- Title of Abstract: Relevance of Smart Economy in Smart Cities in Africa
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Abstract:

This chapter articulates the relevance of smart Economy in Smart Cities in the African context marked by rapid urbanization. A smart city is conceptualized as a sustainable, inclusive, resilient and prosperous city that promotes a people-centric approach based on three core components—Smart City Foundation, Information and Communications Technology (ICT) and Smart Institutions and Laws. These three core components are the pillars of the seven dimensions of a smart city: Infrastructure Development, Environmental Sustainability, Social Development, Social Mauston, Disasters Prevention and Resilience and Peace and Security. Infrastructure Development includes transport, industrial energy, education and health infrastructures, etc. Environment Sustainability is comprised of elements of energy, transport, building and pollution. Social Inclusion includes aspects of participation in decision making as well as according all city residents equal opportunities for growth and prosperity. Social Development encompasses elements of education, health, public space and social capital. Disaster Prevention and Resilience incorporates elements of mitigation and adaptation to various disasters such as flooding, droughts, storms and earthquakes. Peace and security covers all forms of violence and conflicts, including domestic violence, violence in public places, crime, armed conflicts, terrorism, etc .An insecure city limits opportunities for investment and economic growth and cannot be a smart city.

Keywords: Africa • ICT • Smart city • Economy • City foundation • Institutions Laws • Infrastructure • Environment • Social development • Social inclusion Disasters • Resilience • Peace • Security
2 1.1 Introduction

Africa is evolving towards a highly urbanized continent with the highest urban growth rates in the world (3.3% per year between 2000 and 2015). When the New Urban Agenda was adopted in Quito (Ecuador) in 2016,1 along with the adoption of Sus-tainable Development Goals (SDGs) the previous year, four out of ten of African population lived in cities and towns (41.2%), and by 2035, Africa will be predomi-nantly urban. With an area of about 30.2 million square kilometres and a population of 1.29 billion in 2018, Africa is the world's second largest continent as well as the world's second most populous continent after Asia. In 2018 more than half a billion of African people live in urban areas (548 million). Rapid urbanization in Africa has also been marked by a significant increase of number in cities and urban agglomerations. African urbanization is attended by both opportunities and challenges in equal measures. When a city reaches a population size of one million, it offers economies of scale and agglomeration, but it also becomes more complex for its planning, design and management compared to secondary and small cities. African cities are generally characterized by insufficient infrastructures, poor urban planning, and weak urban institutions and laws; they do not produce prosperity as observed in other regions. However, African urbanization is occurring at a time when ICTs are making production and distribution of goods and services more efficient and as well easing the connection between settlements. The Smart City framework presented here provides a unique opportunity for African cities that are struggling with unplanned settlements to integrate ICTs and to shift their urban trajectory onto more efficient paths. It is recognized that when ICTs are well integrated in city foundations, institutions and laws they make a city smart. However, applying Smart City concepts to African cities has been long hampered by weak institutions and laws, and widespread and irregular land tenure that hold back various factors of the

smart city framework. Many settlements in African cities lack key components of smart basic infrastructure namely, sewerage system, rainwater drainage facilities, while basic waste management sites and networks of water and energy are missing. Beside the specific context of African cities, the relevance of Smart Economy in Smart African Cities he is on the fact that many city concepts developed along urbanization have been barely implemented in African cities. Though, the smartness concept has come along various concepts characterizing cities such as ecological cities, healthy cities, livable cities, etc., it is important to recognize that none of these concepts have been popularized in the African context except a few. Additionally, there is the need to develop a smart city concept that integrates the notion of ecological security that points to safeguarding the environment, by developing healthy cities that focus on improving health and promoting liveable cities through planning, design and management of cities.

AFRICAN HISTORY:

As people have histories, cities do too. The historical urban setting that has shaped various social, economic and political transformations in Africa had been overlooked in various studies of African human settlements in the pre-colonial area. However, several archaeological and anthropologic studies demonstrate that cities emerged in Africa long before the European colonialism. As noted by Coquery-Vidrovitch et al. (1993 and 2009), "Cities have existed in sub-Saharan Africa since antiquity. But only now are historians and archaeologists rediscovering their rich heritage: the ancient ruins of Great Zimbabwe and Congo, the harbor cities at the Indian Ocean.

SMART CITIES: In Africa, here is a highlight of the top 5 smart city initiatives on the continent: Konza Techno City, Kenya. The project which has come to be known as Africa's Silicon Savannah, is a Kenyan urban initiative 60 kilometers South East of the capital, Nairobi on 5000 acres of land.

The project which has come to be known as Africa's Silicon Savannah, is a Kenyan urban initiative 60 kilometres South East of the capital, Nairobi on 5000 acres of land. Experts estimate that the city will cost $15.5bn to put up and will generate about $1bn for the country annually. Envisioned as a global technology hub under the country's Vision 2030, the city will include cutting edge technologies in Education, Life sciences, Telecoms, Business Processing Outsourcing and Information Technology Enabled Services. Its smart city framework includes interconnectedness and embedded sensors in the urban environment.

Eko Atlantic, Nigeria
The new coastal city under construction on Victoria Island, bordering Lagos is a modern marvel. The city is built on about 2400 acres of land reclaimed from the Atlantic Ocean and protected by a 8.5 kilometer long sea wall. The city will include independent reliable electricity, advanced fiber optic telecoms, and state of the art urban design. In 2009, the Clinton Global Initiative recognized Eko Atlantic as one of the most inspired and ambitious civil engineering projects in Africa. Upon completion, the economic impacts of the $6bn urban behemoth might just save Africa's largest and fastest growing mega city with an estimated potential to create 250,000 new jobs.

Hope City, Ghana
Located in Greater Accra region, Ghana's own Silicon Valley, was designed to host Africa's tallest building and hold its own in the tech hub arena. The development, a product of leading Italian architects, was designed to host a cluster of buildings on an ICT Park was intended to create more than 50,000 jobs for the ICT sector in Ghana. However, implementation of the master plan has been stagnated since 2013 due to economic downturns. It remains to be seen whether the $10bn project will materialize to change Africa's skyline for good.

Vision City, Rwanda
Overlooking the city from the hilly backdrop of Kigali, Vision City personifies the ethos of the smart city movement in Africa. The largest housing project in the country's history is at the centre of Rwanda's urban transformation campaign. According to the plans, the city will focus on innovation to drive Africa's digital

transformation agenda. Launched in 2013, the cost of putting up the city is estimated at $1.9bn and will provide housing for 22,000 people over eight years.

Waterfall City, South Africa

The largest mixed-use development in South Africa, Watefall City is Gauteng's new work, live and play address. The new development is strategically placed adjacent o Africa's largest mall, Mall of Africa. The development spanning 2200 hectares of land, is expected to be completed in 2025. With a contemporary design embodying the essence of an integrated lifestyle package, the development offers the opportunity to experience work-life balance at its best. The $1.2bn development is projected to create 86,000 jobs.ECONOMY: the careful use of money, resources, and means of production. The system of how money is made and used within a particular country or region. A region's economy is connected with things like how many goods and services are produced and how much money people can spend on these things.

The city of Lagos is among the four the African cities covered in this book, a smart city is viewed as a sustainable, inclusive and prosperous city that promotes a people-centric approach based on three core components - *Smart City Foundation, Information and Communications Technology (ICT) and Smart Institutions and Laws.* These three core components are the pillars of the seven dimensions of a smart city: Infrastructure Development, Environmental Sustainability, Social Development, Social Inclusion, Disasters Exposure, Resilience, and Peace and Security. The collective of these components and dimensions determine a Smart City Economy.

The Lagos's case study is based on two chapters:

Smart City Foundation for Smart Economy: EMERGING CHALLENGES AND OPPORTUNITIES PROVIDED BY SMART CITY LAGOS.

Despite the potentials of Lagos to be a sustainable, inclusive and prosperous city, Lagos smartness has been hampered by its weak city foundation. The city is not well planned with sufficient land allocated to streets and public spaces, and it lacks smart basic infrastructure and smart institutions and laws. Many settlements in the city lack a sewerage system and rainwater drainage facilities, and adequate waste management sites are missing, which are key components of smart basic infrastructure along with connection to water and energy. Flooding during rainy seasons as well as uncollected garbage is a frequent phenomenon in most parts of the city particularly in the poor settlements. Frequent energy shortages also affect the city's economy. These challenges are associated with poor land administration and governance, characterized by lack of transparency and corruption. Faced with continued slum proliferation associated with weak city foundation, the Government of Lagos State is developing various urban development programmes and projects that if adequately implemented will contribute to the smartness of Lagos as a city of the 21st century, a city that will be sustainable, inclusive and prosperous.

Smart Infrastructure Developments for Smart Economy: Opportunities provided by smart city Lagos:

This Technical Report was written with the aim of establishing a concrete definition for smart sustainable cities which can be used worldwide. Although there is abundant literature available on smart cities, there is no standardized, commonly accepted set of terminologies which would help to aptly describe a "Smart Sustainable City" (SSC). Such a standardized definition will help create a more defined structure in relation to information and communication technology (ICT) infrastructure, key performance indicators (KPIs), metrics and policies for smart sustainable cities as viewed by ITU. The following common criteria was used as a guideline, based on key attributes: (1) sustainability, (2) quality of life, (3) urban aspects, and (4) intelligence or smartness. Core themes for SSC include: (1) society, (2) economy, (3) environment, and (4) governance.

Key categories and indicators were established and a list of 30 key terms which should be included in a standardized definition were also identified. The following eight (8) categories were identified to be key for SSC: (1) quality of life and lifestyle, (2) infrastructure and services, (3) ICT, communications, intelligence and information, (4) people, citizen and society, (5) environment and sustainability, (6) governance, management and administration, (7) economy and Finance, and (8) mobility. Six (6) primary indicators were identified to

be smart living, smart people, smart environment and sustainability, smart governance, smart mobility and smart economy. The following 30 key words were identified to be representative of an SSC.

• ICT   Standard of living   Water

Adaptable · Reliable · Scalable · Accessible Security Safe Resilient Economic	Employment Utilities and energy Citizens Telecommunications Well-being Manufacturing Medical Welfare Natural and man-made disasters Physical safety Regulatory and compliance Education Governance Environmental Policies and processes Physical and service infrastructure Standardization Transportation and mobility

Sources of information

This section presents a study of definitions and associated attributes in terms of indicators, indices and rankings of smart sustainable cities. For the purpose of this Technical Report, various articles were collected from the Internet as well as from other databases. These articles were reviewed and analysed to help consolidate a wide range of perspectives which ensures that the definition of smart sustainable cities proposed by the Focus Group includes all major aspects. These definitions were obtained from a variety of sources including:

Academia and research communities.

Government initiatives including EU.

International organizations (United Nations, ITU, etc.).

Corporate/company profiles.

User centric definitions (from leading market research firms).

Trade associations.

Standards development organizations.

A complete list of over all the definitions found in the open literature is stated in Annex 1.

4.2 Methodology

Given the large amount of data, the various indicators, metrics and the 100+ definitions for a smart city, there was a need to perform some in-depth analysis to determine what would be a comprehensive and inclusive definition of a smart sustainable city from the perspective of the work being undertaken by the Focus Group on Smart Sustainable Cities (FG-SSC). All the definitions in Annex 1 were analysed to identify what makes a smart sustainable city. The results from this analysis which identified the top keywords and characteristics of a smart sustainable city are discussed in more detail in section 5.

For each definition, a set of key words was extracted and tabulated. These keywords were then grouped under some common themes. Some words such as "smart" and "city" are implicit and were mentioned in almost every description, so they are not captured explicitly as a separate keyword.

4.3 Approach

A systematic approach was followed throughout the study including:

Top down approach - Indicators, indices, and rankings.

Bottom up approach - Definitions, attributes, and descriptors.

As part of the research, multiple words and combinations thereof were used during the search from primary sources. Primary search words included (but not limited to): smart, sustainable, environment, city (ies), definition, attributes, index, indicator, characteristics, ICT, intelligent, urban, methodology, solution, example, success, and ranking;

Based on the definitions, a series of keywords was identified and documented as illustrated in the sample below:

Source	Definitions	Keywords
Giffinger, Rudolf, *et al..* "Smart Cities Ranking of European Medium-sized Cities." Centre of Regional Science, Vienna UT, Oct. 2007. Page 10. Web. Last Accessed 8 Feb. 2014. http://www.smart-cities.eu/download/smart cities final report.pdf	"A city well performing in a forwardlooking way in [economy, people, governance, mobility, environment, and living] built on the smart combination of endowments and activities of self-decisive, independent and aware citizens."	Economy, people, governance, mobility, environment, quality of living, forward looking, aware citizens, self-decisive citizens, independent citizens.
Cohen, Boyd. "The Top 10 Smart Cities On The Planet." Fast Company, 11 Jan. 2011. Web. Last accessed 12 Feb. 2014. http://www.fastcoexist.com/1679127/the-top-10-smart-cities-on-the-planet .	Smart sustainable cities use information and communication technologies (ICT) to be more intelligent and efficient in the use of resources, resulting in cost and energy savings, improved service delivery and quality of life, and reduced environmental footprint - all supporting innovation and the low-carbon economy.	ICT, cost efficiency, energy efficiency, energy savings, quality of life, environment, improved service delivery, innovation, low carbon economy.
Hitachi. "Smart Sustainable City Overview." *Smart Cities: Hitachi.* Hitachi, Web. Last accessed 9 Feb. 2014. http://www.hitachi.com/products/smartcity/vision/concept/overview.html.	Hitachi's vision for the smart sustainable city seeks to achieve concern for the global environment and lifestyle safety and convenience through the coordination of infrastructure. Smart Sustainable Cities realized through the coordination of infrastructures consist of two infrastructure layers that support consumers' lifestyles together with the urban management infrastructure that links these together using information technology (IT).	Coordinated infrastructure, lifestyle safety, lifestyle convenience, urban infrastructure, IT.
Meijer, Albert, and Manuel Pedro Rodriguez Bolivar. "Governing the Smart Sustainable City: Scaling-Up the Search for Socio-Techno Synergy." T EGPA 2013 (Edinburgh, September) Permanent Study Group on E-Government, 2013, Web. Last accessed 8 Feb. 2014. https ://www.scss.tcd .ie/disciplines/information svstems/egpa/docs/2013/BolivarMeiier.pdf	"We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance."	ICT, high quality of life, natural resource management, participatory governance, transport infrastructure, communication infrastructure, economic growth, sustainability.

5   Results

5.1 Keyword analysis from definitions

All the definitions (listed on Annex 1) were analysed to identify the top keywords and characteristics that make a smart sustainable city. Some words such as "smart" and "city" are implicit and mentioned in almost every description, and hence these words have not been captured explicitly as a separate keyword.

A total of 50 keywords were identified which appeared to have multiple references across all the studied definitions. There were a total number of 726 instances of these 50 keywords. These are captured and presented below in a table to reflect the relative contribution/number of times that these keywords were repeated across all the 100+ definitions. Based on the literature review, a graphical representation of the relative importance of the different keywords was developed. The larger the font is, the more important the word is.

Conclusions

This Technical Report provides an insight into what is meant by a "smart sustainable city (SSC)" and the underlying factors that make a city smart.

This Technical Report analysed approximately 120 existing definitions of smart sustainable cities from various sources to determine a common theme identifying a smart sustainable city.

In addition, this Technical Report considered the key indicators and categories which should be taken into account for a smart sustainable city.

■ Similarly, this Technical Report can form the basis of developing a standard definition of a global smart sustainable city and subsequently can be used to develop a framework to measure the performance of a smart sustainable city.

Finally, a proposed comprehensive definition of a smart sustainable city has been presented.

Annex 1 - Definitions of a smart sustainable city

*Details of references are provided in Annex 2.

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
1	Academic	A smart sustainable city is a city well performing in six (6) characteristics, built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens. 1) Economy, 2) Mobility, 3) Environment, 4) People, 5) Living, 6) Governance.	Economic growth, transport, mobility, environment, standard of living, governance.	Giffinger *et al.* (2007)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
2	Academic	"We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance."	ICT, high quality of life, natural resource management, participatory governance, transport infrastructure, communication infrastructure, economic growth, sustainability.	Meijer *et al.* (2013)
3	Academic	The rudiments of what constitutes a smart sustainable city which we define as a city in which ICT is merged with traditional infrastructures, coordinated and integrated using new digital technologies.	Traditional infrastructure, ICT, integrated infrastructure, coordinated infrastructure, digital technology.	Batty *et al.* (2012)
4	Academic	Instead of striving for physical growth, a city's success today should be measured by how wisely it uses energy, water, and other resources, how well it maintains a high quality of life for its people, and how smart it is in building prosperity on a sustainable foundation. In short, cities have to become much smarter about how they use the existing capacities and resources.	Wise use of resources, quality of life, sustainability.	Dixon (2012)
Massachusetts Institute of Technology (2014)				
5	Non-profit	A city "combining ICT and Web 2.0 technology with other organizational, design and planning efforts to de-materialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and liveability."	ICT, web 2.0, bureaucratic efficiency, city management, innovative solutions, sustainability, liveability, standard of living.	Toppeta (2010)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
6	Conference	What makes a city smart? A nonvendor driven definition of a 'Smart Sustainable City' The closer a city behaves to the ethos of the Internet, the smarter it is. That means the city is a platform - an enabler for the people. So, empowering people is at the centre of the perfect storm. So, what does a Smart Sustainable City look like? A city can be defined as smart when investments in human and social capital and traditional (ex-transport) and modern (ex-ICT) communications infrastructure fuel sustainable economic development and a high quality of life with a wise management of natural resources through participatory governance.	People enabler, human capital, social capital, traditional communication, modern communication, ICT, economic development, quality of life, natural resource management, participatory governance.	Jaokar (2012)

Ref. No.	Category	Definitions/Features	Key concept/ Keywords	Source
7	Others	Seven (7) important elements in most cases of a smart sustainable city (Source: Xi She): 1) sensible -sensor sensing the environment ,2) connectable - networking devices bringing the sensing information to the web, 3) accessible - the broader information of our environment is published on the web, and is accessible to the user on the web, (web), 4) ubiquitous - the user can access information through the web, but more importantly through the use of the mobile (mobile), 5) social - the user acquires the information, and publishes it through his social network (social network), 6) Sharing - sharing is not limited to data but also to the physical object, when some objects are in free status, people can get the notification and use it. (web, mobile), 7) visibility/augmented - to retrofit the physical environment, make the hidden information seen not only through the mobile device by individuals but also with the naked eyes in a more border range like street signs.	Sensor monitoring, Internet connectivity, information availability, mobile, visible.	World Smart Capital (2012)
8	Industry	A smart city is a city that employs ICT infrastructures by sensing, transmitting and utilizing information in order to fulfil information sharing and service collaboration, further improve citizens' livelihood standards and their quality of life, increase urban operation efficiency and public service level, enhance the quality of economic development and industry competitive ability, and realize the scientific and sustainable development of the city.	Sensing, transmitting, ICT infrastructure, information, collaboration, quality of life, urban efficiency, economy, competitive, scientific, sustainable.	China Communication Standards Association (2014)

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