Total wastewater generated 62000 MLD

Out of 816 STPs only 522 are functional

Source: Central Pollution Control Board. inventorization of Sewage Treatment Plants. March 2015
## Wastewater – treatment, use and reuse

<table>
<thead>
<tr>
<th>PROCESS</th>
<th>TREATMENT</th>
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<tbody>
<tr>
<td>OUTPUTS</td>
<td>WASTEWATER SLUDGE</td>
</tr>
<tr>
<td>USE</td>
<td>IRRIGATION</td>
</tr>
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</table>

Pictures sourced from [http://www.millenniumwaterstory.org/Wastewater%20Reuse%20-%20Some%20Reflections.html](http://www.millenniumwaterstory.org/Wastewater%20Reuse%20-%20Some%20Reflections.html)
Circular systems - Energy recovery and other co-benefits

Wastewater-to-Energy System

- **2.3 million metric tons of sludge + kitchen waste**
- **Biogas:** 69.8 million m³
- **Natural gas:** 45.5 million m³
- **Biochar:** 21,600 metric tons
- **Saplings:** 216,000

Proposed 21 year life of system

http://bit.ly/2mNlyfG

WORLD RESOURCES INSTITUTE
Solution 4: Waste to Energy
India: Municipal Solid waste

• 377 million urban dwellers in 7,935 towns and cities
• 62 million tonnes of municipal solid waste per annum
• 43 million tonnes (MT) of the waste is collected, 11.9 MT is treated and 31 MT is dumped in landfill sites.

Solutions around solid waste management

Usual scenario

Collect

Dump

Landfill

Shifting gears

Source segregation

Household/neighborhood composting

Municipal collection of wastes

Dry waste centers

City level composting

Waste to energy

Recycling

Sanitary landfilling

Incineration

Biomethanation
WHAT CAN WE LEARN FROM CITIES THAT HAVE TRANSFORMED?

Medellin, Colombia

Surat, India
The opportunity

Game-changing solutions are out there

Managing Urban Expansion
Transit-oriented development

Improve Energy Efficiency
Smart, efficient buildings

Addressing congestion
Mass Transit, Bike sharing systems and other low impact modes

• But solutions need improving, scaling and adapting for maximum impact:
  – Extending the coverage of mobility, energy, and other services to underserved areas
  – Diversifying options for greater choice and accountability, and adapting to local context.
need shift in conversation….

• From *moving vehicles* to *moving people*
• From *urbanization* to *managing urban expansion in a sustainable manner*
• From *traditional energy supply* to *implementing practices providing clean, reliable energy*