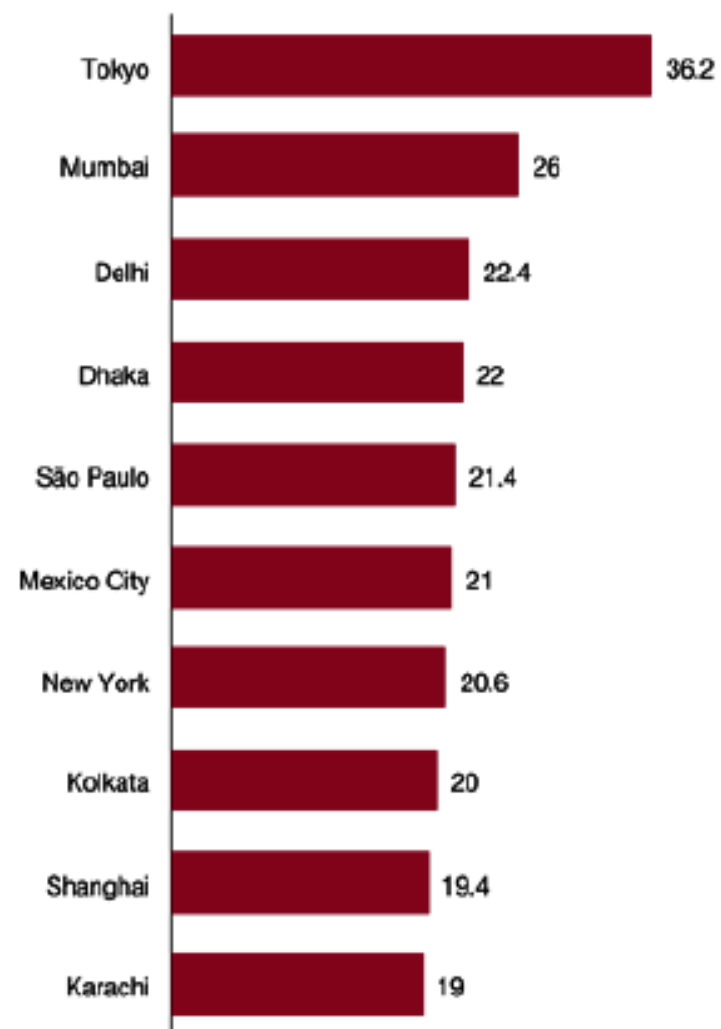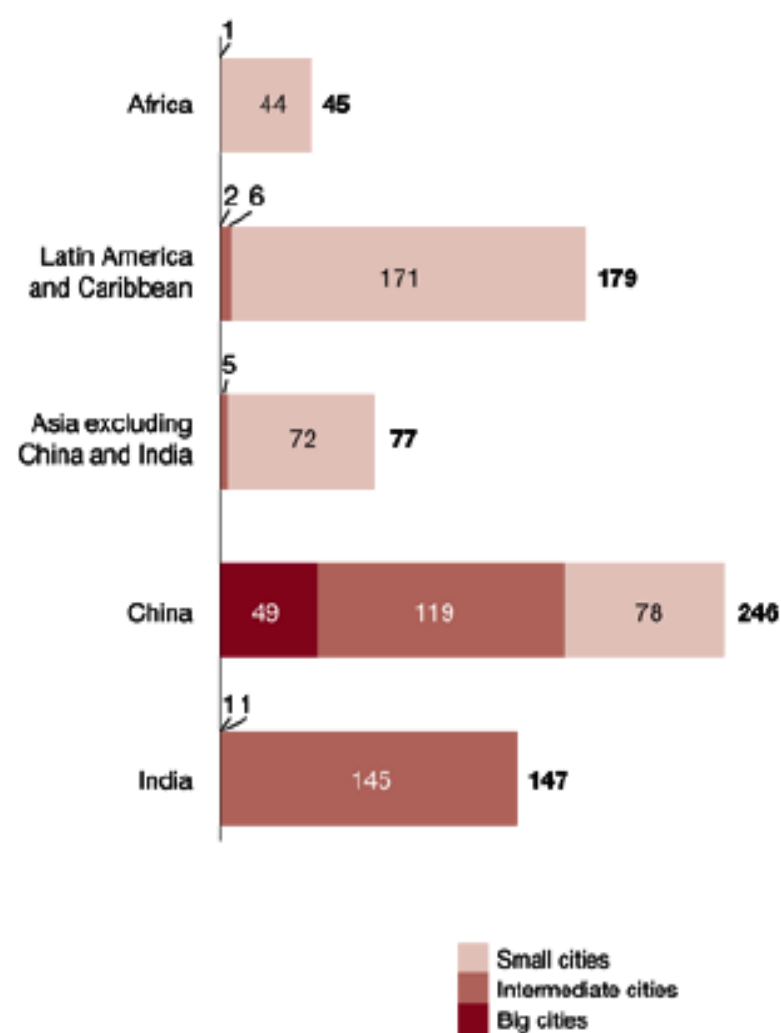# Sustainable Urbanization

- Kevin Naik

- Increasing urbanization and awareness of sustainability issues are setting off a wave of investments in revitalization of existing cities and development of new ones.

- Businesses and governments are starting to recognize the role of technology in meeting these objectives.

- ICT (information and communications technology) component can enable the designing of smarter cities that offer a better quality of life for their residents while being more sustainable and cost efficient.
  - the residents that stand to benefit
  - governments can meet their objectives faster and more cheaply

- Worldwide are living in urban areas than rural for the first time in recorded history

- 1950 only about 30 percent of the world's population lived in cities

- By 2030, the United Nations expects more than 60 percent of the world's population to live in cities.

- With the urban populations of Asia and Africa set to double between 2000 and 2030, going forward, this trend is expected to be dominated by developing economies.

- Expansion of existing cities and creation of new ones

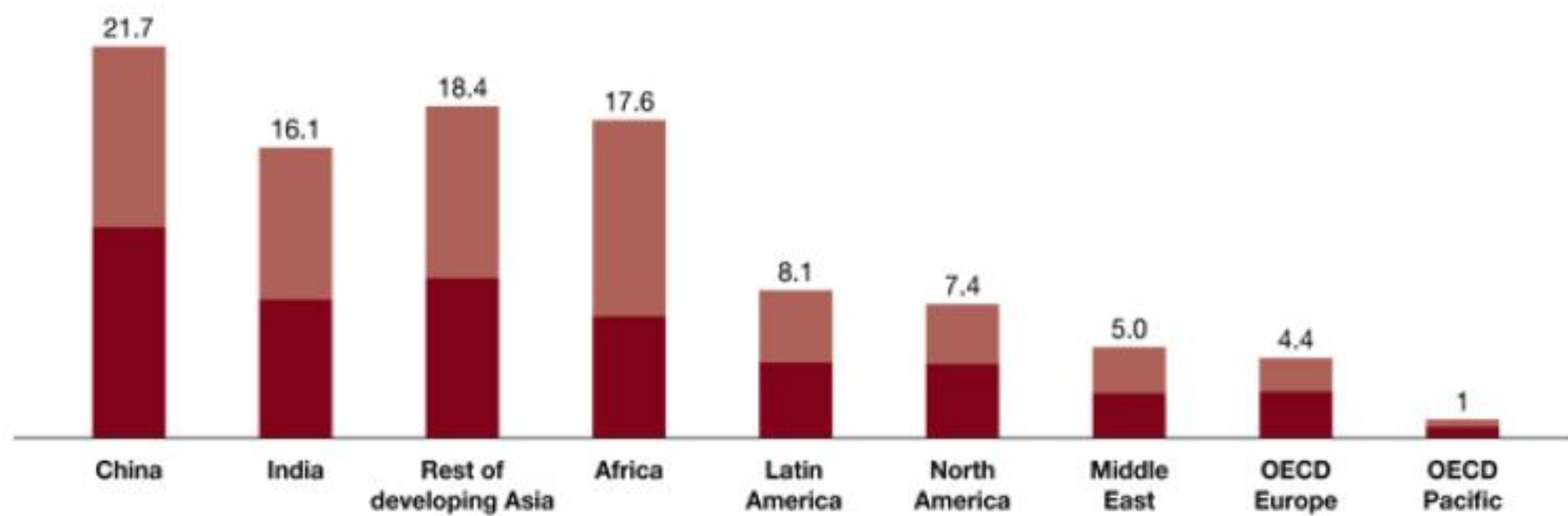## Top ten megacities
(population in millions — 2025 projection)

City	Population
Tokyo	36.2
Mumbai	26
Delhi	22.4
Dhaka	22
São Paulo	21.4
Mexico City	21
New York	20.6
Kolkata	20
Shanghai	19.4
Karachi	19

Number of new city developments globally
(1990–2008)

Region	Small cities	Intermediate cities	Big cities	Total
Africa	44	1		45
Latin America and Caribbean	171	6	2	179
Asia excluding China and India	72	5		77
China	78	119	49	246
India	1	145	1	147

Small cities
Intermediate cities
Big cities

- By 2050, at least 100 new millionplus cities are expected to appear.
- These 694 new cities started out as rural towns and became urban areas by virtue of changes in their administrative status, natural growth, or migration.

Implications of urbanization

- Urban populations are growing at a faster rate than their cities can support.
- Cities are stretched to the limit, struggling to provide basic urban services at unprecedented scales.
- All over the world, major cities — Cairo, Los Angeles, Beijing, Paris, Moscow, Mumbai, Tokyo, Washington, São Paulo — have stories to tell of electricity, transportation, or water systems in crisis.
- Traffic congestion and pollution continue to increase as overcrowding has become endemic. Urban poverty, associated with unemployment and inadequate housing and services, is a serious socioeconomic challenge.
- critical infrastructure is technologically outdated, woefully,inadequate, increasingly fragile, and incapable of meeting even the current needs of all its residents.
- Flow into trillions of dollars over the next 30 years, largely concentrated in developing nations

China 21.7
India 16.1
Rest of developing Asia 18.4
Africa 17.6
Latin America 8.1
North America 7.4
Middle East 5.0
OECD Europe 4.4
OECD Pacific 1

Buildings
Big households

- Take India, for example. Indian cities need to prepare for an influx of tens of millions of people in the coming decades. The 170-millionplus slum dwellers in India surpass the total populations of all but five countries in the world. Mumbai, which originally planned to accommodate 7 million residents, is now home to 18 million.

- The resulting urban sprawl and lack of affordable housing have brought to Mumbai the dubious distinction of fostering the single largest urban slum settlement in Asia.

- By 2025, there are expected to be 13 urban agglomerations in India with more than 10 million inhabitants.

- Building more roads can serve only as a temporary reprieve from congestion and can do little to reduce pollution in a rapidly urbanizing environment.

- Generating more electricity or developing new sources for water cannot purge the system of such embedded inefficiencies as distribution losses, leakage, and pilferage.

- Poses socioeconomic and environmental challenges.

- 80 percent of global CO emissions, and will account for an ever-higher percentage in the coming years, as more and more people

- reside in and move to cities in search of prosperity.

- Urban ecological footprint will not be sustainable — humanity will need the equivalent of two planets to maintain those lifestyles by the 2030

- At the heart of the matter, we face a challenge of meeting demands of urbanization in an economically viable, socially inclusive, and environmentally sustainable fashion.

Vision for cities of the future

- Urbanization is an inevitable progression.

- social equitability, economic viability, and environmental sustainability.

- The role of technology in meeting the goals of urban infrastructure provisioning both today and in the long term.

- Industrial infrastructure such as railways, roads, and telephone lines preparing the way for new cities and new connections.

- Integrated management of the economic, social, and infrastructure aspects of urbanization via the use of networked information.

- Developing the next generation of cities driven by technological solutions.

Songdo: South Korea leads the way in building next-generation cities

- Songdo International City in Incheon, South Korea, is the world's newest city. Built on 1,500 acres of land reclaimed from the Yellow Sea off Incheon, it was created to establish a new standard of smart urban development.

- Gale International and Cisco to develop an interconnected communications network system and a suite of solutions for the residents of Songdo.

- Networking technology and energy management software tools citywide to link municipal systems, education institutions, healthcare facilities, transportation systems, and hospitality organizations into a common network.

- Standards and technologies that reduce energy consumption, increase energy efficiency, utilize recycled and natural materials, and generate clean or renewable electricity.

- Songdo buildings will be built embedded with advanced energy management solutions.

- Greywater and rain will be collected for irrigation and use in cooling towers. A network of underground pneumatic pipes will move solid waste, reducing the need for garbage trucks.

- Green transportation schemes.

- The city's main car depot has been buried in a sunken courtyard to keep heat and emissions down.

- Underground trains linked to Seoul and a network of electric water taxis in the city's saltwater canals to reduce Songdo's carbon footprint.

- More than 40 percent of the city is designated for open spaces, with parks accessible from all corners of the district. A 100-acre "central park" will be built over the multi-level underground parking in the city center.

- The future of cities is evident now in Songdo, a city that seems to have found a harmonious connection between nature and technology, innovation and innovative urban design, and superior quality of life.

Masdar: A renewable oasis

- Masdar City, the world's first carbon-neutral, zero-waste city, is an initiative of the government of Abu Dhabi intended to position the country as a leader in renewable energy and sustainable technology

- city powered entirely by renewable energy is rapidly taking shape.

- Masdar City is a planned urban environment of about 2.5 square miles (6 square kilometers) that is expected to house 40,000 residents after its completion over the next decade.

- Use energy technologies to reduce its waste to nearly nothing, and to leave a negligible footprint of carbon and other industrial emissions. Engineers are exploring solutions such as "personal rapid transportation (PRT) units," which are, essentially, shared solar-powered vehicles that hold six people at a time and can be directed to any of the 200 or so stations beneath the city.

- The city aims to recycle most of its water. Parks and plazas, filled with greenery and modelled after traditional Arab gardens, will foster a sense of community and encourage walking. Narrow alleys between buildings will offer shade and reduce the need for air conditioning.

- implementation of the relevant IT solutions as critical to meeting its goals. ICT solutions such as smart home/smart office and city management applications have been identified to add tangible value through enabling more efficient deployment of services (for example, enhanced monitoring of facilities to reduce consumption, demand-managed scheduling of PRT).

- Sustainability management solutions add intangible value, keeping citizens informed about the environmental progress agenda, and smart home and electronic wallet solutions enhance entertainment and improve quality of life.

The underlying technology

- smart city is that of an urban center that is safe, green, and efficient because all structures — whether used for power, water, waste management, or transportation — are designed, constructed, and maintained with the use of advanced, integrated materials, sensors, electronics, and integrated networks.
- The use of smart grids/meters for water and power transmission provides a technology-enabled solution to reduce leakage and waste and increase transparency and reliability. Smart grids deliver electricity from suppliers to consumers using two way digital technology and can integrate alternative sources of electricity such as solar and wind energy.
- U.S. grids with smart grid capabilities would save between US$46 billion and $117 billion over the next 20 years.

Energy/utilities/water

- "Smart metering" systems
  - *Real-time usage metering savings — 10-15% energy*
- "Smart distribution" systems
  - *Intelligent networked transmission/ distribution*
  - *Real-time network condition monitoring*

Healthcare

- Remote systems for diagnostics and treatment
  - *Enhance patient experience and penetration of direct care*
  - *Improve emergency responses*

Transport

- Intelligent transport systems
  - *Direct traffic flow based on real-time information*
- Automatic systems for reducing congestion
  - *Dynamic demand handling*
  - *Systems like carsharing, multi-modal transport scheduling, etc.*

Education

- Systems for interactive two-way content delivery to students and teachers
  - *Monitoring systems*
  - *Remote access*
  - *Access to quality content*

Housing

- Intelligent real estate solutions that manage building energy efficiency, security, utility supply, etc.
  - *Reduce total cost of ownership over building life cycle*
  - *Provide environmentally sustainable properties*

Public safety and security

- Intelligent systems
  - *Citywide monitoring, sensor tracking, alerting, controls*
- Dynamic resource management systems
  - *Quick emergency response*

- Increasingly finding acceptance as a means of increasing accessibility and reducing cost of delivery.
- Tele-medicine solutions, connecting with other participating hospitals
- Improving efficiency and resource utilization across air, road, rail, and sea
- The cities of Stockholm and London have implemented intelligent traffic management and congestion charging solutions
- GPS-enabled Bus Rapid Transit System (BRTS) solution to meet its transportation needs in a sustainable fashion

Sustainable transportation in Ahmedabad, India

- Reliable and secure public transport with the primary objective of reducing travel time.

- Keeping sustainability at the core of the planning process.

- 155 kilometers of road were created within BRTS after planners determined the service utilization by considering socioeconomic characteristics, travel demand patterns, road network characteristics, the proposed metro plan, and the existing Ahmedabad Municipal Transport Service (AMTS) route network.

- Equipped with ramps for the disabled, CCTVs, and comfortable seating arrangements for commuters.

- The scheduling and tracking of buses on all routes is performed from a central location in the city

- Key design elements include GPS-enabled buses, an integrated control center for traffic management, and use of driver assist and automation technologies with vehicle prioritization and passenger information systems for operational efficiency. Procurement and operation of buses is undertaken by private operators via a public–private partnership (PPP) model.

- BRTS was awarded the 2010 Sustainable Transport Award, beating four other prominent cities worldwide.
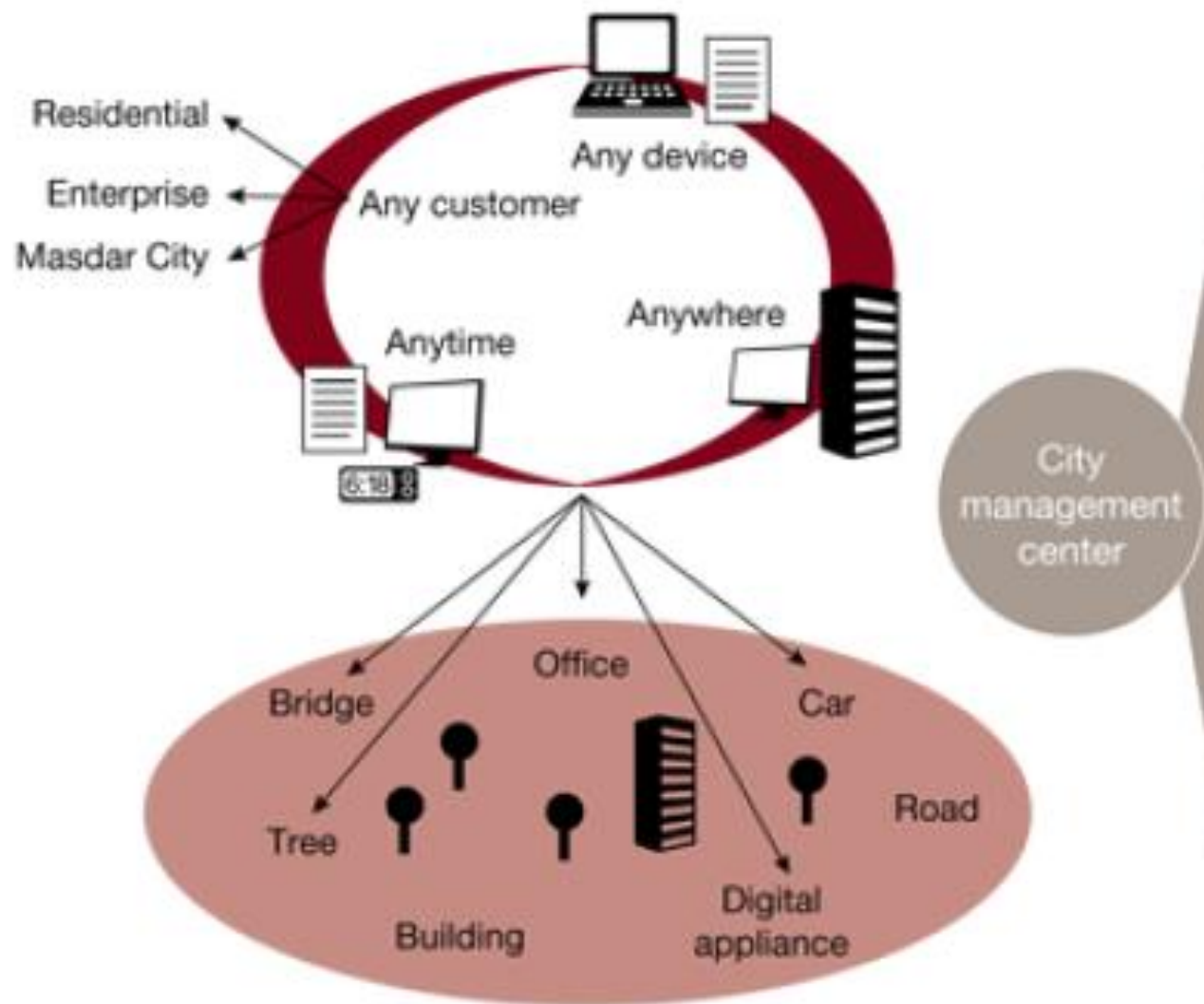
- enabling role in the avoidance of high-emissions infrastructures.
- buildings with features such as leverage sensors and controls designed to improve efficiency and tailor energy use to demand. Public safety and security solutions help prevent, detect, and respond to security requirements.
- Real Time Crime Centers (RTCCs) and integrated emergency response solutions are technology-enabled solutions that have been used successfully worldwide to increase efficiency and reduce response time.
- Reduced the crime rate by 27 percent; the police use analytics and visualization tools to decipher crime patterns as they are forming.

Technology solutions not only make urban service delivery economically viable, but also ensure environmental sustainability and social inclusiveness.

ICT strategy of Smart Cities

1. The ICT infrastructure should enable interaction and interconnectivity between and across homes, office buildings, transportation systems, and smart utilities to ease the chore of urban living for the citizenry.

2. Services should be universally accessible to all city residents

3. Services should be centered on the individual consumer and focused on a superior consumer experience.

Smart city

Residential
Enterprise
Masdar City

Any customer
Any device
Anytime
Anywhere

Bridge
Office
Car
Tree
Building
Digital appliance
Road

City management center

Center

Service
Citizen portal, public service, commercial service, service common framework

Information
Integrated billing and information processing, media information processing

Hub
Multi-channel connection hub, internal and external connection hub

Control
Integrated control, facility management, situation recognition control, facility image information management

Infrastructure
Core technology platform, system operation and management platform, GIS platform, DVR and device gateway platform

Benefits of smart cities

- Efficient usage
- Connected and transparent public services
- Increased safety and security
- A better lifestyle

Implications for stakeholders

- *Governments*
- *Developers*
- *ICT providers*

Conclusion

The world is urbanizing rapidly, and significant investments will be required to fulfil basic demands. The unprecedented urban growth that is expected, especially in countries such as India and China, demands a radical and proactive response. This will require a wide range of policies and practices to be conceptualized around new socially inclusive and environmentally friendly paradigms. Technology has a role to play, and the global community is waking up to it. The current situation holds tremendous potential for governments to build cities of the future that can serve as engines of growth by attracting talent and investment in the global competitive landscape. Property developers and ICT players that embrace these trends have an opportunity to cash in on the benefits.

Reference

- Sustainable urbanization: The role of ICT in city development by by Sandeep Dave, Gregor Harter, Ashish Sharma, Jai Sinha.

- The role of ICT in the proposed urban sustainable development goal and the new urban agenda by UN habitat for a better urban future and Ericsson.