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Smart City & Broadband Penetration: Challenges & Opportunities

Presentation at the 2015 Nigeria Computer Society International Conference

July 2015

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Outline

- **The Intelligent & Connected City: Drivers for Change**
- **Intelligent City Deployment: Opportunities for Cities in Nigeria**
- **Building Intelligent Cities: Approach & Stakeholder Considerations**
- **Case Studies**

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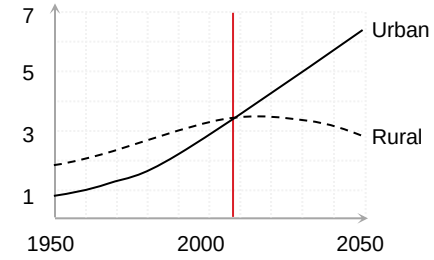
Globally, the challenges of urbanisation and environmental change are driving cities to seek new solutions

POPULATION: Urbanisation is straining infrastructure

Urbanization Tipping Point
(billions of people)



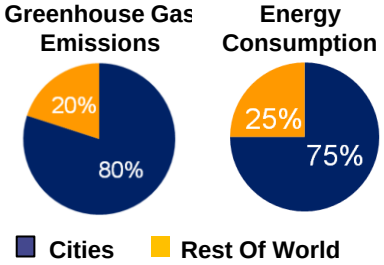
Source: United Nations Department of Economic and Social Affairs. World Urbanization Prospects: The 2007 Revision.

The global population is now predominantly city-dwelling and as a result demand is increasing for urban infrastructure investment.

In 2008, for the first time, the urban population equalled the rural population of the world. By 2050 the urban population is estimated to double to 6.4 billion.

ENVIRONMENT: Resource constraints demand efficiency

City Emissions & Energy Consumption
(as a % of the rest of the world)



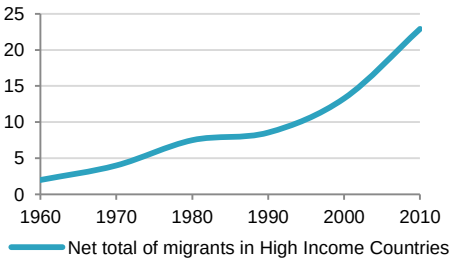
Source: UN-Habitat, 2007.

Cities have a huge pull on the world's finite global resources (fossil fuels, water etc). Cities are major consumers and polluters.

Despite only occupying 2% of land, cities account for 80% of GHG emissions and 75% of energy consumption in the world.

SOCIO-ECONOMIC: Talent mobility has driven competition

Global Mobility – Net Migration
(millions of people)



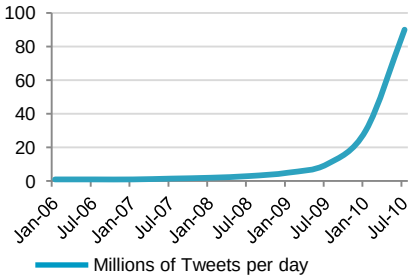
Source: The World Bank, 2011.

Human migration has increased drastically in high income talent segments. As the workforce becomes more globally mobile, cities are increasingly competing to attract and retain talent.

>300% increase in net total migrants from high income countries 1970-2010.

TECHNOLOGY: New technologies are driving innovation

Tweets per day
(millions of tweets)



Source: Twitter website, 2010.

Cities are at the front edge of technology adoption and we are seeing game-changing effects of ICT on both infrastructure management and citizen lifestyles. For example, people are increasingly acting like sensors, providing real-time information through their mobile phones. Twitter now has 160m users who send out nearly 100m tweets a day.

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Several cities around the world are using 'intelligent' and 'point smart' solutions to meet these challenges

	Issues	Outcomes	Point Smart Solution
Mexico City	**Public Safety:** Nine out of ten crimes go unreported in Mexico city[1]	**A safe and secure city with reduced crime rates**	**Safe City:** A scheme that has installed 6,200 security cameras in the city's busiest and traditionally most dangerous areas
Singapore	**Road Congestion**: Road space is a scarce resource in Singapore, it has a vehicle population of 917,000 over 3,240 km of roads[2]	**Transport routes are less congested, lower CO_2 emissions through a reduced use of private cars**	**Electronic Road Pricing:** Using gantries and car based payment systems Singapore can accurately predict traffic conditions and charge motorists for peak time road use.
Jakarta	**Waste:** The city produces around 5,500 tonnes of waste daily and poor waste-disposal practices cost the city administration $82.4 million a year[3]	**A city-wide waste management and recycling system**	**Recycling Payments:** Micropayments via mobile phones to incentivise individuals to increase rates of waste recycling
Copenhagen	**Environmental targets:** 73% of Copenhagen's energy supply is currently from coal, natural gas and oil[4]	**A global leader in clean technology research, development & implementation**	**Copenhagen Cleantech Cluster:** A global-connected, research-driven cluster providing business conditions that aid growth in the cleantech sector

1 http://www.economist.com/node/18744547
2 http://www.indiaenvironmentportal.org.in/files/ERP-Singapore-Lessons.pdf
3 http://www.thejakartaglobe.com/jakarta/jakarta-wastes-rp-800b-per-year-on-trash/332592
4 http://www.cphx.dk/index.php?id=311305#/311302/

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We define an Intelligent City as: a "digitally-enriched, sustainable urban environment"

A City that embeds technology into its design and operation

- Enhanced sensing and control
- Harnessing the potential of data
- Technology driving social, economic and environmental value (e.g. carbon emissions reductions)

A City that integrates across multiple infrastructure layers & drives new insights

- Information exchange between infrastructure layers (water, waste, energy, transport…)
- Economies of scope and scale across industries
- Integrated strategies and roadmaps

A City that focuses on service provision for its citizens and business

- Systematic focus on the suite of services offered
- Driven by the target human capital
- Meeting needs of citizens and business

A City using an innovative public & private sector collaboration model

- A collaborative ecosystems of partners
- Service delivery model innovation
- Innovative sources of financing

IMPROVED SUSTAINABILITY OUTCOMES

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There is a broad range of ‘intelligent’ and ‘point smart’ solutions that are applicable across various sectors of the economy

- Smart Communications
- Digital Public Information Displays
- Networks Master-Planning
- Real-time Customer Analytics
- Mobile Solutions

- Sustainable Supply Chain
- Intelligent Infrastructure
- Smart Logistics
- Smart Ticketing
- Infrastructure Analytics

- Sustainability Performance Management & Reporting
- Mobile payments
- Risk Management
- Financing models

- e-Healthcare
- e-Learning
- Smart Security
- Smart Procurement
- Infrastructure, Facility & Asset Management
- Traffic Management
- Road Toll Systems

- Waste, Water & Recycling Solutions
- Smart Water Grid Services
- Smart Grid Services
- Smart Building Solutions
- Clean Energy Solutions
- Climate & Energy Management Services

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Some of these solutions specifically address some of the modern challenges faced by city leaders

Intelligent City Applications

Smart Grid Technology
To empower end users to be more efficient with their energy uses, and to allow utility companies to proactively identify and repair energy or water leakage

Smart City Planning & Management
Provides urban planners, city administrators, and private sector infrastructure investors with the data and insight to better manage city infrastructure, facilities and assets

Smart Traffic & Parking Control
Through sensors in roadside furniture to proactively reroute traffic to avoid congestion and maximize road utilization

Smart Waste Management
Use of innovative, data-driven solutions such as 'Pay-As-You-Trash' schemes to better manage city waste and reduce solid waste volumes

Smart Security (CCTV/Surveillance)
Cameras to measure real-time footfall mashed up with weather and events data, to alert transport networks, police, and retailers in real time of spikes in footfall

Smart Procurement
Use of communication technologies to achieve efficiencies in procurement through a higher degree of collaboration and engagement between all parties in a supply chain

eHealthCare & eLearning Solutions
Use of electronic media and information/communication technologies to improve public health management and achieve better educational outcomes

Digital Public Information Displays
Application of digital technologies to public furniture such as street light poles, bus-stops and signages to enhance public information dissemination and generate revenue

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The drivers and the key protagonists for these solutions vary by region

North America

Drivers:
- Improvement of energy infrastructure
- Meeting of customer demands
- Creation of new business opportunities & jobs

Key Protagonists: Government, Utilities
Market Maturity: Low
Examples: Boulder, Babcock Ranch

Europe

Drivers:
- Reduction of CO_2 emissions
- Facilitation of competitive energy retail markets
- Creation of new business opportunities & jobs

Key Protagonists: Governments, Utilities
Market Maturity: Medium
Examples: Amsterdam, Copenhagen

Africa

Drivers:
- Quest for economic growth, jobs and business opportunities
- Urban renewal

Key Protagonists: Government, IT/Electronics
Market Maturity: Low
Examples: Konza City, Nairobi; Johannesburg

Latin America and Asia Pacific

Drivers:
- Pace and scale of urbanisation
- New infrastructure demand - transport, energy
- Creation of jobs and attraction of commerce

Key Protagonists: Gov't, Developers, IT/Electronics
Market Maturity: Medium - High
Examples: Rio de Janeiro, Songdo, Meixi Lake

Middle East

Drivers:
- Socio-economic development
- Attraction of commerce
- Diversification of energy supply

Key Protagonists: Government, IT/Electronics
Market Maturity: Low - Medium
Examples: Masdar City, KA CARE

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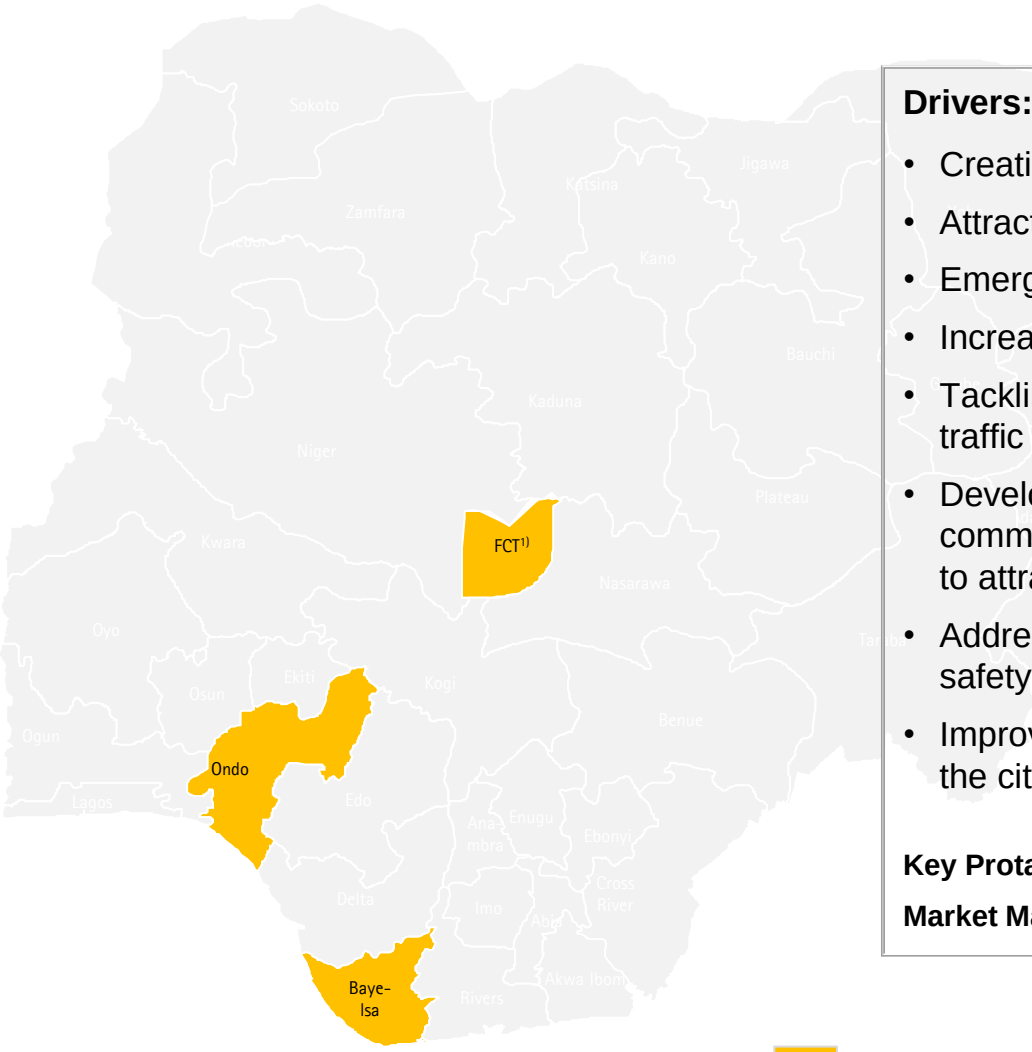
For Nigerian cities, a number of critical imperatives provide a compelling case for the deployment of intelligent city solutions



Drivers:

- Creation of new business opportunities & jobs
- Attraction of talent
- Emergence of business parks and innovation hubs
- Increasing Internally Generated Revenue (IGR)
- Tackling over-congestion (both urban density and traffic volume)
- Developing the educational, transport and communication infrastructure, to incubate talent and to attract industry and commerce.
- Addressing security challenges and improving public safety
- Improving the experience of residents and visitors to the city

Key Protagonists: Developers, Utilities, IT

Market Maturity: Low

Potential Pilot Cities

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We have identified 5 near-term intelligent city solutions that can be deployed in Nigerian cities

Smart Street Lighting & Signs

Smart Bus Stops

Smart Parking

Remote Expert Government Services

Smart Metering

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Beyond smart LED, city leaders and street lighting vendors are using street lights as a multi service platform

Size of Opportunity

$10m - $20m*

per annum

Value Proposition

- Ability to improve functionality and reliability of street lights
- Use of embedded sensors in street lights and digital signages to measure many parameters for a more efficient management of the city
- Increase revenue generation from digital advertising
- Generate additional revenue by use of street lights to host services (e.g. wi-fi access points)

**Preliminary estimates based on analysis of revenue generation potential for an African city with up to 7.5 million residents. Revenue estimate is based primarily on advertising revenue from 12,000 poles deployed. City-specific analysis required to verify revenue generation potential*

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Smart & Connected Bus-Stops can be used to host multiple services - providing a valuable tool for service management and revenue generation

Features

- Similar to street lights, smart bus-stops provide a multi-service platform that Governments can use to deliver services to citizens and generate revenue

$50m - $112m*

per annum

Value Proposition

- Ability to obtain data for better management of city traffic and other city services
- Generate revenue from digital advertising
- Generate revenue from hosting services to business
- Use as assets for public information dissemination and public safety management

**Preliminary estimates based on analysis of revenue generation potential for an African city with up to 7.5 million residents. Revenue estimate is based primarily on advertising revenue from 600 connected bus-stops. City-specific analysis required to verify revenue generation potential*

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Smart parking systems can be deployed to improve revenue generation from public parking, and improve traffic management

Features

- Smart parking devices that change prices to optimize parking space availability
- Parking usage is monitored via sensors placed in the asphalt
- Can be used for both on-street parking, and parking lots owned and managed by the city

Value Proposition

- Optimizes revenue generation from public parking spaces and lots by reducing leakages
- Reduce the time and fuel wasted by drivers searching for an open space.

$35m - $50m*

per annum

**Preliminary estimates based on analysis of revenue generation potential for an African city with up to 5 million residents. Revenue estimate is based primarily on parking tolls for 10,000 cars per week . Applicable only to cities with significant Govt controlled public parking (e.g. Abuja) City-specific analysis required to verify revenue generation potential*

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Remote Expert Government Services can be deployed to improve how cities deliver public services to residents

Near Term Opportunity

- **Federal Digital Service Strategy Launched by the Head of Civil Service of the Federation in August 2014**
- **Federal Ministries, Departments and Agencies directed to establish Digital Service Centres**

Features

- Enables citizens to have remote access to a portfolio of services through a high-quality, high-definition video and voice connection in a truly immersive collaboration experience
- Identifies, locates, and connects citizens with experts for specific Government services
- Creates a virtual pool of experts that are located in a centralized environment, maximizing the effectiveness and reach of their knowledge base

Value Proposition & Benefits

- Increased patronage of city services
- Access to services of experts at a reduced cost (compared with hiring them)
- Significantly improves the experience of the citizen in interacting with public services
- Reduce cost to serve over the long term
- Provides a platform for public-private collaboration in public service delivery with potential for revenue generation

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Smart Metering solutions can inject efficiency in power utilization and improve power consumption behaviors

Value Proposition

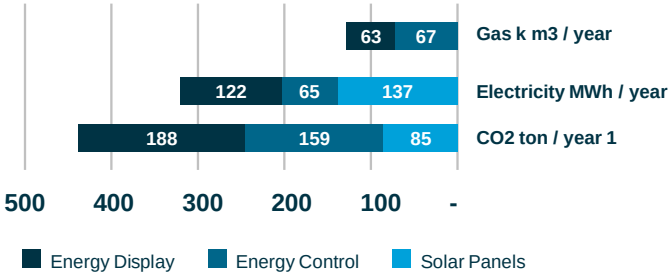
- Smart meters that measure the energy usage and that can be connected to appliances that help to save energy
- Installed with energy displays that give feedback about energy usage and personal savings advice based on the information of the smart meter
- The possibility to acquire energy saving tools (“Energy Control”)
- Stimulate behavioral change for example an online platform
- Monitor and report on behavioral change and energy savings

50-75%

Revenue Uplift*

Results from a Smart Metering Pilot Program

Savings : CO2, Electricity and Gas
Pilot all Households



CO2 %	Electricity %	Gas %
↓ 8.9%	↓ 7.4%	↓ 9.9%

** Revenue uplift indicates potential value realizable by utility companies from the reduction of non-technical losses associated with meter tampering and manipulation when smart meters are introduced. Figure assumes increased power generation and is a proxy for other benefits accruing to State Governments and city residents from smart metering implementations.*

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Smart City Solutions are delivering financial and economic value across several dimensions

5 MBPS High Speed Wireless Internet Connectivity

175 Hectare Area Covered in Public Wi-Fi in Business Park

Seamless Wi-Fi Connectivity Across E& G Blocks

50,000 man days saved per year

Public Wi-Fi as Value Added service for Business and Exhibition Use

3000 Smart Parking Slots

Parking Time Reduced from 20 minutes to 5 minutes

19000 Liters of Fuel saved annually

24 tonnes of Carbon Reduced Annually

7800 Man days saved per year

Reduction in Unauthorized Parking

841 Streetlights touched

800 tonnes of Carbon Reduced Annually

Energy Consumption reduced by 40%

200KW of clean energy generated

Reduced Maintenance Cost

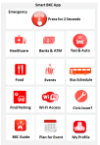
Reduced investment for Wi-Fi and CCTV

Complete E & G Block covered with 90 cameras

Greater coordination among Security Agencies

Reduced Street furniture Theft

Improved Emergency Response



33000 man-days saving due to ease of access of information

33000 man-days saving due to ease of access of information

Improves Citizen Communication

Improved Emergency Alert and Response

6.5 Lacs Employees touched

Improved Location Attractiveness

Improved Quality of Life

Increased Business Confidence And Safer Business Park

Increase in Real Estate Value

Branding Benefits for Business Park and Metropolitan Authority

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A workable approach to implementing an intelligent city in Nigeria will comprise four key steps

Planning & Design — *Implementation*

Concept & Business Case Development	Revision of Existing Master Plan & Implementation of Pilot Initiatives	Rollout Execution	Value Realization & Benefit Tracking
• Concept Design & Planning • Business Case Preparation & Analysis • Stakeholder identification & Engagement	• Vision & City Strategy Articulation • Embed smart city plans into existing master plan • Establish implementation consortiums/partnerships	• Selection of pilot initiatives & projects • Implementation of Pilot projects • Performance Reviews	• Full rollout of set of agreed initiatives and projects	• Value realization and benefit tracking

Program Management & Stakeholder Coordination

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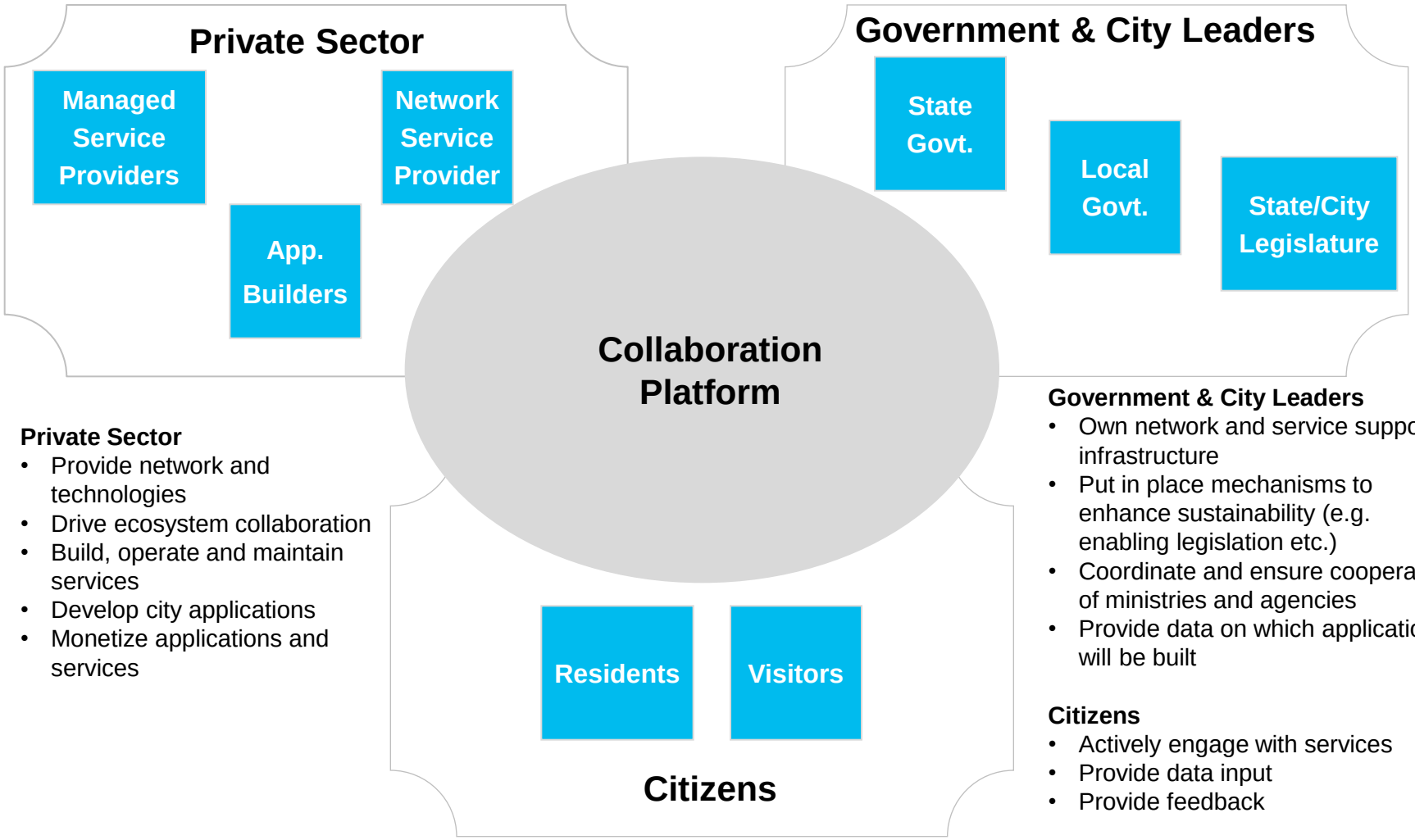
To deploy in Nigerian cities, the following stakeholders will be required to play distinct roles



Private Sector
- Provide network and technologies
- Drive ecosystem collaboration
- Build, operate and maintain services
- Develop city applications
- Monetize applications and services

Government & City Leaders
- Own network and service support infrastructure
- Put in place mechanisms to enhance sustainability (e.g. enabling legislation etc.)
- Coordinate and ensure cooperation of ministries and agencies
- Provide data on which applications will be built

Citizens
- Actively engage with services
- Provide data input
- Provide feedback

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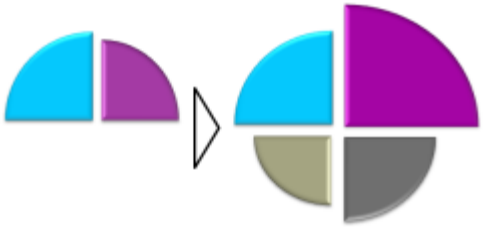
Our vision of the route to an intelligent city has four critical success factors

Vision & Metrics

Effective description of what the end-state model looks and feels like how it will be quantifiably different

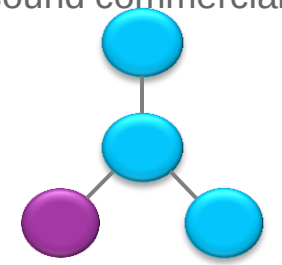
Funding

Effective use of public funding to unleash private and philanthropic capital



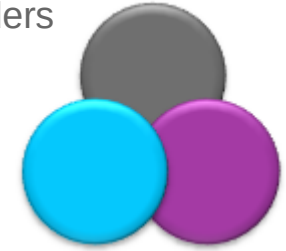
Masterplanning

Adequate master-planning - a multi-disciplinary activity that reflects the importance of innovative technology and a sound commercial model



Stakeholder Involvement in Execution

Proper understanding of each stakeholder, articulating the value and benefits to each group accordingly, and ensuring effective participation by all stakeholders



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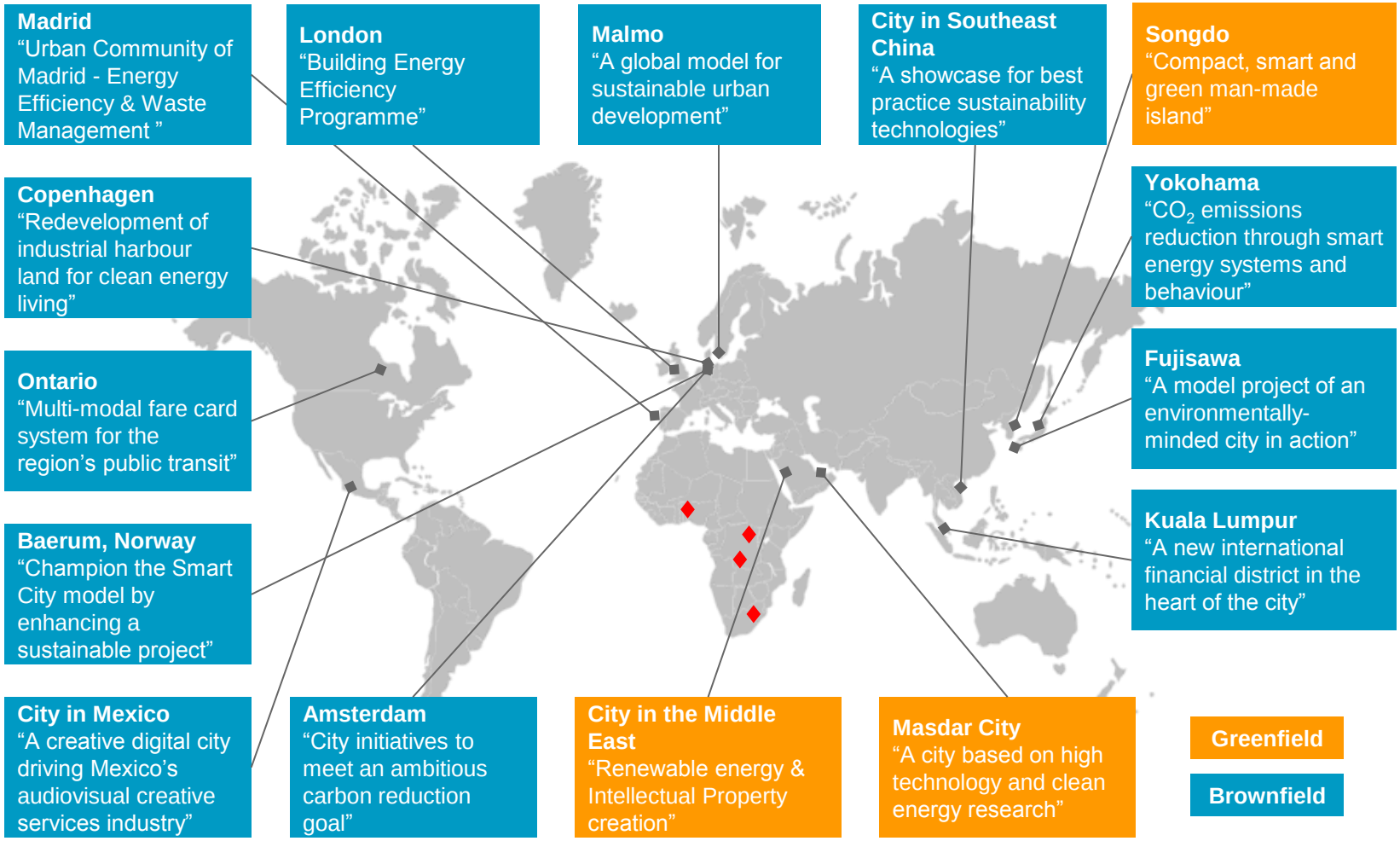
Intelligent city solutions have been widely deployed across the world, and are gradually becoming key to new urban development initiatives in Africa



♦ Urban Development Projects in Africa with Smart City Aspirations include Tatu City and Konza Techno City near Nairobi, Kigamboni City near Dar es Salaam in Tanzania, Some "satellite cities" outside Luanda, Cite le Fleuve in Kinshasha, Hope City outside Accra, Ghana and Eko Atlantic City in Lagos, NIgeria

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