Chapter 34
Transforming the City of Cape Town from an Apartheid City to an Inclusive Smart City

The Long March to a Sustainable, Inclusive and Prosperous City

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Abstract A smart city is viewed as a sustainable, inclusive and prosperous city that promotes a people-centric approach based on three core components and seven dimensions. The three core components are Smart City Foundation, Smart ICT and Smart Institutions and Laws, which in turn 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 three components together with the seven dimensions make a smart economy. Infrastructure development has several elements across various social, economic and environmental dimensions. Cape Town's historical apartheid growth has been characteristic of social, income and city foundation inequalities which have created uniquely distinct human settlements—rich suburbs with adequate services and opportunities, and poor and informal neighbourhoods with acute shortages in core urban services. Since the end of apartheid, Cape Town has however made deliberate and directed efforts to promote social inclusion through policy incentives, physical public and social space development, and promoting equitable access to basic services. The city has also invested heavily in smart

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growth alternatives which began with the formulation of a smart city strategy in 2000, and which has over the years entrenched smart growth aspects into most sectors of growth, and greatly enhanced efficiency and productivity of the urban system. Today, Cape Town is reaping on its massive investment in information and communication technologies, which have made it Africa's premier international city supplying goods to many cities in the west and offering global business process outsourcing services. The city's deliberate progression towards smart growth has opened huge economic activities for its residents, which will continue to reinforce its position as the Western Cape region's economic powerhouse. This chapter discusses Cape Town's growth as an apartheid city, its city foundation during and post-apartheid and the various targeted smart growth approaches adopted in the city over the last two decades as well as their outcome in creating an equitable and productive urban system.

Keywords Cape Town · Smart city · Smart economy · Smart city foundation · Urban planning · Streets · Public spaces · Basic infrastructure · Infrastructure development · Transport · Information · Communication · Technology · Government

34.1 Introduction

The city of Cape Town is the oldest city in South Africa with recorded continuous settlement dating as far back as 1652. With a population of 3.7 million people in an area of 2461 km^2 [1], Cape Town is South Africa's second most populous city after Johannesburg (4.4 Million) and the tenth most populous city in Africa [2]. Cape Town is the provincial capital of the Western Cape region and the legislative capital (seat of the nation's parliament) of South Africa along with Pretoria, the administrative capital, and Bloemfontein, the judicial capital. Cape Town is home to about 64 per cent of the Western Cape region's 5.8 million population and represents about 80 % of its GDP [1–3].

The city of Cape Town metropolitan economy contributes more than three-quarters of the Western Cape province GDP and therefore dictates the economic growth in the region. The metropolitan region has specifically developed a strong financial and business services sector and has a large retail, wholesale, catering and accommodation sector linked to a vibrant tourism industry, and a rich cultural history—all of which heavily rely on the growth of ICT infrastructure. With an increase in a diversity of "global" opportunities present for Cape Town residents, the level of human development in the city, measured through the Human Development Index (HDI), is highest in the city of Cape Town metropolitan municipality (*measured at 0.74 in 2010*) as compared to the other districts of the Western Cape region [4]. This reflects to the fact that the city residents are able to live long and to have healthy lives, to communicate, to participate in the life of the community, and to have sufficient resources to obtain a decent living. This in turn

increases the city residents' spending power and improves opportunities for economic growth.

However, having been the centre of the apartheid regime in South Africa that lasted from 1948 to 1990, the city of Cape Town has been among the most unequal cities in the world. Although the city's Gini coefficient consistently improved between 2001 and 2010, it increased to 0.67 in 2011/2012 [2], a level higher than all other African cities and only comparable to South African cities such as Durban, Johannesburg and Pretoria.

Since the end of apartheid, different models have however been adopted to make the city more inclusive post-apartheid, the key ones being on participatory planning and design; development of inclusive public spaces; improvement in basic infrastructure provision and public transport particularly to the poor neighbourhoods; and development of policies that encourage inclusive human settlement and trade. As a result, the city was named the World Design Capital for 2014 by the International Council of Societies of Industrial Design [5]; and also named the best place in the world to visit by both The New York Times and The Telegraph [6, 7]. Although Cape Town has made commendable progress since the end of apartheid in 1990, efforts are still needed to create an inclusive smart city, a city which is sustainable, inclusive and prosperous.

The study on Cape Town brings a unique city setting: (1) one where segregationist development (apartheid) has been legally rooted in the city foundation and manifested through urban planning and design, institutions and laws and access to basic services; and (2) followed by an inclusive post-apartheid development through urban planning, housing, social development and economic development. This chapter discusses Cape Town's growth as an apartheid city, its city foundation during and post-apartheid and the various targeted smart growth approaches adopted in the city over the last two decades as well as their outcome in creating an equitable and productive urban system. The analysis will be based on the concept of smart economy in smart city developed for the four African cities covered in this book which are Cape Town, Nairobi, Dakar and Senegal.

34.2 The Concept of Smart City Economy in Smart City in the African Context

As noted in Chap. 1, The Smart City concept is built on a combination of ideas associating ICTs with improvements in the functioning of cities in terms of competitiveness, efficiency and innovation in the fight against poverty, social deprivation and poor environmental management. In this regard, the notion of smart cities and its implementation can be associated with sustainable urban development, including economic development. Furthermore, Chap. 1 defined a smart city as being more instrumented, inter-connected and intelligent. It is "a knowledge-based city that develops extraordinary capabilities to be self-aware; functions 24 h and

7 days a week; communicates, selectively, knowledge in real time to citizen end-users for a satisfactory way of life with easy public delivery of services, comfortable mobility, conservation of energy, environment and other natural resources; and creates energetic face-to-face communities and a vibrant urban economy even at a time of national economic downturns".

Referring to Batty et al. [8], Kumar and Dahila [9] presented six interrelated, essential elements that contribute to the "smart city system": (i) smart economy (competitiveness), (ii) smart people (social and human capital), (iii) smart living (quality of life), (iv) smart mobility (transport and ICT), (v) smart environment (natural resources) and (vi) smart governance (participation). Considering that a smart economy is characterized by use of ICT in all economic activities, Kumar and Dahila [9] identified seven characteristics of smart economy, which are as follows:

1. Innovative spirit that finds newer approach to economic activities.
2. Entrepreneurship generated out of individual effort independent of family wealth and inheritance.
3. The ability of the city to create economic imaging, branding and trademark.
4. High productivity of labour and capital.
5. Flexibility of labour market which includes acceptance of labour from outside and devoid of conflicts, and avoiding loss to urban economy by periodic labour unrest.
6. Smart city economy acts as force that creates international embeddedness.
7. Smart economy shows high ability to transform the smart city.

Furthermore, Kumar and Dahiya [9] associated smart economy with other elements of a smart city such as a smart city structure, smart ICT, smart spatial planning and urban design, and smart institutional processes.

A comparative analysis of the concept of smart city presented in Kumar and Dahiya [9] shows that most of the elements of a smart city diversely developed in several studies are also part of the conceptual framework of a sustainable, inclusive and prosperous city developed by Mboup in 2015 [10]. Mboup [10] considers that a smart city is a sustainable, inclusive and prosperous city that promotes a people-centric approach based on two core components: smart city foundation and smart institutions and laws. These two components are the pillars of the other seven dimensions of a smart city: infrastructure development, environmental sustainability, social development, social inclusion, disasters exposure, resilience, peace and security, which in turn make city economy smart. Points of difference are the aspects of social and human capital developed in Kumar and Dahiya [9] concept paper which is lacking in the conceptual framework of a sustainable inclusive and prosperous city of [10]. In addition for Mboup [10], there are two core components for a smart city: a smart city foundation and smart institutions and laws. These two elements are presented in the Kumar and Dahiya [9] as spatial planning and urban design futures, and governance, respectively, but are presented at the same level of the other components of smart city. Mboup [10] also introduces other important elements for a city to be smart: disaster exposure and resilience as well as peace and

security. In the study of smart city economy in Africa, while we will consider the concept of smart city presented by Kumar and Dahiya [9] as the starting point, we will reconceptualize the smart city based on the conceptual framework of a sustainable, inclusive and prosperous city developed by Mboup [10].

For 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 communication 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 constitute a smart city economy (Fig. 34.1).

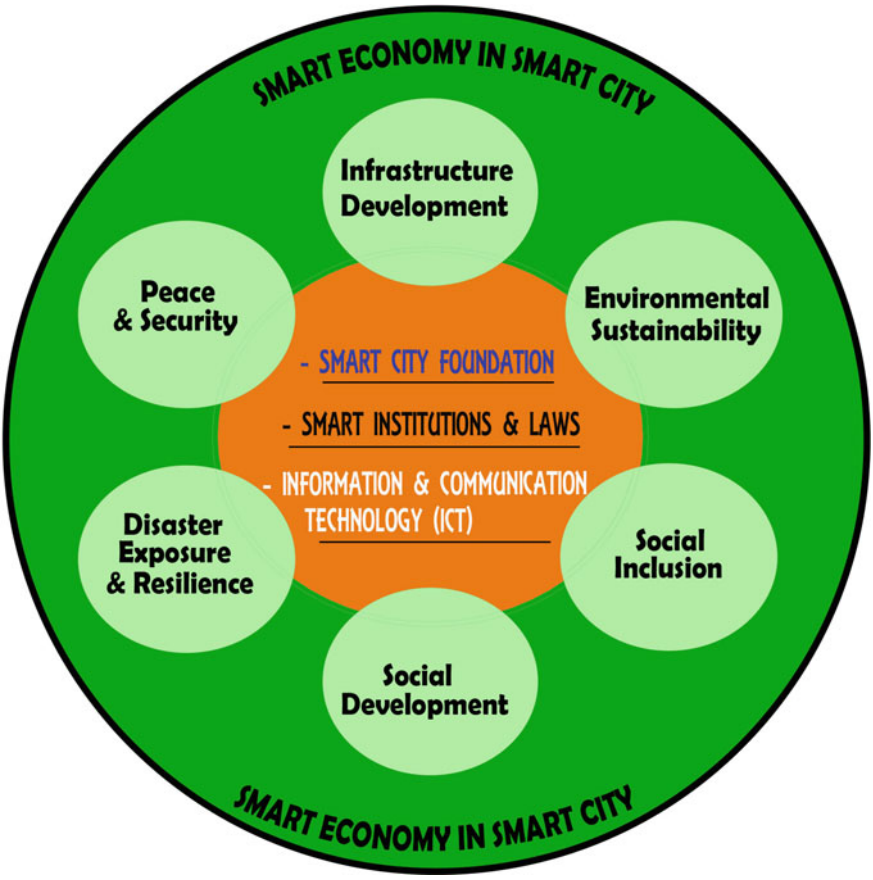


Fig. 34.1 Conceptual framework—smart economy in smart cities in the African context. *Source* [10]

Infrastructure development complements the basic infrastructure services under smart city foundation and extends to actual investment and advancement of services such as transport, ICT, industrial energy, education and health. **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 to all city residents equal opportunities for growth and prosperity. **Social development** encompasses elements of education, health, public space, social inclusion and social capital. **Disaster exposure** incorporates elements of mitigation and adaptation to various disasters such as flooding, droughts, storms and earthquakes. **City resilience** is composed of elements of city foundation, environment, social capital and social development. **Peace and security** deals with all forms of violence and conflicts, including domestic violence, violence in public places, crime, armed conflicts and terrorism. An insecure city limits opportunities for investment and economic growth and cannot be a smart city.

A smart city foundation is composed of three elements: urban planning and design, land policies and basic infrastructure, all of which integrate ICT into their developmental and operational architecture. For a city foundation to be smart, it must be inclusive at the onset of the urban planning and promote mixed neighbourhoods where social clustering is discouraged. Having all the poor living together creates slums and fuels instability and insecurity. Inclusive urban planning eases access to basic services (water, sanitation, housing, education and health) and to decent employment for all. A key element of smart urban planning is a smart street network that reduces travel time and encourages walking and social interactions. Smart urban planning enhances infrastructure development, environmental sustainability, economic and social development; makes cities resilient and prepared to overcome natural disasters; and promotes mixed neighbourhoods where services are walking distances from people's residences. ICT plays a crucial role in promoting a smart city foundation, by enabling inclusiveness in planning, policy and infrastructure provision processes such as through public participation, as well as creating enormous non-physically-limiting opportunities to all city residents. Basic infrastructure constitutes access to urban basic services such as water, sanitation, housing and energy (Fig. 34.2).

34.3 Cape Town's Historical Apartheid City Foundation

The City foundation of Cape Town has historically been guided by a segregationist ideology manifested through institutions and laws, urban planning and design, and access to basic services and amenities. The history of segregation across race in the city dates as far back as the mid-seventeenth century when Jan van Riebeeck, leader of the first Europeans to settle in South Africa, proposed the typically Dutch

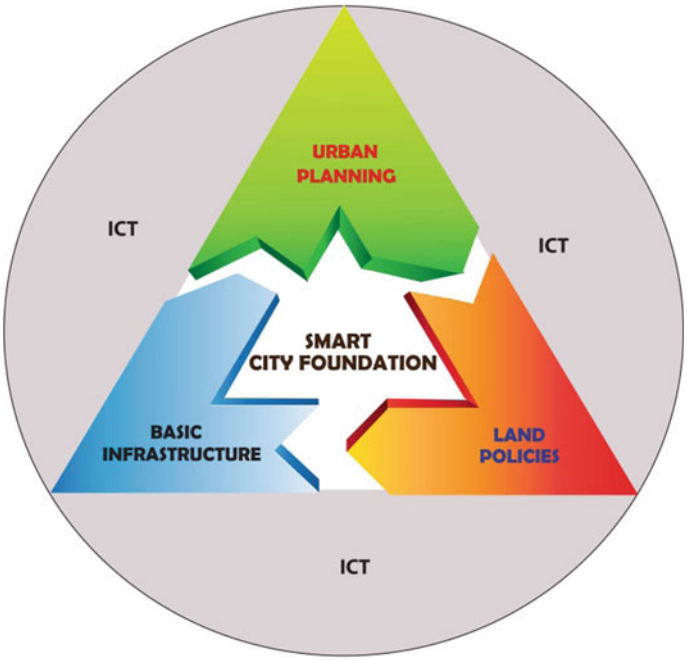


Fig. 34.2 Smart city foundation. *Source* [11]

solution of digging a canal across the Cape Peninsular to separate the white paradise as a self-contained island, cut-off from the rest of "darkest Africa". Unable to realize this ambitious project, he instead opted to plant a bitter almond hedge to keep the blacks out of his settlement [12, 13]. Systematic segregation would continue into the late-nineteenth and early-twentieth centuries, effected through manipulation of urban planning and design principles, and sustained through a diversity of institutional set-ups and various laws and policies [12].

Legislation aimed at preventing land acquisition by "natives" and limiting their movement within the city of Cape Town existed as much as 25 years before the official commencement of the apartheid era in 1948 [12]. The 1922 Stallard Commission, tasked with bringing black workers and consumers into cities while still keeping them separate from whites, and the subsequent Urban Areas Act of 1923 which ordered the removal of Africans from desirable city centres to less desirable "locations" are perhaps the oldest reflections of separationist development in Cape Town [12, 14].

34.3.1 Progressive Institutionalization of a Racial, Social Exclusion: An Apartheid City Foundation

Progressive institutionalization of a racial, social exclusion gave birth to the grand apartheid (separate development) in 1948, a system that was as much an economic and spatial dispensation as it was a political and legal one [15]. This new system enshrined in law the systematic categorization and segregation of the population based on race, with the white group accorded the highest privileges and powers [16]. Laws, policies and planning guidelines were put in place to create clearly demarcated and minimal-interaction white and non-white areas throughout the city. The first key legislation, effected as the Population Registration Act of 1950, officially divided South Africa into four racial groupings—"White", "Coloured", "Asian" or "Native" (African) and requiring all residents to register their race to ease official segregation. In this categorization, the natives had the least rights to the city, and from 1951 a permit system was established to control property transfers and changes of occupancy from members of one race to another. This had serious effects on the businesses of many African and coloured shop owners and artisans, who were suddenly prevented from operating in "white" areas [16–18].

34.3.2 Use of Urban Planning and Design to Mainstream an Apartheid City Foundation

The Group Areas Act of 1950 brought forth strict zoning principles based on a misrepresentation of both Ebenezer Howard's garden city movement and Le Corbusier's Ville Radieuse planning approaches [12]. The adopted zoning models twisted the core principles of functional segregation put forward by the two visionaries to achieve racial segregation, in which the whites would be situated in the most advantageous spaces and the non-whites settled in the least desirable areas [12, 16, 17, 19] (Fig. 34.3)

To achieve the "desired" racial zones, massive forced evictions and relocations were carried out in which Africans were relocated to peripheral "orderly" townships designed along the lines of military barracks, in which grim "matchbox houses" were laid out in strict grids of wide streets and surrounded by a fence, with only two or three points of entry. This, it was believed would mould the black labour force into an orderly class, would be easily contained if need be by sealing off the neighbourhoods with minimal effort [20, 21]. Cape Town's District Six, an informal settlement located near the city's harbour and downtown is the most infamous case of such forced removal. When the district was declared a "whites only area" in 1966, all its 60,000 multi-racial population was forcefully removed and relocated to racially homogenous Cape flatlands 25 km from downtown [16].

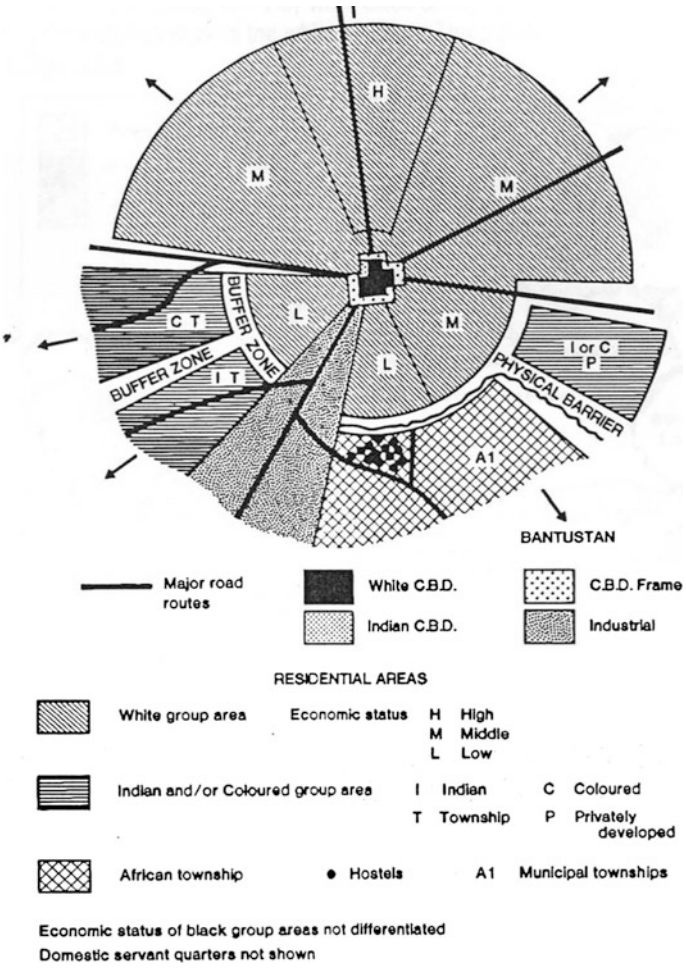


Fig. 34.3 Apartheid segregationist urban planning using strict zoning principles. *Source* [19]

The resultant "zones" from this policy directive and its planning translations gave rise to residential neighbourhoods that prevailed throughout the apartheid period, and that have shaped Cape Town's urban form to date.

34.3.3 An Apartheid Access to Basic Infrastructure and Services

The separate Amenities Act of 1953 included a clause stating that separate facilities no longer had to be "substantially equal", allowing the government to provide better

facilities to whites. Every amenity imaginable was subject to racial categorization, from taxis and ambulances to parks, walkways and parking spaces. Beaches were strictly segregated with those offering more facilities dedicated to the whites, and the blacks only allowed into the unattractive coastal areas. Cape Town's central train terminal is perhaps the most explicit concretization of apartheid ideology by the central government through this act. The terminal was built in 1966 as two trains—one for white and one for non-white commuters; and reverse engineered to bring the different races to the city from segregated suburbs without ever crossing paths [16].

34.3.4 Apartheid Social and Economic Development Through Exclusion to Education, to Decent Employment and Other Social Services

Other significant laws that promoted segregation in the mid- to late-1950s were the Native Laws Amendment Act (1957) which prohibited Africans from going to social places such as churches in white areas, and laws on higher education that designated some universities as mostly whites campuses, with very minimal admission of non-whites. Section 10 of the Natives Act required Africans to work continuously in the Cape if they were to retain their right to live there. Between 1954 and 1962, more than 18,000 men and 6000 women were endorsed out of the city for not continuously working there [15]. Subsequent policies adopted in the 1960s promoted "grand apartheid", by establishing "independent tribal homelands" and making it possible to exclude blacks from a right to live in South Africa. A rule was imposed in 1965 by which African workers had to return to their "homeland" at the end of an employment contract, then reapply to work in the Cape Town area. This was supposed to prevent any growth in the numbers of black "permanent residents" in the city.

34.4 The Long March to Freedom and Social Inclusion: Transforming Cape Town to an Inclusive, Smart City

With an apartheid city foundation characterized by apartheid institutions and laws, apartheid urban planning and design, and apartheid access to basic infrastructure and services, the excluded people of Cape Town had to fight for their social freedom. Both peaceful and violent protests were held in the city between 1950 and 1990 when apartheid was officially abolished, each with varied outcomes.

Protests held during the 1950s to push for social inclusion in aspects such as voting were generally unsuccessful both as a result of non-unified campaigns and also as a result of draconian laws aimed at suppressing any opposition to the

government. Large-scale anti-pass demonstrations held in the 1960s were countered with suppressive measures such as declaration of a state of emergency, banning of social movements, imprisonment and exiling of leaders, and empowerment of the police, which made it impossible to legally protest against the system.

With mounting economic hardships, international pressure and increased local protests throughout the 1980s, the government secretly began negotiations with Nelson Mandela, who had been jailed since 1964. Although police still used violence against peaceful protests, the momentum of the protests was unrelenting and would culminate in mass voting against the government by white Capetonians in the 1989 elections, the release of Nelson Mandela in 1990 and the subsequent repealing of segregationist laws. The first multi-racial democratic elections in 1994 won by the African National Congress and the enactment of South Africa's new constitution, which enfranchised blacks and other racial groups, marked the official end of the apartheid system [15].

The dismantling of apartheid in the early 1990s came with calls for inclusive development in South Africa, mostly guided by Nelson Mandela's ideal of a democratic and free society carried in his 1964 speech:

> *"During my lifetime I have dedicated myself to this struggle of the African people. I have fought against white domination, and I have fought against black domination. I have cherished the ideal of a democratic and free society in which all persons live together in harmony and with equal opportunities. It is an ideal which I hope to live for and to achieve. But if needs be, it is an ideal for which I am prepared to die. Let there be justice for all. Let there be peace for all. Let there be work, bread, water and salt for all. Let each know that for each the body, the mind and the soul have been freed to fulfill themselves".* [22, 23]

Major strides have been made especially in the areas of policy and opening up of the physical space to promote social integration in the living and public settings in the city as will be discussed in the subsequent suctions. For example, Cape Town is among the first African cities to initiate smart growth through policy directives, as evidenced by the 2000 Cape Town smart city strategy and its subsequent projects which have greatly shaped its transition towards inclusivity and enhanced productivity.

In the effort to be a liveable city, the city of Cape Town has already developed Integrated Transport Plan that accommodated pedestrian and cycling lanes as well as parks and other public spaces. Furthermore, the city promotes car-free zones to create safe public spaces where people of all races interact.

The Cape Town Densification Strategy is another policy the city has adopted in the recent past to promote sustainable, inclusive and smart growth. The strategy, whose aim is to promote higher densities in areas well served with public transport and other social amenities and facilities, has already put in place densification guidelines for the achievement of a more productive city. Once fully implemented, the policy will make the city more compact and easy to layout infrastructure services; more economically productive owing to the creation of threshold populations for businesses to grow and thrive; create more social and spatial spaces where different races can interact; improve housing and tenure options; promote urban place making and improved security; and promote environmental protection; all of

which are central components of a smart city. Other policies that are promoting the growth of a smart Cape Town include, among others, strategies on public transport, provisions for public participation in all urban planning processes, infrastructure service provision and housing upgrading in the poor neighbourhoods, creation of public and open spaces in all city areas, clean energy policies and creation of economic opportunities in which the informal economy can thrive and improve the lives of a majority of the city residents with little investment.

The various city policies, plans and development projects have collaboratively and continuously worked to make Cape Town sustainable, equitable and economically vibrant, particularly by promoting improved access to economic opportunities, integration and inclusivity, resilience, adaptiveness, interconnectedness, land-use intensification, environmental protection and development control, all of which are core components of smart city economy. As a show of the city's progress with inclusive planning, the city received the 2014 World Design Capital award for its innovative use of design as a tool for social, cultural and economic development. The award particularly applauded the city's innovation in public transport and other projects such as the Green Point Urban Park and the Buitengracht Pedestrian Bridge; community development projects, such as the Violence Prevention through Urban Upgrading initiative as well as urban gardening projects; and the revolutionary ICT systems being used to help run the city more effectively. There is however still a huge need to align the various policies and processes into a collective system, which could greatly benefit from smart governance approaches.

34.5 Development and Use of ICT to Transform Cape Town to a Sustainable, Inclusive and Prosperous City

34.5.1 Milestones in the Creation of a Smart City Through ICT

Cape Town has historically experienced major setbacks in the aspect of social segregation, but the city has over the past two decades made major strides towards promoting inclusive and smart growth. The efforts towards smart and intelligent growth have been noticed and honoured in awards such as the World Design Capital for 2014, the Earth Hour City Challenge (EHCC) title of Global Earth Hour Capital in 2014[1] from the World Wildlife Fund (WWF); the SERI special achievement in GIS award in 2013, the computer honours twenty-first century achievement award in 2003, the Bill and Melinda Gates Access to Learning Award for Smart Cape in 2003, and the ICT achiever's award for e-government in 2002 [5, 24].

[1]Over 160 cities from 14 countries were among the competitors.

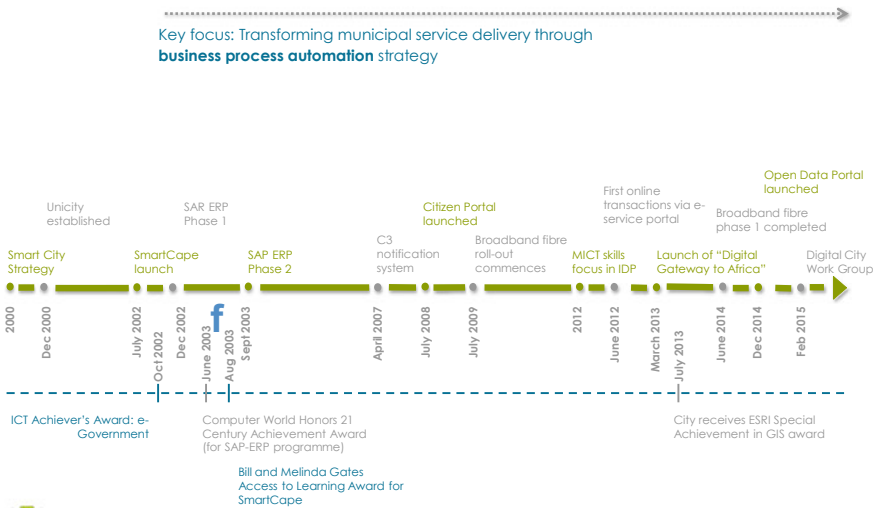


Fig. 34.4 City of Cape Town's steps towards becoming a smart city. *Source* [24]

The transition towards smart growth for Cape Town has however not been haphazard and uncoordinated like in many other African cities where ICT adoption and penetration, and evolution in various smart city systems go side by side with informal growth. In Cape Town, there has been a deliberate approach and efforts (both investment and policy) dedicated towards smart growth. The city has made major strides towards smart growth, through key interventions such as development of a smart city strategy in early 2000, launch of the SAP-ERP programme in 2002, introduction of the C3 notification system in 2007, roll out of the city's broadband fibre in 2009, launch of the city's open data portal in 2014, creation of the digital city working group in 2015 and launch of projects such as MICT skills focus on IDP, online transactions and the digital gateway to Africa project (Fig. 34.4). Through these initiatives, the city's transition has greatly evolved and expanded to incorporate many aspects of the urban system as discussed in the following paragraphs.

34.5.2 Cape Town's Smart City Strategy

The Cape Town smart city strategy introduced in 2000 aimed to reposition Cape Town as a leading player in the new global knowledge economy. The strategy, which was designed to transform local governments into smart growth leader, has not only transformed the way that local government works and delivers its services, but also transformed the way that the entire city operates. Instead of being a technical tool just for IT experts and developers, the ICT was embedded across all city departments and strategies [25].

The smart city strategy and its projects aim to reduce poverty and inequality in the city by empowering social policies and programmes and reducing social and gender gaps in education and employment. It has helped to address key questions pertinent to attainment of inclusive smart growth, which included [25] the following:

- What leadership is necessary to establish competitive advantage in a digital economy and society (smart city leadership)?
- What must be done to ensure that our policy and regulatory environment supports the development of a smart city?
- How will information technology lay the foundation for the building of a new flexible and responsive organization and enable the organisation to continually improve in its efficiency and effectiveness in delivering its programmes and services (administrative/e-government strategy)?
- How do we use IT as an instrument to foster the economic and social development of the city (development strategy)? and
- How can IT be used to ensure/enhance good governance (digital democracy)?

The strategy considers high customer service as prerequisite along with ICT solutions supporting government to be a more "self-service" model in an efficient and less costly operational environment. It focuses on transforming the way the local government delivers its services through five pillars: leadership, development strategy, policy and regulatory environment digital democracy, and administrative/e-government (Fig. 34.5).

Fig. 34.5 Cape Town smart city strategy framework. *Source* [25]

The five focus areas of the strategy as presented in the Fig. 34.5 are as follows:

- **Leadership**—in technology policy and strategy should be located at the most senior levels in the organisation, both politically and administratively. Other leadership areas are in business, in interaction with citizens, in non-profit organisations and in other collaborative initiatives.
- **Development strategy**—ICTs should be used to foster the city's economic and social development, through the growth and retention of the ICT industry, creation of employment potential through the use of ICT as a skill and the use of ICT for social development.
- **Policy and regulatory environment**—the entire city's legislation needs to be reviewed, and all new legislation passed by the city needs to be designed to ensure digital age appropriateness.
- **Digital democracy**—the city should make a concerted effort to ensure more equitable access to, and spread the benefits offered by ICTs to all. For local government, communities and business to take full advantage of the benefits offered by ICTs, there is an overall need for infrastructure, skills development and planning.
- **Administrative/e-government**—ICTs should be used as strategic tools to transform local government to create a highly efficient and effective organisation, reduce transaction costs, allow service to citizens anywhere and anytime and to allow citizens to deal with local government services in an integrated manner, via one-stop shops.

Within this framework, the "**Smart City**" **Strategy of the City of Cape Town** represents an example not only of successful implementation of an ICTs-driven reengineering of the city government, but a way to address the twin challenges of poverty alleviation and globalisation of the overall provincial government, by identifying the way that ICTs can enable economic and social development and enhance good governance, in the city and in the province, but also in consistency with the national and regional objectives [25].

In order to realize these objectives, the city of Cape Town elected to implement an ERP system, using the proprietary solution SAP. The SAP-ERP has enabled the city to manage its resources more efficiently and help create a citizen-focused environment. The city's ERP programme aimed to capitalise on the output of the organisation by optimising the way it deploys its resources, aligning business processes and by exploiting appropriate ICTs. The overall impact of the new system has been felt across three areas, organizations, human resource and the citizen levels [25].

34.5.3 The Digital City Working Group

In 2015, the city of Cape Town has introduced the Digital Working Group to identify broad focus areas for the city's approach to digital competitiveness,

identify the city's objectives in relation to each focus area, identify the short- and long-term initiatives that could support those objectives, develop an implementation framework that identifies primary and supporting role players who will be responsible for implementation, identify indicators to assess the impact of the strategy, ensure integration and avoid duplication. The working group focuses on the aspects of digital government, digital inclusion, digital economy and digital infrastructure as follows [24]:

- The **digital government** component aims to drive transparency, enhance service delivery, promote citizen engagement through ICT and enable the city to be a caring and responsive government;
- The **digital inclusion** component aims at closing the digital divide by promoting digital access, improving digital skills and driving digital initiatives that enhance quality of life;
- The **digital economy** component aims at creating an enabling environment for the growth of tech-enabled enterprises and maximizing its job creation potential and, in the long term, to make the city of Cape Town a regional tech-hub and growth in the digital economy;
- The **digital infrastructure** component, as a foundational enabler of the other three pillars of the strategy, aims at developing and using digital solutions to enhance the effectiveness of critical city infrastructure and make Cape Town the most connected city in Africa with the lowest telecommunication service tariffs.

34.5.4 State of ICT in the City of Cape Town

The smart city strategy is supported by a robust, well-run and up-to-date ICT infrastructure based on a wide area network (WAN) that provides connectivity to city-wide workstations in several administrative buildings linking officials through several custom-developed applications in conjunction with commercial software packages. In order to better coordinate the Cape Online Programme implementation, the information technology (IT) and e-government units of the Provincial Government of the Western Cape joined in 2004 to form the Centre for e-Innovation (Ce-I). To improve the region's "ICTs backbone", the Ce-I is anticipating the incorporation of "next-generation" technologies aiming to realise an ambitious programme of integration of the current local area networks (LAN) and the WAN, provided by the State IT Agency (SITA), and to prepare to be a "model" for future IT governance planning. The centre for e-innovation has also established partnerships with various government entities to ensure smooth flow of its operations and to promote service infiltration to all government levels [25]. Furthermore, the development and use of ICT has also been noticeable at many sectors from private and individual initiatives. In 1998, the **Cape IT Initiative (CITI)** was launched as a not-for-profit networking and cluster development organisation that brings together people, ideas and capital in the Western Cape ICTs' sector. CITI's

goal is to promote Cape Town as a global IT hub and gateway into Africa, and enhance the creation of jobs and prosperity. Its aims are to enhance the development and collaboration in the ICTs cluster, promote the ICTs industry and make CITI the pre-eminent industry information source [25]. The objectives of CITI are to identify, facilitate and assist entrepreneurial ICTs business in the province through research, networking, collaboration, promotion and marketing activities. Since its founding, the number of IT companies in the province has increased from 248 to over 1200. With a total employment of about 27,000 people, IT companies are the second largest employer next to tourism in the province [25].

Based on numerous ICT initiatives, Cape Town is a base for IT and manufacturing companies in the Western Cape region. The share of the city's population with access to internet increased from only 14 % in 2002 to 49.3 % in 2011 [1, 26]. With this growth, continued investment in the ICT sector by the local authority and the subsequent progress in ICT, media and call centre industries, Cape Town became the first African city to enter the Intelligent Community Forum's "Smart21 Communities" in 2008. At a provincial level, internet access in the Western Cape is higher than the national average with 38 % computer with ADSL internet access in 2015 compared to the national average of 22 and 93.8 % accessing internet via a mobile phone, compared to a national average of 70.8 % [27]. The percentage of people with access to internet using ADSL increased from 20.3 % in 2012 [28].

In its commitment to build an opportunity city, the city is heavily investing in the broadband infrastructure programme. The programme was the single biggest capital expenditure item in the corporate services budget for the 2012/2013 financial year with an allocation of R61 million, and an additional R152 million for the 2013/14 and 2014/15 financial years. The 7- to 10-year broadband project is greatly expected to reduce telecommunication costs, improve connectivity speeds, link different sectors of the city via high-speed networks and improve the city's competitiveness both locally and internationally. The network is further anticipated to create and establish 250,000 jobs throughout the Cape Town metropolitan area, improve business communication, facilitate high-speed data communications to municipal facilities and ultimately help drive economic growth, development and inclusion—especially in previously marginalized areas [29]. The project's plan to avail the network's spare capacity to the private sector, internet service providers and telecommunication companies will further promote outsourcing and stimulate competiveness among businesses and in the telecommunications market, and in turn help reduce costs to end-users. After initial investment in the project, the city's corporate network is already one of the fastest municipal networks in Africa and subsequent expansion into previously unserved areas will directly and meaningfully stimulate economic growth by supporting entrepreneurial activities.

As the core of smart cities, Cape Town's continued investment in ICT infrastructure and its plans to link both the public and public sectors with high-speed broadband network will not only create a "digitally inclusive and equal opportunity" society in which economic growth is possible, but will also cement the city's place as the first smart city in Africa [26].

34.6 Investment in Smart Transport Enhances Cape Town's Efficiency and Productivity

34.6.1 Cape Town Has Invested in Public Transport, Is Promoting Social Inclusion and Enhancing Commuter Convenience

Transport is the other major area where Cape Town has heavily been investing in, in a bid to create an equal opportunity city. Recent development plans and public policies have emphasized the need to promote the development and expansion of a sustainable public transport system, and improvement of public transport is one of eight key strategic focus areas for the city of Cape Town Integrated Development Plan. The current public transport system measures 0.11 km per square kilometre [30] and consists mainly of rail, buses, the integrated rapid transit (IRT), taxis and minibuses.

Efforts on the provision of reliable public transport in Cape Town started as far back as 1861 when an act was passed that allowed for a company to be formed for the purpose of providing horse-drawn tram services between Sea Point and Cape Town. Over the years, new and emerging alternatives have been incorporated into the city's public transport network to help move the ever-growing population. For example, the Golden Arrows Bus Services (GABS) company, which has been operating the city's bus transport service for more than 150 years today, has a fleet of buses that covers 59.4 million kilometres, conveying 51.8 million passengers annually from the townships and suburbs to the city and major economic centres, at a rate of approximately 220,000 per week day [31]. Information on ticket purchase, routes and bus schedules is available online offering great commuter convenience. Equally, the Cape Town passenger rail system—Metrorail—which started operating in the city in 1863 currently covers 610 km and operates 671 scheduled trains per weekday on 23 routes and 118 stations [32, 33]. The Metrorail has the most comprehensive routes in South Africa.

The Integrated Rapid Transport (IRT) system is perhaps the fastest growing public transport system in Cape Town. This bus service, operated under the "MyCiti" brand, was launched in 2010, shortly before 2010 FIFA World Cup. Myciti currently has a network of 32 km of dedicated road within Cape Town, operates on 36 routes and has more than 600 bus stops [33]. The service, which initially only served the wealthy white neighbourhoods, has steadily expanded to the poor neighbourhoods and informal settlements, bringing scheduled, subsidized, state-of-the-art transit to parts of the city that have never had a formal bus route. When the network is finally completed, it is expected to offer a reliable, safe and cost-effective transport network within 500 m of 75 % of the homes in the city [34]. The IRT integrates modern ICT technologies to monitor the fleet and promote security.

Social integration has also been a key target in the expansion of the city's transport as evidenced by the extension network for the IRT system. Likewise, the

city's rail system has over the last decade experienced a major transformation aimed at promoting social integration. In the build-up to the 2010 FIFA World Cup, Cape Town's central train station, a grant representation of segregationist infrastructure of the apartheid regime, was transformed into one of the city's most inclusive spaces. With an intention to open up and democratize the station and promote freedom of movement, the terminal was designed in a way to create democratic public spaces linked to other public transport networks, and to create commercial space specifically for the informal economy where the poor could trade and sell produce to the thousands of daily commuters. The station has not only granted the poor residents' ownership of one of the apartheid regime's most prized segregating infrastructure, but because its centralized location has also become the central square for the city's sprawling informal settlements.

As the public transport system continues to expand into previously unserved areas, and with the continued development of policies to promote public transport and to encourage more commuters to use the same, the result will reduce transport costs for more city residents and in turn improve productivity, which will undoubtedly contribute to the economic growth of the city. The creation of trading spaces within the mass movement corridors near areas such as the train station will also create income generation opportunities for the urban poor and further result in economic growth within this social group (Fig. 34.6).

Fig. 34.6 Cape Town's MyCiti public transport. *Source* Flickr/Steven M Guess

34.6.2 Informal Public Transport in Cape Town

Even though public transportation system in Cape Town is comparable to the cities in the developed countries, the current capacity of the formal public transport cannot meet the demand of the commuters, which creates an opportunity for informal transport system. The informal transport sector in Cape Town comprises of minibus taxis, buses and metered taxis which are owned by private individuals and/or companies. The minibus taxi service in most areas operates on dedicated routes and is frequently available, inexpensive and convenient since loading and offloading happen on demand pretty much anywhere en route [35]. The services have however also been identified as being dangerous, chaotic, unreliable and uncomfortable, with regular commuter complains initiated against the rude and violent behaviour of the taxi drivers.

Despite the challenges associated with the minibus taxi service, the service, which was introduced more than half a century ago provides transport services to 15 % of the population, who are mostly low income earners living the townships and informal settlements [33]. There are 102 registered minibus taxi route associations in the Cape Town metro area [36], which are currently managed by South African National Taxi Association (SANTACO) (Fig. 34.7).

The minibus taxi industry is a critical pillar of the South African public transport sector, operating and competing with the heavily subsidised bus industry for more than five decades without receiving a cent from the government in the form of grants or subsidies. In 2015, the City of Cape Town's Mayoral Committee proposed

Fig. 34.7 Cape Town's minibus taxis. *Source* [37]

a policy to transform minibus taxi services into a formal transportation system. This move, which is in line with the national goal of formalizing the entire public transport system, will make the industry more economically sustainable while improving service delivery. A new national law, the National Land Transport Bill, spells out a plan for publicly controlled integrated transport systems and for cities to take greater control of planning, regulating, implementing and monitoring public transport services [38]. In 2006, The South African National Department of Transport launched a policy to revitalize passenger transport system. The Integrated Rapid Public Transport Network (IRPTN) programme envisaged that the cities in South Africa would implement integrated networks reliant on the Bus Rapid Transit (BRT). The minibus taxis operators in the BRT routes would be given an opportunity to be incorporated in the IRPTN.

34.6.3 Increased Use of Private Car Hampers Efforts to Make Cape Town a Smart City

The absence of reliable public transport leads to middle-to-upper class income group to resolve into buying their own cars or use metered taxis. About 19.1 % of city of Cape Town population used their own cars, as drivers and 14.7 %, as passengers to go to work or school in 2001 [39]. In 2011, number of people using cars to go to work increased to 42.9 % and further to 48 % in 2015 [1, 33, 40], generally translating to an increasing traffic congestion challenge. Western Cape has the highest number of private cars compared to other provinces in South Africa. According to the TomTom Traffic Index Report, Cape Town remains the most congested city in South Africa and is ranked 47th in the world. Cape Town has a Traffic Index of 30 %, which means that drivers experience an average increase of 30 % in trip length of throughout the day. During the morning peak period, Capetonians can expect to add an additional 71 % to free-flowing travel time [41]. If the city of Cape Town does not improve its public transportation system, this number will continue to rise as the number of middle class people and urban growth increase.

Increased use of cars in urban areas results in increased demand of land required for road infrastructure and parking facilities. While owning a car represents a revolution of mobility and convenience, increased use of private cars results in increased use of non-renewable energy, obesity, accidents, social isolation, urban decay, urban sprawl and pollution. The second largest contributor to greenhouse emission is transportation sector. Air pollution data from World Health Organization show a moderate PM10 Pollution Level in the city of Cape Town. Main sources of air pollution in Cape Town are industrial and vehicle emissions. Improvement on public transportation is vital for environmental sustainability of the city as it can reduce CO_2 emissions.

Like other South African cities, Cape Town is a monocentric city where the wealthy communities are situated next to the economic opportunities whereas the poor and overcrowded communities are located in the periphery of the city [42]. This leads to congestion and long trips from the periphery to the centre. Traffic congestion is a major indication of the disjuncture between land-use planning and transport systems. It not only exposes the limitation of a transport-oriented bias to mobility, but also reveals the inefficiency of land-use systems in a given city. Limited road capacity, in the face of growing demand for motorized mobility, partly explains deteriorating traffic conditions. Congestion has widespread impacts on the urban quality of life, consumption of fossil fuels, air pollution and economic growth and prosperity. In addition to economic costs, congestion causes significant numbers of early deaths from respiratory illnesses, stress and physical and mental fatigue. It also degrades green areas, which, in turn, diminishes their carbon sequestration properties.

To alleviate traffic congestion in Cape Town CBD, Transport for Cape Town (TCT) is undertaking a R6.5bm project to review and improve traffic signal timing at the 110 intersections in the CBD [43]. The city also plans to extend Myciti routes and to use electric buses as IRT. This will make Cape Town the first city in Africa to use electric buses for public transport [40]. These initiatives directly support the city's commitment to the Paris Pledge for Action at COP21 and as member of the C40 cities to take progressive action and lead the way in reducing energy consumption and emissions. To reduce the disjoint of economic and residential locations, in 2016, the city has adopted new approach to integrated spatial and transport planning called Transit-Oriented Development (TOD) Strategic Framework [44] which is aimed at ensuring that new developments are strategically located around public transport where residents will have easy access to either rail or MyCiTi trunk routes.

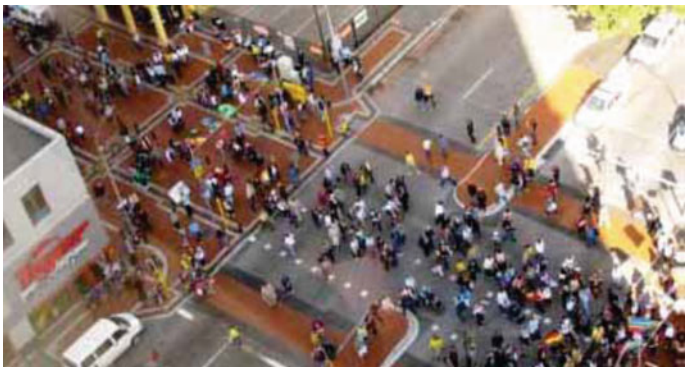
34.6.4 Integrating Public Transport, Walking and Cycling in the City of Cape Town: Creating Streets for All

Cape Town has formulated and adopted several policies with an aim of making the city more sustainable, inclusive, livable, prosperous and smart. In 2012, the city joined the livable streets movement in a bid to promote streets for all, and to make the city more livable and more pedestrian and cyclist friendly by reducing motorized transport. Over 21 % of population of the City of Cape Town population walks as a mode of transport [38]. As part of this movement, the city has already put in place policies within the Integrated Transport Plan and invested in the construction of pedestrian and cycling lanes as well as parks and other public spaces.

In addition, the city organizes "open streets-type events" for which car-free zones are temporarily set up to create safe public spaces in which citizens can experience and appreciate their city in a new way. Four of such events have already

been set up between 2013 and 2015 and have greatly been received by the city dwellers and applauded for creating social spaces where people of all races interact.

Photo of Cape Town—streets for all. *Source* © www.andrewboraine.com



34.6.5 Smart Streets Contribute to Provision of Basic Infrastructure and Safeguard Environmental Sustainability

Connectivity includes prioritizing streets as the basic element of mobility and accessibility accompanied by the progressive provision of services (connections to water, sewerage facilities, energy, drainage, etc.). As connectivity increases, travel distances decrease and route options and travel modes increase (e.g., more use of non-motorized and public transport), allowing more direct travel between destinations, thereby creating a more accessible and resilient system. A smart street network expands multimodal transport systems with sidewalks and bicycle paths, ensures eco-efficiency of infrastructural systems and supports density through integrated infrastructure development, thereby enhancing efficiency and access. Streets that provide space only to motorists are characterized by congestion and high CO_2 emissions.

Besides easing mobility, streets provide pathways for pipes, power lines and drainage systems, among other amenities. Evidence from most cities across the world shows that areas of the city endowed with adequate streets are also areas with laid down pipes for water supply, drainage and sewerage networks. Cape Town's high street share area also provides infrastructure for basic services such as water, sanitation and electivity. According to census 2001 and 2011, there has been an increase in the number of dwellings with access to basic service in the City of Cape Town, with 94 % of household having access to electricity and 75 % having access to piped water inside dwelling in 2011 [1].

Environmental sustainability is another dimension of city smartness. Smart streets contribute to safeguarding environmental sustainability. The natural assets of

cities should be preserved for the sake of future generations and create sustainable environment. Research shows that street design patterns greatly influence level of pm10 air pollution. In Africa, studies measuring air pollution emissions on the street indicate that poor roads, fuel quality, vehicle maintenance and roadway dust are the most common sources of pm10 and pm2.5 emissions. The South African National Environmental Management: Air Quality Act 39 of 2004 stipulates that three main criteria pollutants need to be measured and reported. In 2010, the city adopted the City of Cape Town Air Quality Management Bylaw. Among other provisions, this bylaw regulates emissions of atmospheric pollutants within Cape Town and puts in place licensing and penalty systems. Since 2011, no station failed to comply with the limit of no more than four exceedances of the 120 $\mu g/m^3$ daily standard [45].

To promote the city's coordinated growth, efficiency in the transport and movement systems and to enhance environmental sustainability, the City of Cape Town has compiled 8 district plans for each of its planning districts. The plans, which have been approved by the city authority, are aimed at assisting in providing a guide to land use and environmental decision-making processes within the districts. Four local spatial planning and design projects have already been informed by the city's spatial development framework and the district plans. These projects are Lavistown Development, urban fringe development, Langa Local Area Planning Initiative and Du Noon Northern Sport Precinct Plan. Opportunities that existed in these areas were identified, and the plans are aimed utilizing these opportunities to empower the communities and reduce the negative impact of human activity on the environment. The projects promote improved access to public transport (both BRT, non-motorised and rail), basic services, economic opportunities, recreational facilities, housing and ICT infrastructures among others using existing spaces. Walking ways are part of each development to promote walking and cycling in these areas.

Some of these projects involve development of mixed land uses and high-density housing opportunities. Mixed-use developments can reduce the distance between residential and employment areas, which lessens dependency on cars and travel demand altogether. Density and mixed-use around public transport stops will increase use and, hence, system viability. Linking job location and transport needs increases land efficiency. A compact pattern adjacent to a public transport node has many benefits. The Comprehensive Integrated Transport Plan 2013-2018 guides the development of efficient and viable relationship between land use, supporting infrastructure and transport for the sustainable development and improvement of public transport system within the city region.

34.6.6 Intelligent Transport Systems Are Key for Cape Town's Smart Mobility

Intelligent transport systems (ITSs) apply computer and communication technology to assist in solving transport problems. The development of an integrated ITS strategy for the City of Cape Town has been ongoing since 2002. The aim of the strategy has been to develop and implement systems that will improve service for travellers in the city through an increase in the capability of existing infrastructure and resources; a reduction of the environmental impact of transport; a reduction in the effects of congestion; a reduction in the number and severity of collisions; a reduction in user costs; and an improvement in public transport service [46].

Some of the intelligent transport system projects that have been proposed and/or being implemented by the City of Cape Town include the metropolitan area traffic control system, advance transport monitoring system, metro-trans-info call centre, CCTV public area surveillance systems on the road network, automated incident detection (in combination with the CCTV systems), improved public transport safety in combination with the CCTV systems, automated speed enforcement system for freeways, advanced public transport system for the CBD, red-light and speed violation monitoring systems for local roads, and expansion of existing CCTV and area traffic control systems.

The Metropolitan Area Traffic Control System is an investment of more than 50 million rand (R 50 million) and replacement costs of about R 80 million commissioned in 1998. The system has about 700 sites connected to two central computers which integrate features such as detailed fault and event monitoring, traffic counting, lamp and detector monitoring, remote clock setting, 50 timing plans and remote downloading of signal plans [46]. The system has resulted in among others, time and operating cost savings among road users estimated at about rand 5 million per month; coordinated operation; better utilization of existing traffic corridors, effective use of road space resulting to an increase in usable capacity; fewer and shorter disruptions due to faulty signals; improved safety; and enhanced traffic management [46].

As part of the larger ITS system, and in order to improve efficiency in the utilization of transportation resources among government entities, Cape Town has introduced various innovations such as e-fuel, which is a fuel management component that brings together bank, fuel supply and vehicle tracking systems to ensure that government fuel purchases are tightly controlled; and FleetMan, a web-enabled tool, to help fleet managers track and take care of this investment. The asset management system, for example, supports automatic logging of vehicle use, enabling departments to be billed promptly and accurately. This improves cash flow and financial accountability, as well as eliminating many disputes.

34.7 Social Infrastructure Development Attracts Investment and Enhances Cape Town's Productivity

34.7.1 Health and Education Infrastructure for Enhanced Human Capital

The contribution of education to health and well-being and to better subsistence and livelihood is indisputable. It is crucial to reducing poverty, improving health and enabling people to play a full part in their communities and nations. It finally generates powerful poverty-reducing synergies and yields enormous intergenerational gains

The city boasts of the highest literacy rates within the larger Western Cape region, recorded at 90.5 % in 2011 [1]. Although Cape Town's literacy rate is slightly lower than the national level's total literacy rate of 94.3 % [47], the city has heavily invested in the education sector, so much that it enjoys relatively good net enrolment and pupil–teacher ratio, and has the highest manpower potential in South Africa [48].

Cape Town also has the highest number of health facilities within the larger Western Cape region, with a total of 160 facilities, comprising of 149 primary healthcare facilities (community health centres, clinics, satellite clinics, etc.), 9 district hospitals and 2 regional hospitals in 2013 [49]. This has been translated into high level of health service provision within the city, as witnessed by high levels of immunization (*population of under 1 year fully immunized was 89.5 % in 2011/2012*) and low levels of severe underweight children under five years (*number of severely underweight children under 5 years in 2011/2012 was 3.2 per 1000 population*) [39]. The implication in turn is a healthy city population that will be able to achieve and maintain a high quality of life, and access opportunities to boost economic growth.

With an increase in a diversity of "global" opportunities present for Cape Town residents, the level of human development in the city, measured through the HDI, is highest in the city of Cape Town metropolitan municipality (*measured at 0.74 in 2010*) as compared to the other districts of the Western Cape region [4]. This reflects to the fact that the city residents are able to live long and to have healthy lives, to communicate, to participate in the life of the community and to have sufficient resources to obtain a decent living. This in turn increases the city residents' spending power and improves opportunities for economic growth.

34.7.1.1 Cape Town: A Knowledge-Based City Through ICT Innovations

At the beginning of the new millennium, considering that economic growth will be driven more by people and knowledge than capital and natural resources, the city Cape Town introduced the "The Cape Online e-government Programme" to boost

"the transition to a society based on the availability and leverage of knowledge, it is necessary to change and adjust to the imperatives of the knowledge society". The Cape Online Programme was introduced "to develop an innovative environment that facilitates a competitive, knowledge-based economy that promotes economic growth and enhances the quality of life of the people". This is to be realized through "Enabling government to harness the capabilities of the Internet to grow the appropriate use of ICTs, increase internal efficiencies and provide better service to its citizens as a pathway to e-government" [50]. The Cape Online Programme was later strengthened in 2004 with the information technology (IT) and e-government units of the Provincial Government of the Western Cape to form the Centre for e-Innovation (Ce-I). The Centre's purpose is to provide ICT services to the PGWC, including driving its e-government strategy; its roles are: (1) to provide and support the basic ICTs infrastructure upon which most of the government's activities depend; (2) to provide and support applications that improve the efficiency of government administration, lower costs and reduce the scope for corruption; (3) to provide and support applications that enable the government to deliver better services; and (4) to build an inclusive Information Society [25].

Under the Ce-I, various educational projects have been implemented, including Education projects—The Khanya Project is a joint venture between the Ce-I and the Western Cape Education Department that uses ICTs to support the educational curriculum throughout the Western Cape by providing content for teachers and learners an integrated learning platform; the Schools Administration Management System Project (SAMS) has been developed with an aim to provide a way for even the most remote and isolated schools to upload administrative information to a central server automatically and quickly; and e-Literacy was reinforced with Ce-I developing a series of community training and e-literacy projects, including training modules that will be free for anyone to adapt and use for themselves [25].

34.7.1.2 Use of ICT to Strengthen Health Sector and Services

Various healthcare systems such as maternity system (CRADLE) and networking community health centres (CHCs) have been developed to improve efficiency in the healthcare system. It is linked with the health information system, which provides consolidated electronic health records for patients across the provincial health system. The use of CRADLE has allowed access to accurate, timely and comprehensive information on maternal and child health and has enabled officials to track problems and intervene in a timely manner when problems arise [25].

The development and the use of the Social Service Electronic Document Management System (EDMS) has also strengthened the Department of Social Services and Poverty Alleviation to reduce significantly the management and administration time of grants and pensions, and also prevented the loss of paper-based applications, fraud and corruption. The city of Cape Town has also introduced two innovative ICT infrastructure systems: the Cape Gateway that provides government information to Western Cape citizens via a web portal, a call

centre and a walk-in centre in Cape Town's Long Street; and the Cape Access, which complements Cape Gateway by providing computer access and skills in rural communities [25].

34.7.2 *Peace and Security for Sustained Investment and Economic Growth*

A city that does not promote peace and security is not attractive to investors and cannot enjoy smart economic growth. Despite the fact that Cape Town has the highest police—civilian ratio (*1:6754*) among the major South African cities (*Johannesburg, 1:1272; Tshwane, 1:3072; Ekurhuleni, 1:5252 and Durban, 1:2452*) [51]—the city has capitalized on smart policing technologies such as smart monitoring systems including use of CCTV, development of digital criminal database and fingerprint technologies and incorporation of community policing to reduce the crime prevalence in the city, making it among the most secure cities to live and invest in. These ICT-based surveillance and response systems have resulted in reduction of crime rates and increased arrests across the city.

With the continued adoption and investment in modern ICT-based security monitoring systems, Cape Town is strategically placed for attracting investments and in turn promoting smart economic growth.

34.8 Innovation in Promoting Access to Basic Infrastructure

South Africa has made significant strides since 1994 to reduce extreme poverty by providing basic services—such as water, electricity, sanitation and housing—to large segments of its population. Cape Town has some of the best rates of infrastructure provision throughout the country. Although not at 100 % service delivery, statistics from the South African Census of 2011 portray Cape Town as a city that has not only invested, but has also innovated and developed "smart" approaches to basic infrastructure service delivery for its residents.

In a bid to promote access to water to all its residents, the city of Cape Town has invested in smart approaches and technologies to the entire water supply chain—catchment, storage, treatment and distribution system. As a factor of investment in this chain, up to 97 % of the city's water demand is collected from surface water, and only an average of 4.3 % of the total bulk water is unaccounted for [52]. To ensure equitable water distribution among all its residents, the city further created a system through which informal settlement residents are serviced from standpipes within a walking distance of 100 m. To reduce water wastage at the household level, the city has installed more than 45,000 water meters since 2010 in houses to

alert owners when water consumption has reached unaffordable levels, and provides hands on training on aspects such as fixing water leaks among the poor households [1]. The various projects are enabled and supported by policies related to water quality, public participation in water governance and community information on the importance of attaining maximum utility for the water service. As an outcome of these initiatives, 87.3 % of the city residents had access to piped water either inside their dwelling or inside their yard, 12 % had access to piped water from a communal tap and only 0.7 % did not have access to piped water in 2011 [1].

A similar trend of heavy investment has been observed in the city's attempts to provide sanitation facilities to its residents, resulting in 90 % of households having access to flush toilets. Increased connections to the city's sewer network over the past decade increased the need for more efficient wastewater management technologies. In 2010, eight out of the city's 23 wastewater facilities were awarded with the Department of Water and Forestry's "Green Drop" award for high standards and adoption of modern technologies in wastewater management [30].

Cape Town has over the years not only invested heavily in municipal waste collection systems but has also shown leadership and innovation in fostering public private partnerships for waste collection, management and recycling. The city has been lauded for its efforts to promote reduction in waste generation, encourage recycling and for its schemes to promote waste reduction, reuse, recycling and separation at the household level. Recycling, on-site and central community collection and drop-off facilities are also widely available across the city. The use of ICT in managing solid waste has been adopted in the city through the integrated waste exchange website, which allows businesses and the public to exchange potentially useful waste materials. The city has put in place smart policies, such as Cape Town's extended producer responsibility policy in which the city procurement guidelines favour companies that operate take-back programmes for items they sell, and also has policies to monitor and enforce waste generation and disposal standards by industries. With a waste generation rate of 573 kg per capita [30], and the city's continued growth, a lot of pressure is being exerted on the waste management systems and the Cape Town is rapidly running out of landfill space at its three main sites. More "smart" waste management approaches are urgently needed to reverse this trend.

34.9 Conclusion

The study on Cape Town brings a unique city setting where segregationist development (apartheid) has been legally rooted in the city foundation and manifested through urban planning and design, institutions and laws and access to basic services; and also where deliberate inclusive development has been promoted post-apartheid through both policies and investment. Although Cape Town has made commendable progress since the end of apartheid in 1990, efforts are still needed to create a smart city, a city which is sustainable, inclusive and prosperous.

Since the end of apartheid, different models have however been adopted to make the city more inclusive, the key ones being on participatory planning and design; development of inclusive public spaces; improvement in basic infrastructure provision and public transport particularly to the poor neighbourhoods; and development of policies that encourage inclusive human settlement and trade. The transition towards smart growth for Cape Town has however not been haphazard and uncoordinated like in many other African cities where ICT adoption and penetration, and evolution in various smart city systems go side by side with informal growth. In Cape Town, there has been a deliberate approach and efforts (both investment and policy) dedicated towards smart growth. The Cape Town's smart city strategy has transformed the way the local government delivers its services through five pillars: leadership, development strategy, policy and regulatory environment digital democracy, administrative/e-government. In 2015, the city of Cape Town has also introduced the Digital Working Group to focus on the aspects of digital government, digital inclusion, digital economy and digital infrastructure.

Implementation of various smart growth-targeted policies, plans and development projects has collaboratively and continuously worked to make Cape Town sustainable, equitable and economically vibrant, particularly by promoting improved access to economic opportunities, integration and inclusivity, resilience, adaptiveness, interconnectedness, land-use intensification, environmental protection and development control. All these are core components of smart city economy. As a result of the various interventions, the city has received several awards, such as the 2014 World Design Capital award; the Global Earth Hour Capital in 2014 from the WWF; the SERI special achievement in GIS award in 2013; the computer honours twenty-first century achievement award in 2003; the Bill and Melinda Gates Access to Learning Award for Smart Cape in 2003; and the ICT achiever's award for e-government in 2002.

The 2014 World Design Capital was awarded to the city for its innovative use of design as a tool for social, cultural and economic development. It particularly applauded the city's innovation in public transport and other projects such as the Green Point Urban Park and the Buitengracht Pedestrian Bridge; community development projects, such as the Violence Prevention through Urban Upgrading initiative as well as urban gardening projects; and the revolutionary IT systems being used to help run the city more effectively.

Transport is the other major area where Cape Town has heavily been investing in, in a bid to create an equal opportunity city. The development of an integrated intelligent transport system strategy for the city in 2002 has, among other things, greatly contributed towards efficiency in the public transport network through an increase in the capability of existing infrastructure and resources; improved commuter convenience; reduced the environmental impact of transport; reduced congestion in the city; lowered the number and severity of collisions; and reduced the transport system user costs. Social integration has also been a key target in the expansion of the city's transport as evidenced by the extension network for the IRT system. Likewise, the city's rail system has over the last decade experienced a major transformation aimed at promoting social integration. As the public transport system continues to expand into

previously unserved areas, and with the continued development of policies to promote public transport and to encourage more commuters to use the same, the result will reduce transport costs for more city residents and in turn improve productivity, which will undoubtedly contribute to the economic growth of the city.

Upon realization that economic growth will be driven more by people and knowledge than capital and natural resources, the city Cape Town introduced the "The Cape Online e-government Programme" to boost "the transition to a society based on the availability and leverage of knowledge, it is necessary to change and adjust to the imperatives of the knowledge society". The Cape Online Programme was introduced "to develop an innovative environment that facilitates a competitive, knowledge-based economy that promotes economic growth and enhances the quality of life of the people".

Today, the city of Cape Town metropolitan economy contributes more than three-quarters of the Western Cape province GDP. The metropolitan region has specifically developed a strong financial and business services sector and has a large retail, wholesale, catering and accommodation sector linked to a vibrant tourism industry, and a rich cultural history—all of which heavily rely on the growth of ICT infrastructure. The city residents are able to live long and to have healthy lives, to communicate, to participate in the life of the community and to have sufficient resources to obtain a decent living. This in turn increases the city residents' spending power and improves opportunities for economic growth. Although Cape Town has made commendable progress since the end of apartheid in 1990 that led to numerous award of recognition, the city is called to reduce inequalities and create smart solutions for all citizens.

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