

# Implementing the Green City Policy in Municipal Spatial Planning:

## *The Case of Buffalo City Metropolitan Municipality*

DLANI, Abongile | IJEOMA, EOC | ZHOU, Leocadia

ARTICLE

### Abstract

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The term “eco-city,” and similar concepts such as “green” and “sustainable” cities, has evolved overtime concurrent to the development of the understanding of social change and mankind’s impact on environmental and economic health. With the advent of climate change impacts, modern economies developed the green city policy to create sustainable urban development, low emission, and environmentally friendly cities. In South Africa municipalities, including Buffalo City Metropolitan Municipality (BCMM) have been tasked to develop and implement the green city

policy. However, BCMM is yet to develop the green city policy that clearly articulate how the municipality will combat climate change and reduce its Green House Gases (GHG) emissions in its spatial planning designs.

Against this background, this article reviews and analyses green policy landscape in Metropolitan Municipalities. It is envisaged that the research will provide the basis for the development of a comprehensive green policy strategies and programmes for the local transition to action in Buffalo City Metropolitan Municipality, in the Eastern Cape Province.

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**Keywords:** Eco-city, Green-city, Green House Gases, Climate change, Buffalo City

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## **Introduction**

According to South Africa's National Climate Change Response Paper (2011), the phenomenon known as climate change, the focus of this article, refers to an ongoing trend of changes in the earth's general weather conditions as a result of an average rise in the temperature of the earth's surface often referred to as global warming. Climate change, and what to do about it, has become one of the enduring problematics of our time. It is, so the rhetoric goes, a global problem requiring global solutions (Bulkeley & Kern, 2006). Subsequent to the Kyoto Protocol in 1997, countries in the world committed themselves to a reduction of greenhouse gases (GHG) Emission produced by them. The Intergovernmental Panel on Climate Change (IPCC) Assessment Report (AR) 4 stated that urban activities are GHG emitters through industry and transportation.

Most of the world's GHG emissions are ultimately attributable to cities, which are centres of economic activity (Hoornweg, Freire, Lee, Bhada-Tata, Yuen, 2011). However, greenhouse gas emissions emanate from the activities and decisions of individuals and organisations operating at local, regional, national and international levels. According to Simarmata et al (2012) it is necessary to reconfigure the cities development strategies, from economic infrastructure development-orientated, to environmental protection-orientated. Urban development strategies need to be directed to the development of environmental-friendly cities, by limiting the development of economic infrastructure that increases emissions.

Spatial planning, which contains strategies and policies for urban development, should be directed to the efforts to reduce GHG in transport, urban design and development, waste management, renewable energy, environmental health and water resources. In order to contribute to such an analysis, this article reviews and analyses green policy landscape in Metropolitan Municipalities in South Africa. The aim of the research will provide the basis for the development of comprehensive green policy strategies and programmes for the local transition to action in Buffalo City Metropolitan Municipality, in the Eastern Cape Province.

## **The Concept of Eco Cities**

The term "eco-city" is still relatively new, and researchers and governments use it to describe a multitude of ideas and concepts (Van Dijk, 2011; Joss, 2010). Synonymous

concepts such as "sustainable city," "low-carbon city," "eco-community", "green city" are used interchangeably with the term "eco-city." These terms all describe attempts at the city level to resolve economic, social, and environmental conflicts that have arisen primarily due to the consequences of economic growth and demographic change.

Despite its origins in the late 1800s, eco-city planning is not a singular body of thought but an amalgamation of various planning modes that have arisen in response to the side-effects of economic development during the past 150 years. The plethora of ideas and descriptors makes it difficult to formulate a single precise definition (Zhou & Williams, 2013).

According to Zhou & Williams (2013) broadly, an eco-city should incorporate plans, measures, technologies, and operational strategies to increase all aspects of environmental, social, and economic health; narrowly, these goals should be accomplished primarily by efforts to conserve natural resources, reduce fossil fuel use, increase density and reduce automobile use, reduce and recycle waste streams, integrate nature into cities, shift the economy toward the service sector and high value-added technology creation, build diverse spaces that offer value to all population subgroups, and actively seek and support community involvement in city improvement efforts

### **Governance and Green Economy**

The new policy wave sweeping both developed and developing countries is the move towards green economies. The concept is the brainchild of developed countries and can be traced back to the 2008 global financial crisis. There was a realisation that neither the increased greenhouse gases nor the global financial crisis could be reversed through current industrial and production systems, which have a cumulative effect on the environment (Kaggwa et al, 2013). In their quest to re-invigorate economic growth, global leaders decided to address the financial crisis along with other crises that acted as drivers of the global green economy transition, including energy and climate change (UNEP, 2011).

According to Kaggwa et al (2013) the green economy in South Africa is viewed as a path to sustainable development based on its potential to address the interdependence among inclusive economic growth, social protection and natural ecosystems. It is defined as a 'system of economic activities related to the production, distribution and consumption of goods and services that result in improved human well-being over the

long term, while not exposing future generations to significant environmental risks or ecological scarcities (DEA, 2012). Developing a green economy implies decoupling resource use and environmental impact from economic growth. The green economy is characterised by substantially increased investment in green industrial sectors, supported by enabling policy reforms. As with any other new policy initiative, the social and economic impact of the transition to a green economy, in both the short and the long term, is not yet fully understood. As such, it is important to assess the implications of this transition at country level using selected indices, given that each country has unique developmental challenges and aspirations.

### **The Politics of Climate Change**

Climate change has moved to the centre stage of public concern in a remarkable way and in a very short space of time. Scientists have expressed serious concerns about global warming for a quarter of a century or more. Environmental groups have struggled for much of that period to get governments and citizens to take the issue seriously. Yet within the past few years, climate change has assumed a very large presence in discussion and debate, and not just in this or that country but across the world (Giddens, 2008). Climate change is now a mainstream political issue. However, as yet there is no substantive framework for policy which offers coherence and consistency as to how national governments should cope with the long-term political challenges of climate change.

According to Giddens (2008) the literature on climate change tends to divide into several categories. There are many books written by scientists and others about the phenomenon itself and the dangers it poses. Where books and articles have been written about the "politics of climate change", they tend to be about such international agreements. Giddens (2008) argues most countries have no effective politics of climate change, especially at a national level where much of the action must happen. That is to say, there is no developed analysis of the political changes we have to make if the aspirations we have to limit climate change are to become real.

Giddens (2008) further states that very few aspects of the climate change debate are uncontroversial and the controversies between protagonists are often intense and even bitter. Three different positions can be distinguished. First, there are the climate change sceptics, who claim the case that present-day processes of global warming are produced

by human activity is not proven. Fluctuations in climate, they point out, produced by natural causes, have been a constant feature of world history. The current situation, they assert, is no different. Other sceptics accept that climate change is happening and that it is humanly induced, but argue that the threat it poses has been exaggerated. For them, other world problems, such as poverty, Aids, or the possible spread of nuclear weapons, are both more worrying and present more pressing dangers than climate change. The sceptics have dwindled significantly in numbers in recent years as the science of climate change has progressed, but they still get a significant hearing.

### **Challenges in implementing Green City Policies**

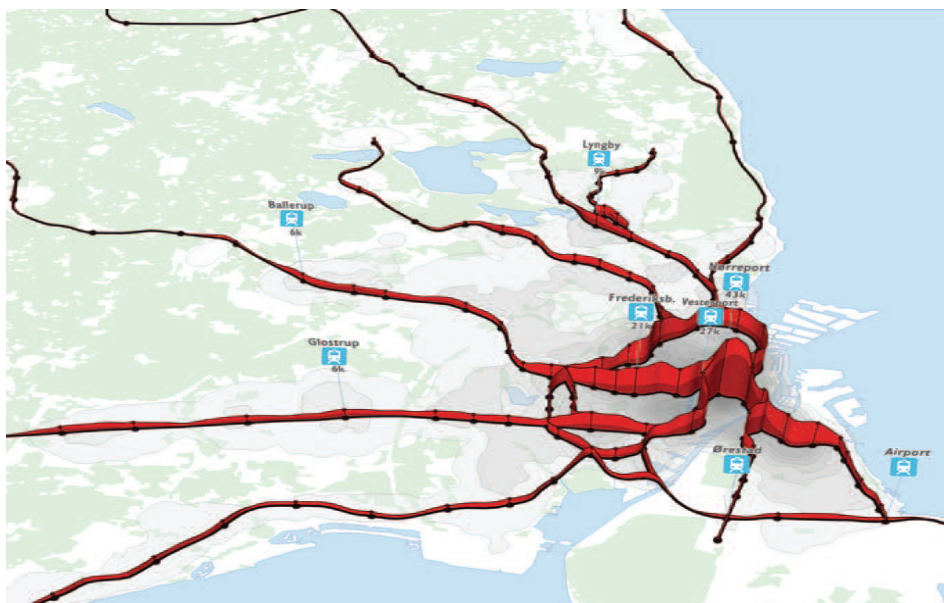
According to a survey done by the Global Green Growth Initiative (2012), most cities face a number of challenges in implementing green city initiatives. Challenges in the transport sector are mentioned most frequently, followed by pressures of rapid urban population growth, employment, governance challenges, and limited financial resources. Of the 90 cities analysed, 70% identify air pollution as a significant or very significant environmental challenge for the city and its region. This is followed by severe storms and flooding (68%), stormwater management (64%) and solid waste processing and disposal (57%). The majority of cities also identify fly tipping of household waste, water pollution and lack of green space as significant challenges.

Cities in middle- and low-income countries face additional challenges to those surveyed in high-income countries. With respect to environmental issues, water-related challenges, sewage treatment, solid waste and soil erosion are all reported significantly more often by cities in middle- and low-income countries. Three in four cities surveyed in middle and low-income countries identify solid waste processing/disposal, sewage treatment/disposal and dumped household waste as important challenges. Environmental challenges also differ between geographic regions. Stormwater management is more important to city authorities in Asia and North America than to those in Europe. With regard to urban development challenges, overcrowding and informal land developments are more frequently reported by Asian cities. European cities more often report social exclusion as a major challenge and noise pollution seems to be particularly acute in Europe: 18 out of 25 European cities identify noise as an important challenge, while only three North American cities regard noise as significant

### Best Green Policy Initiatives and Practices Case Studies

According to the Global Green Growth Initiative report (2012) certain cities in the developed and developing world have made significant milestones towards green growth in all facets of city planning. The case studies provide inspiration by reporting on the success of integrating policy sectors and contributing to green growth. Each city's experience also offers important lessons about on-going challenges for building effective partnerships between business and government, delivering on environmental targets and integrating economic and environmental policy.

**Figure 1: Population and employment density along major transit routes in Copenhagen**

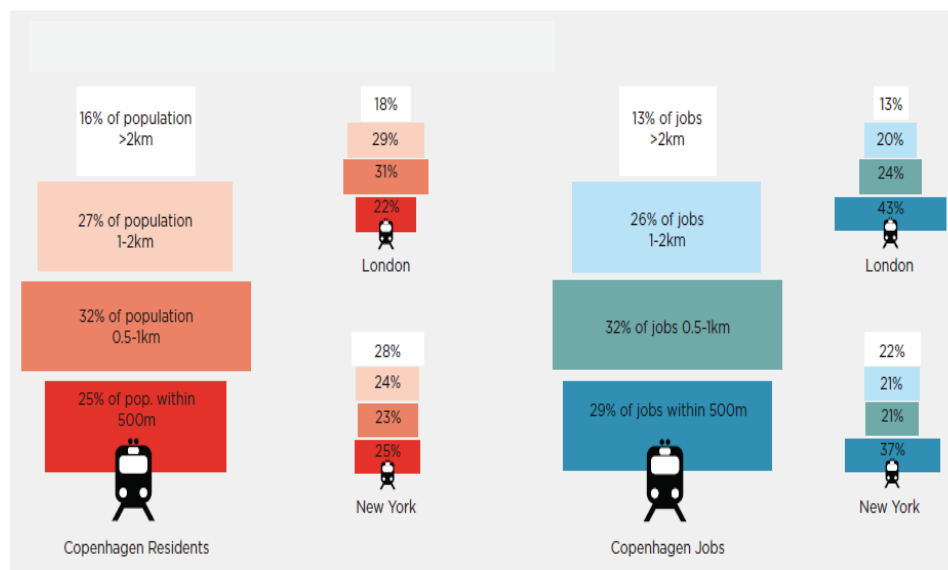


## Land use and transport

### Copenhagen: integrated regional planning for green growth

The City of Copenhagen has placed green growth and quality of life at the centre of its latest Municipal Plan (Curtis, 2014). The City has an ambitious goal to be “the world’s first carbon neutral capital” by 2025 and at the leading edge on technology and innovation in Europe. Copenhagen has a vision of being a key hub for business in Scandinavia and at the centre of the cross-border Oresund region. Copenhagen is widely regarded as one of the greenest cities in the world and recently came top in the Economist Intelligent Unit’s European Green City ranking (Economist Intelligence Unit, 2009). The city’s environmental policy leadership spans renewable energy, district heating, waste management, the cleaning of its former industrial harbour and promoting cycling, for which it has become best known.

*Figure 2: Copenhagen pedestrian accessibility to rail and metro stations*

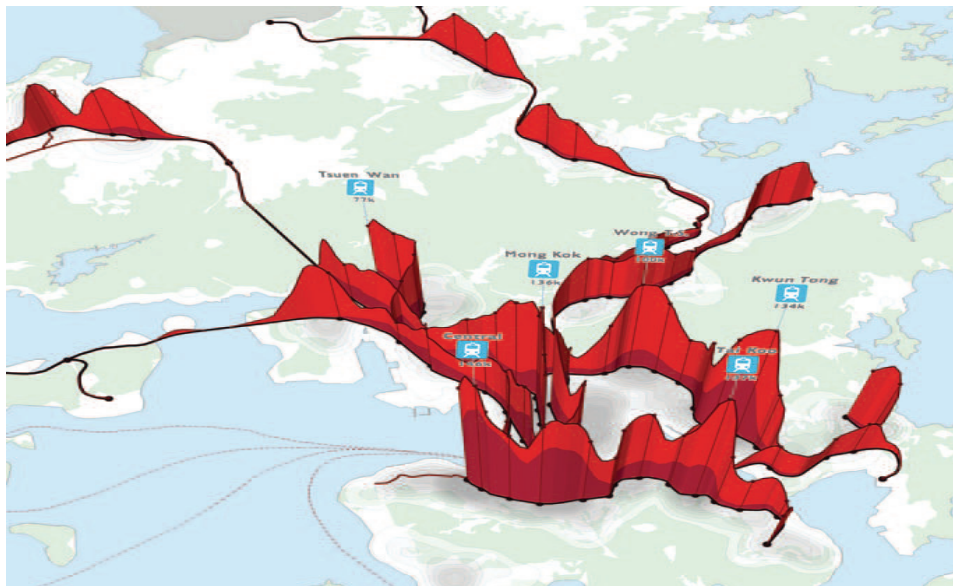


### The Policy Programme

According to the Global Green Growth Institute (2012) Copenhagen’s integrated transport and land-use strategy is a key element in the city’s green growth agenda.

Initiated more than six decades ago with the regional-scale 'Finger Plan' and continuing today with investment in the metro and the successful promotion of cycling, Copenhagen's approach to land-use and transport has established dense, walkable urban centres connected by rail-based public transport (see figure 1). The 'Finger Plan' promotes urban growth along rail corridors radiating from the city centre, while protecting 'green wedges' from development. This includes the 'Station Proximity Principle', which generally requires new large offices of more than 1,500 m<sup>2</sup> to be located within 600 m of a railway station.

**Figure 3: Population and employment density along Hong Kong's MTR network**



## **Hong Kong: building a compact city economy**

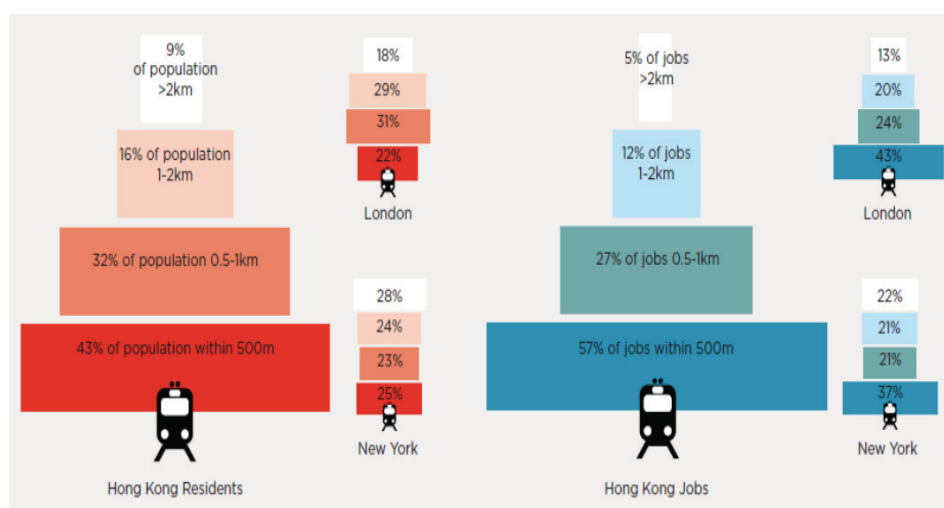
### ***The Policy Programme***

Hong Kong's policy approach to land-use and transport combines extensive investment in public transport infrastructure and services with complementary land-use regulations in order to tightly integrate urban expansion at high density public transport nodes and along linear rail-based corridors (see figure 3) (Cullinane & Cullinane, 2003). Above all,



public ownership of most land enables the government to have direct control over spatial development (Ming, 2004). Hong Kong's mountainous landscape limits urban expansion, and reinforces the orientation of development around public transport corridors. The latest planning strategy shows an evolution from the ambitious new town developments of the 1970s through to the 1990s, towards brownfield development and urban regeneration.

**Figure 4: Hong Kong pedestrian accessibility to rail and metro stations**



Spatial planning is currently guided by the Hong Kong 2030: Planning Vision and Strategy, a broad framework that generally follows an approach developed over the past 30-40 years. Key concepts include a 'rail-based pattern' of development, and a commitment to 'doing more with less' – prioritising regeneration of existing urbanised territory rather than expansion into Greenfield areas (see figure 4). According to Ming (2004) related regulation and guidelines specify where development can occur and at what density levels, while limiting car-parking provision. Urban expansion occurs in strictly defined areas, since 46% of Hong Kong's territory has been legally protected by 'Country Park' status since the 1970s. A further 30% of land remains undeveloped and subject to various degrees of protection under a 'hierarchy of no-go areas'. Land is

zoned according to maximum floor-area ratios, with extremely dense building permitted directly above and adjacent to rail stations.

## **Eco-districts and Buildings Globally**

### ***Stockholm: Innovation and the next generation of eco-districts***

In the words of Stockholm's Mayor, Sten Nordin, "In 2030, we will be the green capital of the world". This goal is part of the City's Vision 2030, designed to make Stockholm and its economy 'world class' (City of Stockholm Executive Office, 2010). Stockholm has a history of green growth and was named European Green Capital in 2010.

***Figure 5: Hammarby Sjöstad, Stockholm***



### ***The Policy Programme***

Stockholm and Sweden more generally, has a long history of energy efficiency in the buildings sector. Over 50 years ago the City began creating the infrastructure for district heating, which now accounts for nearly 80% of all heating in Stockholm (City of Stockholm, 2012f). Originally owned by the City, the system is now owned and operated by Fortum, a private corporation. Today, 80% of the energy used for district heating in the City is renewable fuel, energy from waste or residual heat.

National building regulations – which are some of the most stringent in the world – have also driven the energy efficiency of new buildings in the Stockholm region. Energy use must comply with a standard of 90 kWh/m<sup>2</sup> for district heating and 55 kWh/m<sup>2</sup> for electric heating. These standards have been taken further by energy efficiency targets under the City of Stockholm's Environmental Programme 2012-2015.<sup>13</sup> Using contractual obligations on land designated by the City, developers will need to meet a standard of 55 kWh/m<sup>2</sup> for district heating.

### **Portland: A leader of the US green building economy**

Portland, Oregon, which sits in Multnomah County in the Pacific Northwest, is considered one of the greenest cities in the United States (Business Courier, 2011). The city is also known for its urban growth boundary, restricting urban expansion into surrounding farmland and forests. Portland has experienced green economic growth as a result of its combined economic and environmental policies. Between 1993 and 2010, the metropolitan economy grew by 59%, while between 2003 and 2010 the number of jobs in the green sector increased by 32%. Greenhouse gas emissions per capita decreased by 26% from 14 tCO<sub>2</sub>e in 1993 to 10.4 tCO<sub>2</sub>e in 2010.

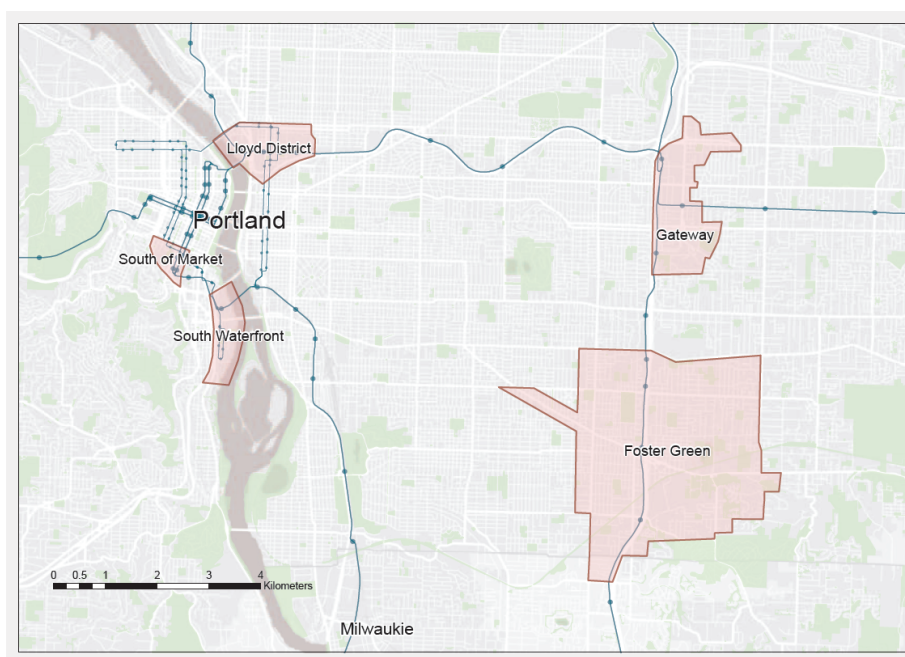
#### ***The Policy Programme***

The City of Portland has actively promoted the green buildings sector over the last decade. In 1999, Portland's Energy Office established the "Green Building Initiative" to assist home builder associations to develop green building programmes. Since then, the City's Office for Sustainable Development has carried out a progressive green building programme. In 2001, the City Council adopted the City's Green Building Policy, which requires all new city-owned facilities to register and certify at the Leadership in Energy & Environmental Design (LEED) level and incorporate green building strategies into tenant improvement and operation and maintenance practices ((Allen, Potiowsky, 2008).

Under Portland and Multnomah's Climate Action Plan, the City has four main goals for the building sector to meet by 2030. These are (1) reducing by 25% the total energy use of all buildings built before 2010, (2) achieving zero net greenhouse gas emissions in all new buildings and homes, (3) producing 10% of the total energy used within Multnomah County from on-site renewable sources and clean district energy systems,

and (4) ensuring that new buildings and major remodels can adapt to the changing climate.

**Figure 6: Portland's five eco-districts**



## Waste, recycling and energy

### *Belo Horizonte: harnessing collective action to recycle*

The City of Belo Horizonte, the centre of Brazil's third largest metropolitan area, is considered a leader of Brazil's economic growth in the last few decades. The metropolitan area's economy – measured as Gross Value Added (GVA) per capita – grew by 37%, its population by 41% and the number of people employed by 65% in the period 1993 to 2010. This growth was accompanied by a 37% increase in greenhouse gas emissions per person in the municipality between 2000 and 2010, though at 1.6 tCO<sub>2</sub>e per person this remains low compared to developed countries, which emit an average of 10.6 tCO<sub>2</sub>e. While recycling rates up until 2009 remained relatively low at around 5-7% of total waste, the city has nevertheless made significant advances in

recent years and now has programmes in place to recycle construction waste (around 300 tonnes a day) and is developing a sophisticated composting programme for organic waste (10 tonnes a day), including the redistribution of surplus processed food to registered charities in the city (Mendes, 2012a).

### ***The Policy Programme***

Belo Horizonte has been a pioneer in municipal solid waste management in Brazil since the 1990s and instrumental in the move to include the informal sector in municipal recycling strategies. The need to improve existing informal employment structures and raise the standard of living of the urban poor led to the development of an integrated solid waste management (ISWM) strategy. The policy emphasised segregation of waste at source to minimize environmental impacts and maximize social and economic benefits in local communities (Dias, 2011). In the early 1990s, local legislation was changed to prioritize the collection of recyclables by co-operatives of informal waste-pickers, recognizing that these workers were already contributing significantly to increasing recycling volumes in the city and that a partnership with the city would improve their productivity and help the city meet both environmental and socio-economic goals.

Following this regulatory change, the Superintendência de Limpeza Urbana (SLU), responsible for all solid waste management services for the city, used a combination of legislative and financial policy tools to further integrate the informal sector into municipal waste management. Today, around 600 waste-pickers work for the cooperatives, with a total of 80 sorting warehouses run by seven different cooperatives across the city.

## **Durban: a leader in waste-to-energy**

### ***Policy Programme***

In 2004, the Cleansing and Solid Waste Department of the Durban Metropolitan Area municipal government developed an integrated waste management strategy that covers generation, collection, treatment and disposal of waste. As part of the new integrated waste management policy, the city aims to ramp up its recycling programme and is focusing on educating residents about the importance of waste reduction and recycling.

In addition to initiatives concerned with managing waste generation at source, the city is also pioneering gas-to-electricity conversion at two of its landfill sites, making it

the first city in South Africa to explore such technologies. Since 2008, the city has been extracting landfill gas (a mixture of methane gas and carbon dioxide produced by the breakdown of organic wastes in the landfill site) for the generation of electricity at the Bisasar Road and Marian Hill landfill sites, both owned and operated by the city (EThekweni Municipality, 2011e). Durban's landfill sites were initially identified as a suitable location for such a project by the World Bank back in 2002 (World Bank, 2006). The project finally became financially viable after ratification of the Kyoto Protocol in 2005, which allowed the municipality to apply for funding through the United Nations Framework Convention on Climate Change's (UNFCCC) Clean Development Mechanism (CDM) (Interview John Parkin, 2012).

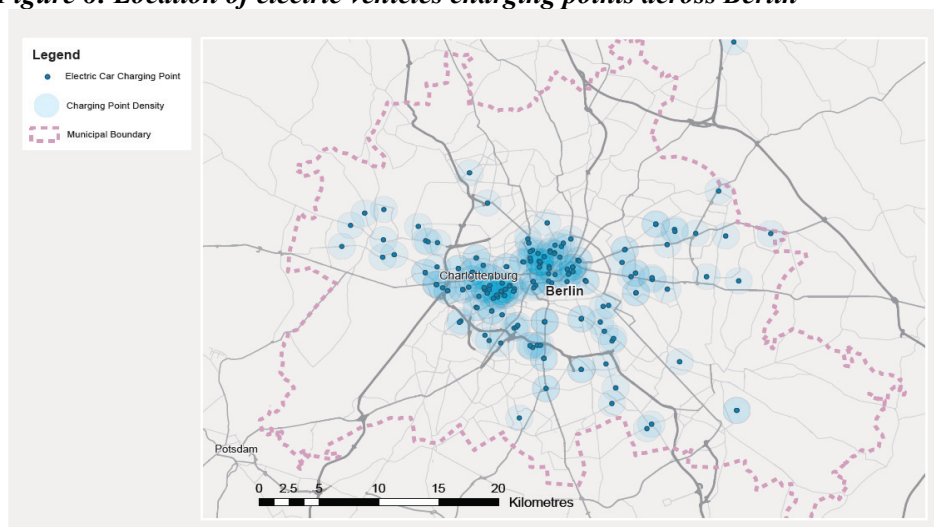
## **Electric mobility and renewable energy**

### **Berlin: urban mobility for the next industrial revolution**

Over the last decade, the Berlin-Brandenburg metropolitan region has embarked on one of the most ambitious renewable energy and electric mobility agendas of any city region of similar size and status.

***Figure 7: Deutsche Bahn has led the integration of electric mobility with public transport in Berlin***



*Figure 8: Location of electric vehicles charging points across Berlin*

### ***The Policy Programme***

The Berlin-Brandenburg electric mobility programme is part of the German Federal Government's National Development Plan for Electric Mobility (German Government, 2009). At the federal level, this programme is primarily based on an agenda to build a globally competitive electric mobility industry and to introduce 1 million electric vehicles to German streets by 2020. More broadly, this policy is part of Germany's Energy Transformation, which itself is facilitated by six new federal laws including the much publicised feed-in tariff for renewable energy. According to Weiss et al (2011) the Electric Mobility Plan itself focuses on funding new battery technology, new e-mobility systems and related infrastructure development, as well as provisions for regulatory incentives. Across Germany, only about 3,000 new vehicles were electric, compared to 6.5 million newly registered vehicles between 2010 and 2011. In Berlin/ Brandenburg, about 500 electric vehicles are registered today and 220 public charging stations have been installed, supplying 100% certified renewable energy (see figure 8).

### **London: the electric vehicle pioneer**

Over the last decade, London has become a prominent leader in progressive transport policies and is globally recognized for introducing congestion charging, the upgrading of



public transport and more recently the promotion of cycling. These policies have contributed to a steady drop in car ownership across London, from an average of 0.81 cars per household in 1995 to 0.76 in 2011. The city has also seen the introduction of about 2,300 electric vehicles, the largest number in any city to date, and has been leading on the development of charging infrastructure for over five years (Greater London Authority, 2012a).

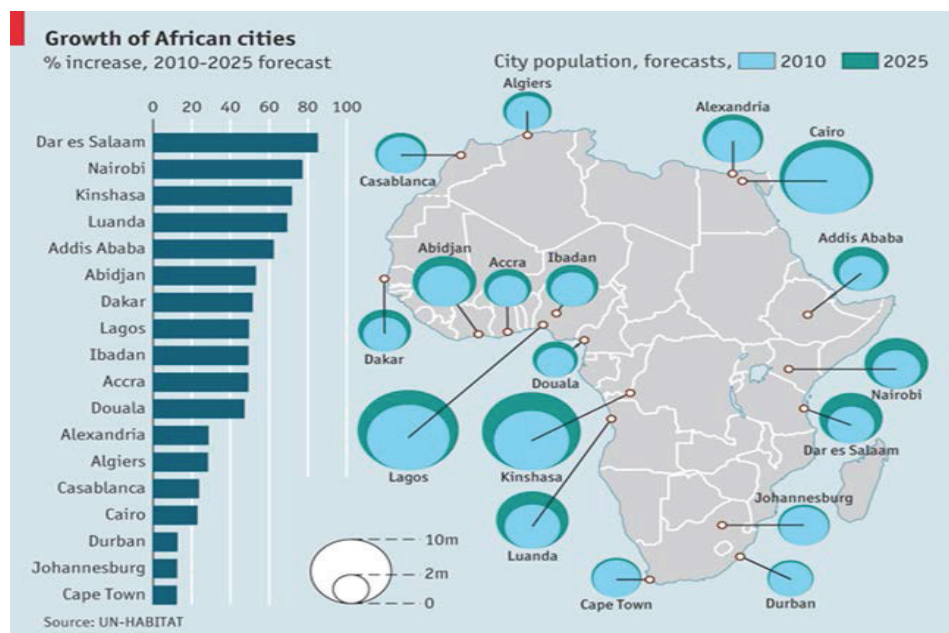
### ***The Policy Programme***

The London electric mobility programme is part of the city's wider effort to de-carbonize transport and address air quality issues in the city. While not directly linked to a renewable energy strategy, it builds on the broader ambition of the UK Government to increase renewable energy production (Nathan, et al., 2012). According to McGreevy (2012) the relatively early adoption of electric vehicles in London was initially stimulated by a 100% discount on the congestion charge introduced in 2003, with savings for electric vehicle owners of up to £2,000 (US\$3,200) a year. While this created an important financial incentive, the marketing effect of this approach was arguably even more important. More recently, a range of regulatory, incentive-driven and investment-based policy instruments have been established at national, city and borough level to encourage a shift towards electric vehicles.

### **Implementation of Green City Policy in Africa**

Africa is urbanizing fast. The proportion of the population living in urban areas has risen from 15 percent in 1960 to 40 percent in 2010 and is projected to reach 60 percent in 2050 according to the United Nations Population Division (see figure 9). Urban growth is estimated at 3.7 percent a year, more than twice the world's urban growth rate (Un-Habitat 2010). Between 2010 and 2050, African urban populations will triple, reaching 1.2 billion people. This challenge is unique in human history in terms of size and the pace of the transformation.



**Figure 9: African Cities population increase projections**

## City of Lagos

### *Energy and CO<sub>2</sub>: Well above average*

In 2008 the Lagos State government, in collaboration with the Clinton Climate Initiative, embarked on a beautification programme for its major open spaces and highways. Within two years over 500,000 trees had been planted. On top of this the state government called on the private sector to partner with it in the greening of public spaces.

### *Transport*

With over six million cars on the road every day, thoroughfares are congested and polluted. The public transport system, consisting mainly of tens of thousands of privately owned buses, is not directly controlled by city officials. In March 2008 the Lagos State government introduced bus rapid transit in conjunction with the private sector. This was promoted as an affordable, reliable and safe means of travelling while significantly

reducing congestion on the city's roads. The buses, running in dedicated lanes, can reduce journey times by 30%.

### ***Waste***

The Lagos Megacity Project is the overarching waste policy of the state government. One of the most notable initiatives of the past decade was the waste-to-wealth programme to convert various types of waste into usable materials. The programme was introduced in 1999 but has gathered momentum in recent years. As part of this programme, Lagos has established one of the biggest compost plants in Africa and converts 800 tonnes of municipal solid waste into fertiliser each day. In addition, the city has established four small-scale plastic-recycling plants, which convert 30 metric tonnes of nylon or plastic waste materials into usable products like shopping bags

### ***Water***

The World Bank is currently conducting a water initiative across the states of Lagos and Cross River called the Second National Urban Water Sector Reform Project. It has several aims: to improve the reliability of water supplies produced by the water treatment works in Lagos; to increase access to piped water networks in four cities in Cross River State; and to improve the commercial viability of urban water utilities in Cross River and Lagos states. The project was approved in 2005 and is expected to end in May 2013. Some of the practical outcomes of the project will be the installation of safe and suitable housing for pumps and generators; hiring better-trained chemists, biologists and water scientists for laboratory work; completely fencing-off the perimeter of water treatment plants; using better and more secure manhole covers; and conducting more frequent testing of water before it is pumped out for distribution.

### ***Air quality***

The Nigerian government has a long-standing ban on the import of cars more than five years old. While the government has not put any other specific measures in place, such as monitoring emissions from cars and generators, preventing very old cars from entering the country is expected to have a positive effect on air quality over time.

## **City of Accra**

### ***Energy and CO2: Above average***

Although the national government's main renewable priority is hydropower, the state-owned power company, the Volta River Authority (VRA), has also initiated a project to generate 100 megawatts of wind and solar power by the end of 2011 through the installation of solar plants in three northern regions and a coastal wind farm.

### ***Air quality: Above average***

Unlike the majority of Index cities, Accra informs citizens about the dangers of air pollution. Air monitoring is also relatively rigorous. Checks are made at various locations throughout the city for levels of nitrogen dioxide, suspended particulate matter, suspended fine particulate matter and carbon monoxide. The transport sector, primarily consisting of the trotros, is the dominant source of air pollution in Accra. Authorities take air pollution seriously, particularly from the transport sector, and are taking steps to tackle the problem (see "green initiatives" below). In 2006 the national Environmental Protection Agency (EPA) conducted an assessment of carbon dioxide emissions from the transport sector. On the basis of this study, the agency drafted a plan for an annual vehicle certification regime that would include CO<sub>2</sub> emissions. The EPA is exploring collaborations with private companies in order to implement the plan. In addition, the government's bus rapid transit project aims to reduce air pollution from the transport sector.

### ***Environmental governance: Well above average***

Accra is the only city in the Index to place well above average in the environmental governance category. The city's local government works in partnership with the national EPA to implement environmental policies. The city's assembly has the power to implement environment-related regulations, and has a relatively wide remit, encompassing all the main category areas monitored by the Index, including sanitation, land use, informal settlements and waste management. In addition, each of those main category areas has been subject to a baseline review within the last five years. Accra provides public information on environmental projects and performance. The city also has a process to involve non-governmental organisations and other stakeholders in public meetings on projects that have a major environmental impact. One of Ghana's

most noteworthy environmental initiatives is its participation in the UN Convention on Climate Change. As part of this process, the EPA is preparing a national greenhouse gas inventory report, which will identify greenhouse gas emissions by source from 1990 to 2006. Work on the inventory began in 2008 and the report was expected to be released in late 2011. The results of the study will be used to develop a national climate change mitigation policy.

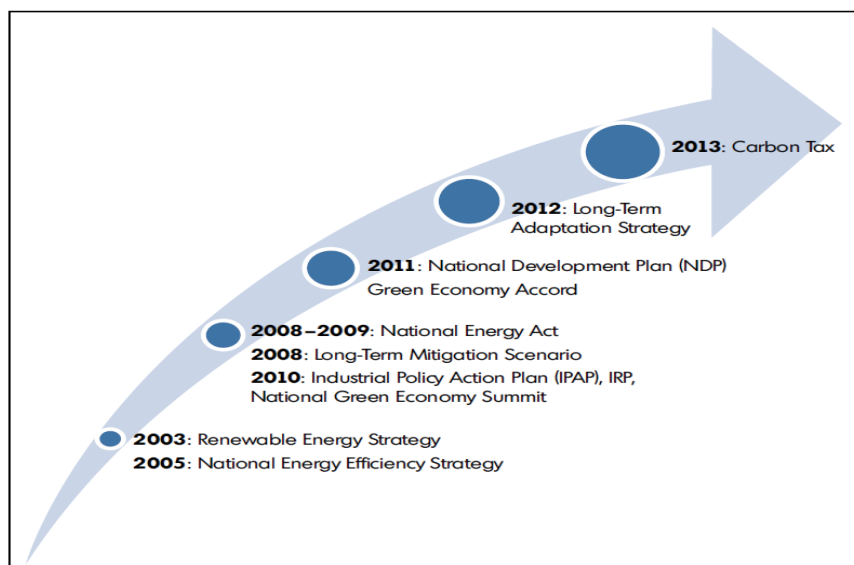
## **City of Cairo**

### ***Energy and CO2: Average***

UN Habitat estimates that almost all households in Cairo have access to electricity, but the city fares less well in curbing electricity consumption. On average, Cairo consumes 8.0 gigajoules of electricity per capita, compared with the Index average of 6.4 gigajoules. Despite high electricity consumption, CO2 emissions from electricity are an estimated 477 kg per capita, less than half of the Index average of 984 kg. Nearly 70% of the city's electricity production is based on natural gas. Egypt is a beneficiary of the Clean Technology Fund (CTF), an international multi-donor trust fund to provide financing for low-carbon technologies with the potential for reducing greenhouse gas emissions.

### ***Transport: Above average***

A major programme is under way to improve traffic congestion and reduce polluting emissions from public transport vehicles. The work is being carried out through two schemes – the Egypt Urban Transport Infrastructure Development Project and the Carbon Finance Vehicle Scrapping and Recycling Programme. Both initiatives are being developed with financial assistance from the World Bank and the multi-donor Clean Technology Fund. The urban transport project includes the provision of 1,100 new fuel-efficient buses to replace the old fleet, the construction of six bus rapid transit corridors and improvements to the traffic management system.

*Figure 10: Landmark development in South Africa's green economy space*

## Green City Policy implementation in South African Metros

Coordination and alignment of policies and actions is central to achieving climate resilience and in South African cities. Achieving climate change resilient development requires both horizontal and vertical integration of climate change into government planning, and needs to involve all sectors of society (see figure 10) (National Climate Change Response White Paper, 2011). In response for policy in action, South African cities have made significant milestones towards implementing green city policies in short to medium and long terms planning. These cities include the city of Cape Town, EThekwin metro and City of Johannesburg.

### City of Cape Town

#### *Transport: Smart Mobility*

Smart mobility innovations are being used to change current inefficient patterns and to create a much wider range of mobility options. Smart mobility is integral to urban renewal and integrated spatial design (Green is Smart, 2013). There are major changes in

public transport that are underway or planned, particularly in Cape Town. Examples include the multibillion Rand investment in the MyCiti bus rapid transit system, a major upgrade planned for the commuter rail system by Metrorail and the creation of a metropolitan transport authority for Cape Town. In addition to the hard systems, soft systems aimed at improving the public transport experience through mobile and other applications are being developed. According to Green is Smart (2013) in addition to MyCiti bus the City of Cape Town has implemented two green initiatives in their bid for lower carbon transportation system.

### ***University of Cape Town (UCT) RideLink***

In an attempt to decrease single-person car usage at UCT, UCT traffic and the Green Campus Initiative created the Ridelink Carpooling System. The system is designed to make it easier for students to find lifts with people travelling to university at similar times/areas to them. Students and staff can enter their details and search the database to find people with matching schedules at the click of a button. Special parking is allocated to people participating in the system.

### ***Green Cab***

Green Cab provides a green transport solution through the utilisation of Liquefied Petroleum Gas (LPG) and BioDiesel. LPG burns more cleanly than petrol and reduces carbon emissions by up to 34%, and harmful emissions by up to 87%. The Green Cab taxi company was set up in 2008 by four women because they "realised we cannot continue to do business as usual in the tourism sector". Green Cab claims to be Cape Town's only carbon-neutral transport service.

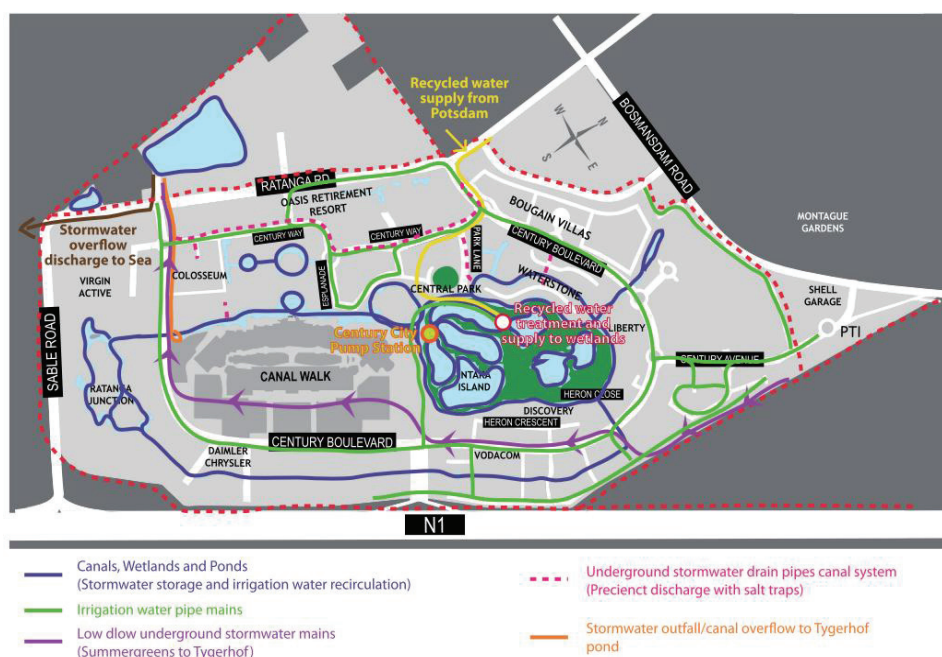
### ***Water***

According to Jennings et al (2008) Cape Town is a severely water stressed region. However the cost of water does not yet reflect this shortage nor environmental impact of water borne waste and impact of storm water systems. These are addressed in the following ways:

- Recycled water is made available from the Potsdam effluent treatment plant and treated to a level adequate for irrigation

- In addition it is further treated before being polished by the managed wetland to maintain the canal water levels
- All storm water is treated via silt traps before being attenuated in the canal system
- The managed wetlands maintain the canal water quality and a constant flow through the canals assists in oxygenation supporting aquatic life.

**Figure 11: Water supply in City of Cape Town**



The approach to view a problem rather as a solution not only reduces the off-site impact of storm water and effluent but provides a safe and significant amenity in the canals. It has been interesting to see the innovative response from building owners in the use of rainwater systems as well as the irrigation water for cooling towers supporting energy efficient cooling systems (see figure 11). With the current cost of the irrigation water well below potable water the current economic benefit will only be further

accelerated as the financial cost of municipal water starts to reflect the shortage and environmental impact.

### **City of Johannesburg**

Jo'burg is determined to create a green city, in keeping with the movement to prevent climate change and improve the environment in whatever way possible (Circo, 2007). Many of the City's development decisions are taken with the need for a green planet in mind: from greening and cleaning the environment, to reducing the energy load in buildings, to cutting carbon emissions.

### **Landfill gas to energy project**

Landfill preparation for a gas flareIn 2005, the City identified Robinson Deep, Marie Louise, Linbro Park, Goudkoppies and Ennerdale landfills as potential sites to implement a landfill gas to energy Clean Development Mechanism (CDM) project. Through the implementation of a CDM project, the City will contribute to the country's achievement of the Kyoto Protocol commitments and simultaneously generate revenue through the sale of Certified Emission Reductions (CERs) and sale of electricity generated (Schäffle & Swilling, 2013). The City of Johannesburg Environment Infrastructure and Services department initiated the landfill gas to energy CDM project in 2007. The main aim of the project is to mitigate the harmful greenhouse gases (GHG) emitted from the landfills. It is anticipated that the renewable energy generated from the project will be fed into the municipal grid, thus off-setting largely coal derived electricity (Schäffle & Swilling, 2013).

### **Green Building**

Green buildings are designed and constructed to maximise the whole life cycle performance, conserve resources and enhance the comfort of occupants. This is achieved by the use of technology such as fuel cells and solar-heated water tanks and by attention to natural elements such as maximising natural lights and building orientation (Singh & Sharma, 2014). In hybrid (mixed-income) property development sites, such as Cosmo City, as well as social housing delivery in places like Alexandra, the municipality has also introduced a pilot programme through which solar water heaters have been installed into low-income homes. Through this initiative, an attempt is being made to



construct a housing and service delivery model that not only responds to the basic needs of poor households, but does so in a manner that is consistent with energy conservation (Mokwena, 2009).

## **The Case of Buffalo City Metro**

According to South Africa's National Climate Change Response White Paper (2011) measurement and monitoring of climate change responses is critical to ensure their effective implementation. Given the nature and implications of climate change and the economic and social implications of effective climate change responses, decisions must be based on accurate, current and complete information in order to reduce risk and ensure that interventions are effective.

Buffalo City Metropolitan Municipality (BCMM) plays a vital role in addressing the Metro's social, economic and environmental needs. All South African municipalities, including BCMM, are tasked with the provision of services in a sustainable and equitable manner, the facilitation of social and economic development and the promotion of a safe and healthy environment for all people living within its domain. Climate change is already having a direct impact on the ability of many South African municipalities to meet their developmental objectives. According to BCMM's not yet adopted Draft Climate Change Strategy (2012) extended dry seasons, increasing temperatures, extreme storms and sea level rise result in drought, crop failure, livestock death, damage to infrastructure, runaway fires and will further entrench poverty with the increase of vector-borne disease, disabling of existing livelihoods and damage to household assets. These effects are further compromising the municipality's ability to provide sustainable services to its citizens.

The NCCS White Paper therefore places an obligation on BCMM to formally include climate change response in planning. In line with this, the South African Municipal Infrastructure Dialogue on Climate Change (January 2010) notes that local governments, with their task of approving and implementing development frameworks around the country, are seen as uniquely placed to tackle climate change. According to BCMM Metro Growth Strategy (2030) situational analysis BCMM has the spatial characteristics to implement green policies and environment friendly strategies.

## **BCMM Physical Landscape**

### ***Topography***

The topography of the region is characterised by a number of incised river valleys, that run nearly parallel to each other in a South –Easterly direction through the municipality and which dissect the municipality at regular intervals. This terrain lacks large tracts of flat land, impacting significantly on settlement patterns and the cost of provision of services within the Region.

### ***Geology and Soils***

The geological stratum of the Region is typical of the Karoo system consisting of mainly mudstones and sandstones infringed by dolerite dykes and sills. Much of the geology is of marine origin, giving rise to the high salinity of the groundwater in the area. The soils are generally moderate to deep clayey loams and the erodible index of the soils in the region is recorded as being medium to low.

### ***Climate***

The climate is moderate for most of the year, with hot spells from December to February, particularly in the inland areas. Although the region does receive rainfall all year round, it is primarily a summer rainfall region, with the months of June and July generally being the driest months of the year. The rainfall within BCMM varies from approximately 1000mm along the coastal belt between East London and Kwelera, gradually decreasing in a westerly direction to 500mm in the areas of the upper reaches of the Tyolomnqa, Keiskamma and Umkhangiso Rivers. In the north western portion of the region, in the vicinity of the Amatole Mountain Range, the mean annual precipitation again increases to between 1000 to 1500mm.

The Buffalo City Metro Municipality has ten (10) major river systems, nine (9) of which are considered "endangered" and the Buffalo River system is considered „vulnerable" (SANBI, 2004). In terms of aquatic systems, the National Wetlands Inventory identifies a total of 2064 wetland areas. The groundwater potential in the region is generally not good, resulting in low borehole yields (generally below 2 l/s) and high salinity waters. The north-western portion of the region has the greater groundwater potential (i.e. Peelton villages), with the potential reducing in a south-easterly direction towards the coast.

### ***Vegetation***

BCMM has a wide variety of vegetation types and the main type of vegetation types of vegetation types are spread throughout the BCMM covering 252577.5ha. The vegetation types may impact to a certain extent on the livelihood of communities as it determines the carrying capacity of the field in terms of livestock units. The scarcity of vegetation again determines whether crop production or livestock farming should be practised. The four biomes represented in BCMM are: - Albany Thicket (66.82%); Savannah (29.24%); Forest (2.73%) and Grassland (1.14%) of which twelve (12) vegetation types have been classified by Mucina & Rutherford (2006). An estimated 26.8% of BCMM area that has no natural habitat is remaining. The South African National Biodiversity Institute (SANBI) identifies no critically endangered, endangered or vulnerable terrestrial ecosystems within the Municipality.

### ***Urban and Rural Land Use Coverage***

About 9% of the land is cultivated on a semi-commercial/subsistence basis; over 10% of land cover in the municipality is degraded. The urban or built up residential land covers about 7.8% of land cover, 19,127 ha consists of Urban Land. A total of 230 rural villages exist with a total coverage of 13,339 ha. The subsistence agriculture affects the quality of the soil/land cover/environment and although important for survival, poses a threat to the species. Subsistence agriculture is evident in the densely populated rural areas with surrounding degraded land.

### ***Spatial form of the City***

The Cities spatial structures can bring about positive change through transforming entrenched settlements patterns and developing attractive environments, such as areas of high vitality intermixed with high-quality public space - that are conducive to inward migration of talent, investment, eliminate congestion, sprawl - associated with energy in efficiency (World Cities" Report 2012). The current SDF emphasize on major capital investment (housing and a diversity of economic enterprises) in the core urban areas and proposes targeting areas of opportunity and areas of need in fringe rural and per-urban areas, to upgrade existing settlements and facilitate new development opportunities in these areas" through infill - development of vacant land (i.e. infill areas) and "compaction" (Buffalo City, 2012).

***Green Opportunities based on Situational Analysis***

- Opportunity to expand agricultural production: explore innovative and sustainable agricultural approaches within the commercial farming sector and the subsistence and small-scale farming sectors;
- Opportunity to harness natural resources for feasible production of renewable energy;
- Agro-industry development through beneficiation;
- Agriculture exports, Supporting rural development and small-scale agricultural activities to retain and develop the rural agricultural skill base and rural agricultural output;
- Improving agricultural skills base, and
- Aqua-culture development.

**The environmental landscape**

The fact that cities alleviate poverty has a flip side of environmental and natural resource challenges, as Cities generally consume more energy and commodities and generate more waste, thus presenting threats to non-renewable commodities and energy sources that will become scarce (World Cities Report: 2011).

***Natural Environment***

According to BCMMD IDP (2013/14) Buffalo City has 68 km of coastline which is a significant natural asset, which includes ten (10) estuaries, conservancies, National Heritage Sites, rocky shores and fourteen (14) sandy beaches. Certain areas are near pristine, while other areas along the coast are currently over-utilised. The coastline has tremendous potential for the development of tourism, subsistence fishing, recreation and conservation. The biophysical environment in Buffalo City has got a number of pressures, including; - increased development pressure, especially along the coastline, estuaries & rivers; demand for low income housing and associated services; proliferation of informal settlements; poor sanitation, poor operational state of certain wastewater treatment infrastructure; polluting waste sites; lack of proper waste disposal facilities; illegal industrial effluent discharges and other illegal dumping; poor storm water management; overgrazing on commonage and communal land.

The pressures impact negatively on the state and quality of Buffalo City's natural environment resulting in:

- polluted water resources;
- polluted air;
- damage to the landscape and loss of biodiversity in sensitive coastal areas, natural forests and other important ecosystems (thicket);
- increased invasion by alien plant species;
- increased erosion disasters, particularly in the peri-urban and rural areas;
- loss of urban open space and environmental and health impacts.

South Africa's metros currently have per capita CO<sub>2</sub> emissions that range between 3.7 and 7.5, waste production in the order of 1 000 kg per person per annum and a Gini coefficient of between 0.67 and 0.753 (Siemens 2011, Lewis and Jooste 2012, Peters and Swilling 2012).

#### ***Types of Energy Resources***

A global phenomenon and challenge that South Africa is continually faced with, is the issue of cost effective and renewable energy. Energy is critical to virtually every aspect of the Municipality's economic and social development and depending on the manner in which it is produced, transported and utilised, it can contribute to environmental degradation. The investments in renewable energy and energy efficiency are important to reduce the negative economic, social and environmental impacts of energy production and consumption in South Africa.

BCMM would need to investigate potential alternative sources of energy to ensure a more sustainable energy mixes. The BCMM would need to investigate potential alternative sources of energy to ensure a more sustainable energy mix by 2030.

The BCM State of Energy Report (2008) highlighted some issues and opportunities associated with sustainable energy in BCMM. These are outlined here below:-

- Energy not necessarily used efficiently or sustainably - Energy demand is increasing, the focus has been on increasing supply, rather than managing demand;
- Lack of incentive to use energy efficiently;
- There are a number renewable energy, energy efficiency and carbon trading opportunities in BCMM.

### ***Climate change***

According to Makiwane (2011) the climate changes could imply that Buffalo City Municipality is faced with: - More frequent and severe flooding as a result of higher intensity storm events and possibly more frequent hail events. This will impact on human settlements, infrastructure, human health and place a greater burden on particularly impoverished communities, higher intensity storm events could create increased swell surges and higher waves, coupled with sea-level rise, potentially damaging all infrastructure on the coastline and threaten settlement in such areas, higher rainfall may increase agricultural production but, water availability could become a limiting factor, requiring increased irrigation. The small scale farming is likely to be most negatively affected. The heat waves may result in increased heat stress to plants, animals and humans and will increase associated fire risk placing livestock and grazing capacity under threat.

### ***Green Opportunities based on situational analysis***

- Opportunity to develop renewable power sources to appropriate scales drawing on the natural resources wind and smaller-scale solar radiation;
- Opportunity in linking the green economy to service delivery and employment creation requires significant investment in new technologies, new infrastructure and new means of delivering municipal services.
- Promotion of carbon budgeting approach, linking social and economic considerations to carbon reduction targets, and
- Build standards that promote energy efficiency.

### **Conclusion and Recommendation**

The effects of climate change are most evident on grass roots governance (Local Government) and level. Heavy rains, floods, droughts, soil erosion and unhealthy air to breathe affect all citizens in that region. Municipalities must plan to avert the consequences of climate change on basic service delivery issues. In addition to being responsive municipalities must be proactive by studying the problem and putting in

place measures to ensure that it will not occur in their region as expressed in SA National Climate Change Response Paper 2011.

Buffalo City has the potential in terms of its physical topography, arable land and rivers to be a world class green city. Recently it was awarded an award in this regard. Therefore BCMM is a growing rural Metro that must prioritize preventative measures to ensure that its growth does not become a problem for the environment and citizens. It needs to adopt a green city policy that set out for spatial considerations and reforms.

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**AUTHORS' CONTACT:**

**DLANI Abongile**

Dept of Public Administration  
University of Fort Hare  
South Africa  
Email: [200909703@ufh.ac.za](mailto:200909703@ufh.ac.za)

**IJEOMA EOC**

Dept Public Administration  
University of Fort Hare  
South Africa  
Email: [eijeoma@ufh.ac.za](mailto:eijeoma@ufh.ac.za)

**ZHOU Leocadia**

Risk & Vulnerability Science Centre  
University of Fort Hare  
South Africa  
Email: [lzhou@ufh.ac.za](mailto:lzhou@ufh.ac.za)