DURBAN CLIMATE CHANGE STRATEGY

ANNUAL REPORT 2018/19

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EXECUTIVE SUMMARY

During the 2018/19 financial year, Durban has continued to advance its implementation of the Durban Climate Change Strategy (DCCS), and this annual report marks an important stage in that journey. Our commitment to produce an annual report, communicating successes and failures in implementing a city-wide climate change programme, is important in terms of transparency and as a motivational tool for residents of the City. The DCCS Secretariat has undertaken to use this annual report as its main reporting instrument in the City's Integrated Development Plan reporting process from the 2019/20 financial year onwards.

The DCCS Implementation Framework sets out how Durban will advance implementation through three themes: governance, implementation and strategic development. The governance theme is now well established in Durban, with the political Climate Change Committee meeting quarterly, the Technical Task Team (TTT) meeting bi-monthly and the Subcommittee meeting in support of the TTT. The Subcommittee is developing a dashboard to support TTT decision-making by relevant Heads of Units, and this dashboard will be based on the C40 1.5 °C Climate Action Plan, which is being finalised and circulated through the City's cluster committees for approval.

Procurement is ongoing for a service provider to conduct the first five-year review of the DCCS, whilst developing an integrated implementation plan with a monitoring and evaluation framework and reporting tool. This process is expected to start early in the 2019/20 financial year and progress will be reported in next financial year's DCCS annual report. A key part of the strategic development framework is servicing the City's multiple transdisciplinary research programmes, which are managed by line functions and the City's Municipal Institute of Learning. The institute hosted its annual Research Symposium in June 2019, where much of this innovative action research was presented. A summary of the Durban Research Action Partnership activities can be found in this annual report. Finally, the City received a prestigious award from C40 for its Carbon Disclosure Project reporting during the 2018/19 financial year. This provides recognition of the hard work that has gone into Durban's climate change activities.

During the 2019/20 financial year, Durban will continue to strive to advance its climate change work with a number of work programmes laid out, as described in the projects section of this annual report, and in the way forward section. We intend to report on all activities in the 2019/20 annual report, which we aim to have ready by December 2020.

DURBAN CLIMATE CHANGE STRATEGY

DCCS FOREWORD: CHAIR EMCCC

We were reminded on 22nd April 2019 of how severely climate change is likely to impact Durban and its residents. Widespread and heavy downpours on that day turned our rivers into torrents and saturated our soils, making them dangerously unstable and resulted in serious landslides. We mourn the loss of 70 lives during these floods and are still busy counting the cost of infrastructure repairs. Following the intense drought we experienced in 2015, it is clear that adapting to climate change will become an important part of our lives and the impacts will vary from year to year. I am happy to report that eThekwini Municipality is putting in place measures to address climate change – both to adapt to its impacts and to reduce our greenhouse gas emissions. It's our way of doing our part to avoid dangerously high global concentrations of these gases which drive climate change.

During the 2018/19 financial year, the eThekwini Municipal Climate Change Committee met regularly to oversee the implementation of the City's Climate Change Strategy. A highlight of the year was the launch of the Compact of Mayors (CoM) of KwaZulu-Natal (KZN) on 13 November 2018. The CoM KZN provides political leadership and support for the Central KZN Climate Change Compact; a partnership of central KZN municipalities which aim to support each other's climate change adaptation work and integrate this work into a regional response. Details of the launch and Compact activities can be found in the Durban Adaptation Charter Annual Report, in the publications section at *www.durban.gov.za/epcpd*

Our City's engagement with the C40 Cities Climate Leadership group continues to provide substantial benefits from capacity building to programme development. As Vice-Chair representing Africa, I have continued to provide regional leadership and sought opportunities for African cities to further their own climate change journeys. Durban has engaged with three major C40 programmes, namely the Deadline 2020 pilot, Cities Finance Facility and New Buildings Efficiency programmes. We have participated in a number of C40 networks, including the newly established Urban Flooding Network, and we have won awards for our reporting in the Carbon Disclosure Project. The Deadline 2020 pilot programme has helped us develop a draft 1.5 °C Climate Action Plan (CAP), which aims to put us on a climate change trajectory that is consistent with the global aim of limiting warming to no more than 1.5 °C (which is considered the maximum limit beyond which risk increases dangerously) and preparing Durban for the impacts of climate change. The CAP will form the core of our DCCS implementation plan this year.

While we celebrate these successes, our determination to win the climate change battle is tempered by regular losses experienced by our communities and City line functions, as well as those experienced by our regional neighbours. Here my thoughts go out to residents of the cities of Pemba and Beira in Mozambique, who were devastated by cyclones earlier this year. These challenges that we share, as regional neighbours, bring us together in our fight against climate change and provide us with the motivation to partner with each other to help one another develop the capacity to act, and to act timeously.

EThekwini Municipality Mayor and Chair of the Climate Change Committee, Councillor Zandile Gumede.

INTRODUCTION

During April 2019, Durban experienced catastrophic flooding, claiming 70 lives in KZN and over R600 million in damage. Climate change is now a lived reality for most people; globally and here in Durban work continues to help us prepare for the expected impacts. Associated with this work are our efforts to reduce emissions of greenhouse gases to play our part in keeping global temperature increase to no more than 1.5 °C.

This is the first in a series of annual reports that the Durban Climate Change Strategy (DCCS) Secretariat will aim to produce to inform Durban residents of our efforts to tackle climate change, helpfully inspiring change. The report focuses on implementing the DCCS and our engagement with a number of climate change-focused international programmes. These include partnerships with C40 Cities Climate Leadership group, the Cities Fit for Climate Change Programme and our implementation of transdisciplinary action research programmes with the University of KwaZulu-Natal. Further information can be obtained by following links in the electronic text of this report, or via the contact details on the inside back cover.

Climate change international landscape

Preventing "dangerous" human interference in the world's climate system is the ultimate aim of the United Nations Framework Convention on Climate Change (UNFCCC). This international environmental treaty came into force in 1994 and the 197 parties to the Convention have met every year since 1995 to assess progress in dealing with climate change. Milestones included the 1997 Kyoto Protocol, which established legally binding obligations for developed countries to reduce their greenhouse gas (GHG) emissions. More recently, the 2015 Paris Agreement was adopted to govern emission reductions from 2020 onwards and, for the first time, brought all nations into a common cause to combat climate change and adapt to its effects.

The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping the average global temperature rise this century to well below 2°C, compared to pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5°C. Working in parallel to the global climate treaty negotiations is the Intergovernmental Panel on Climate Change (IPCC), an independent body dedicated to providing the world with a scientific evidence basis for climate change decision making. The panel's work is made possible by thousands of volunteer scientists and other experts who write and review reports, which are then reviewed by governments. EThekwini Municipality has an IPCC reviewer, an IPCC lead author (on the Special Report on Oceans and the Cryosphere in a Changing Climate) and a co-Chair for Working Group II (focusing on adaptation). The IPCC is best known for its comprehensive assessment reports, widely recognized as the most credible sources of scientific information on climate change.

During 2018, the IPCC published a Special Report, *Global Warming* of 1.5°C (SR15), which concluded that to limit average global warming to 1.5 °C, carbon dioxide emissions must fall by about 45% by 2030 from a 2010 baseline. The IPCC special report warned that failing to meet the more ambitious target of 1.5 °C would bring far higher risks to health, livelihoods, food security, water supply, human security and economic growth.

As major contributors to climate change, cities have a crucial role. According to UN Habitat, cities consume 78% of the world's energy and produce more than 60% of GHG emissions. Yet, they account for less than 2% of the Earth's surface. According to the IPCC report, limiting global warming to 1.5 °C would require "rapid and far-reaching transitions" in uses of energy, land, urban and infrastructure and industrial systems. An added challenge is the projection in a UN report that another 2.5 billion people will live in urban areas by 2050, with the most rapid growth in urbanisation in Asia and Africa. The good news is that cities around the world have begun to take measures to reduce GHG emissions and are putting policies in place that encourage the use of alternative energy sources. This annual report is Durban's account of how it supports the global climate change movement.

IPCC Cities and Climate Change Science conference

The United Nations predicts that 66% of the world's population will be living in cities within the next 30 years (compared with 55% now). Cities have the potential to become major catalysts for change in implementing international agreements such as the Paris Agreement and the 2030 Sustainable Development Agenda.

In March 2018, more than 700 academics, leaders, city officials, innovators and influencers came together to share knowledge and develop ideas on cities and climate change during the IPCC Cities Conference, in Edmonton, Canada. The work and collaboration of these leaders at this landmark conference laid the foundation for the insights and suggested pathways presented in the Global Research and Action Agenda on Cities and Climate Change Science.

It was recognised that for national governments to implement the Paris Agreement, cities will need to be empowered financially and politically to develop ambitious climate targets and to take transformative climate action. The Conference and the new Global Research and Action Agenda are considered to be two important steps in a journey to generating greater knowledge and decision-making to address climate change challenges in urban areas.

Legislative and policy framework background

The eThekwini Municipality's climate change, resilience and sustainable development work is guided by international agreements reached by the United Nations. The Paris Agreement was approved by all parties at the United Nations Framework Convention on Climate Change (UNFCCC) and ratified in 2016. The agreement provides a legally-binding framework to deal with climate change, accelerate actions and secure the investments needed for a sustainable future. South Africa is a signatory to the Paris Agreement and has a set of Nationally Determined Contributions to make towards addressing climate change globally.

The agreement brings all nations, developed and developing, into common but differentiated cause to undertake efforts to combat climate change and adapt to it.

The Sustainable Development Agenda is made up of 17 goals which came in to effect in January 2016. It calls for action to promote development while protecting the planet. The agenda highlights the aim of reducing global greenhouse gas emissions and addressing adaptation to climate change impacts as a priority. It also makes provisions for less resourced countries, noting they will need support to meet their obligations. There are now stand-alone goals on urbanisation and climate change. South Africa has shown commitment to the agenda and has adopted the sustainable development goals.

The Sendai Framework for Disaster Risk Reduction was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, in March 2015. The framework outlines seven targets and four priorities for action to prevent and reduce disaster risks for the next 15 years. The agreement recognises the primary role of state government institutions in reducing the risk of disasters, but it also notes the need for local government and the private sector to play a part.

In November 2016 South Africa and other Southern African Development Community (SADC) countries showed their commitment by developing the SADC Regional Disaster Preparedness and Response Strategy, which is in line with the Sendai Framework. The Disaster Management Amendment Act 16 of 2015 also puts emphasis on resilience and risk reduction through ecosystem and community-based adaptation. Section 53 of the Act provides a strong mandate to municipalities to conduct risk and vulnerability assessments, develop adaptation plans and allocate budget for adaptation programmes.

The South African national government is busy preparing the Climate Change Bill, a dedicated piece of legislation to guide and compel action. The carbon tax is expected to be included in the Bill, which is likely to be enacted by 2020.

Climate change impacts in Durban

Climate change is likely to affect Durban in a number of ways. It is projected that average temperatures will increase, sea-levels will rise approximately 2.7 mm per year and aggregate rainfall may increase, but rainfall will also become more variable, both in terms of inter-annual aggregate rainfall and seasonally. Extreme weather events are set to become more frequent and intense. These changes are expected to strain the city's water resources, while increasing the risk of damage and loss of infrastructure, affecting the city's economy and development. With agriculture and food security threatened, there could be an increase in cases of malnutrition, while the health of residents might be further impacted by heat-related illnesses, diseases spread by pests, such as malaria, and waterborne diseases, like cholera.

Further details on the recent C40 Deadline 2020 climate risk assessment conducted for Durban can be found here. https://ethekwini.maps.arcgis.com/apps/MapSeries/index.html?appid=4c59620219d343a1aec468b87aa0ffc5

Durban's pathway to developing the DCCS

Recognising the risk posed by climate change to the city's economic growth and its communities, the Municipal Climate Protection Programme was developed in 2004. The aim was to assist the municipality in adapting to and mitigating climate change. The programme emphasises the importance of putting climate actions into the mainstream of all municipal work. The programme was included in the City's Integrated Development Plan in 2006 and the Climate Protection Branch was formed within the Environmental Planning and Climate Protection Department in 2007. The branch is tasked with driving the city's climate change adaptation agenda.

In 2008, the Energy Office was established. The office's initial focus was on improving the efficiency of electricity use in municipal infrastructure. The mandate for mitigation was afforded to the Energy Office in 2009 ahead of Durban hosting the United Nations Framework Convention on Climate Change (UNFCCC) Seventeenth Conference of the Parties (COP17) in 2011. Hosting COP17 shone a bright light on the issue of climate change in Durban. It raised awareness among residents, sector leaders and city officials, and secured political champions to lead the development of Durban's climate change work programmes, like the Durban Adaptation Charter and the Durban Climate Change Strategy (DCCS). The DCCS was developed by the Climate Protection Branch and the Energy Office and approved by the eThekwini Municipality Council in 2015. Further details can be found on the eThekwini Municipality website here.
http://www.durban.gov.za/City_Services/energyoffice/Pages/DurbanClimateChangeStrategy.aspx

Durban beachfront erosion 2nd March 2018. Picture: Tony Carnie.

Durban beachfront erosion 3rd March 2018. Picture: Tony Carnie.

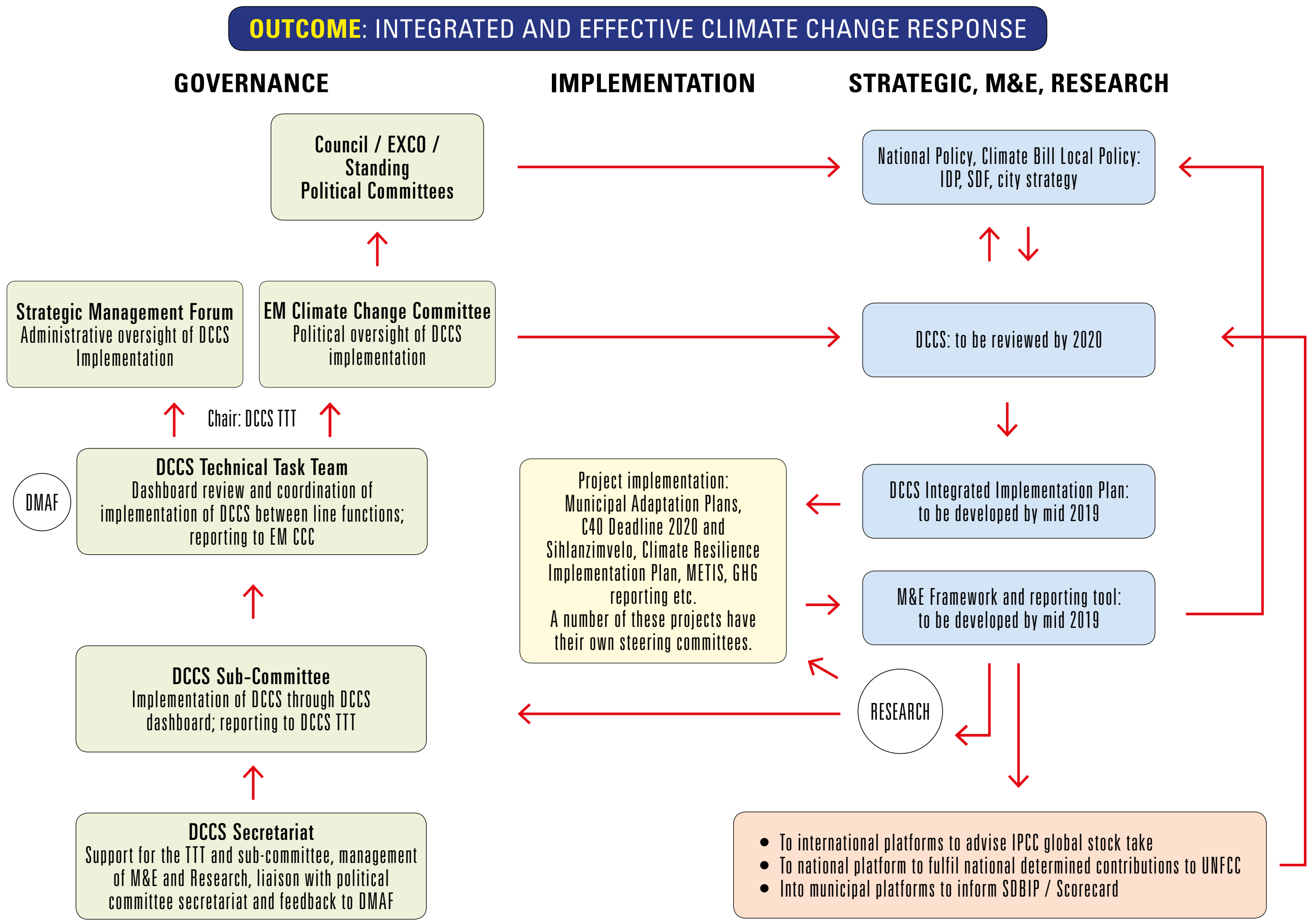
The strategy outlines a city-wide approach to integrating climate change mitigation and adaptation responses into city functions and operations. It has ten interrelated themes, of which five have an adaptation focus (Biodiversity, Water, Health, Food Security and Sea-Level Rise); three a mitigation focus (Energy, Waste and Pollution and Transport); and two are cross-cutting (Economic Development and Knowledge Generation and Awareness).

Since its approval, the implementation phase of the DCCS has been pursued, initially including six flagship programmes. A sector-based approach was adopted for the development of pilot implementation plans for the DCCS in two parallel processes, with the Climate Protection Branch leading the adaptation focused themes and the Energy Office leading the mitigation themes. Developing the implementation plans for the adaptation themes started with an assessment of adaptation programmes already being implemented in line functions. An Implementation Guidance Document was developed for the DCCS, which proposed a framework implementation for the DCCS, and is described below.

A critical analysis of the City's climate change response since 2014 can be found in Roberts and O'Donoghue (2016) [1] and Roberts et al (2015) [2]. Of particular interest is a flow diagram showing the development of the City's climate change work programme in the latter citation. This flow diagram has been updated for the DCCS Annual Report 2018/19 (see centre spread of this report) and clearly shows the progress that has been made since 2015, with the Paris Agreement emerging as a watershed moment, not only globally, but for Durban too. Another clear trait is how much of the work prior to 2015, and since, has converged around the development of the DCCS Implementation Framework and the planned first five year review of the DCCS. The rest of this report provides detail for important nodal points in the flow diagram.

The DCCS Implementation Framework

The aim of the Durban Climate Change Strategy (DCCS) is the successful implementation of an integrated mitigation and adaptation climate change response. This implementation framework was developed and approved in 2017 and consists of three themes: governance, implementation and strategic development (Figure 1). The themes are based on guidance developed during the Durban Adaptation Charter (DAC) Implementation Guidance Workshop, held in March 2013. Implementation of the DCCS is aligned with the ten principles of the DAC.
(see projects section of www.durban.gov.za/EPCPD).



Governance theme

Political oversight of the DCCS is entrusted to the eThekwini Municipality Climate Change Committee (EMCCC), which sits quarterly and is chaired by Mayor Zandile Gumede. The DCCS Technical Task Team (TTT) drives implementation of the strategy. It is a coordinating body of Heads of Units, responsible for implementing the strategy's ten themes, and making sure it achieves the strategy's stated aims and deals with any gaps in implementation. A key aim is to coordinate the climate change strategy across municipal departments and in so doing, reduce the silo effect of operations in the City.

The DCCS TTT is supported by the DCCS Subcommittee, consisting of Senior Managers and Deputy Heads responsible for implementing projects. The DCCS Subcommittee is busy developing a "dashboard" for the TTT to monitor implementation of the Strategy. The DCCS Subcommittee met for the first time on 22 January 2018, when it began developing its terms of reference and an interim dashboard. The chair of the DCCS TTT reports to the EMCCC and the Strategic Management Forum, consisting of the Deputy City Managers of City clusters.

Secretariat support for the DCCS TTT and subcommittee will be provided by the DCCS Secretariat, consisting of the two branches (Climate Protection Board and Energy Office) within the EPCPD. It is proposed these two branches will form a Climate Change Department during the 2019/20 financial year. This will strengthen the City's climate change response and improve coordination between the two Branches. The Secretariat is supported by a project officer, who provides secretariat support, among other tasks.

Implementation theme

During the 2016/17 financial year, an implementation gap analysis was conducted, and pilot implementation plans developed for the Water (flooding) and Sea Level Rise themes. Engaging with the Gesellschaft für Internationale Zusammenarbeit (GIZ)-funded Cities Fit for Climate Change programme (see report below) has allowed the city to develop the Climate Resilience Implementation Spatial Plan (CRISP) through the Strategic Spatial Planning Department.

Engagement with the C40 Deadline 2020 programme has enabled the City to secure technical support to ensure the development of a Climate Action Plan for the DCCS, which will comply with a world that limits the global temperature rise to no more than 1.5 °C, and is consistent with South Africa's Nationally Determined Contributions for the Paris Agreement. The CAP is in the final stages of development and is ready for Council approval processes. The CAP, and other climate change related work programmes in the City, will continue to be implemented in the city, while they are included in the process of developing an integrated implementation plan for the DCCS, as part of the first five-year review of the Strategy.

Strategic development, Monitoring and Evaluation and Research theme:

The DCCS Secretariat is conducting a full tender procurement process for support to develop an integrated implementation plan for the DCCS. It will incorporate existing climate change work, including any gaps, and streamline this into an integrated climate change programme. This will include the development of a monitoring and evaluation framework that will guide future reviews of the DCCS, its implementation and streamline reporting on international, national and local platforms.

Strategic development requires sound evidence derived from transdisciplinary research. It is proposed that the Durban Research Action Partnership be the vehicle that drives the development of climate and environmental change knowledge in the city. It is important that research provides the City with an evidence basis for appropriate decision-making, and synthesises learning outcomes from the monitoring and evaluation (M&E) framework and reporting process. The M&E framework and DRAP will be managed by the DCCS Secretariat.

Until the integrated implementation plan and M&E framework are developed, implementation of the DCCS with be through the 1.5 °C Climate Action Plan, communicated via a dashboard at TTT meetings. It is envisaged that the full integrated implementation plan should be ready during the 2020/21 financial year.

[1] Roberts, D. and O'Donoghue, S. (2016) Chapter 18 City View: Durban, South Africa in *State of the World: Can a City Be Sustainable?* Mastny, L. (Ed). The Worldwatch Institute, Island Press, Washington. 337 – 342.
[2] Roberts, D., Morgan, D., O'Donoghue, S., Guastella, L., Hlongwa, N. and Price, P. (2015) Durban, South Africa: Working Towards Transformative Adaptation in an African City in Bartlett, S. and Satterthwaite, D. (eds) *Cities in a Finite Planet*, Routledge, London; 96 – 115.

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ETHEKWINI MUNICIPALITY GREENHOUSE GAS EMISSIONS

Introduction

EThekwini Municipality's greenhouse gas (GHG) emissions, in per capita terms, are considered above average compared with several other large cities. This could be because GHG emissions are largely determined by the fuel sources in use and eThekwini Municipality, being an industrial port city generates a significant additional volume of emissions from fuel consumption.

Scope 2 emissions (indirect emissions produced through electricity purchased from Eskom, South Africa's electricity public utility) are the largest contributor to overall emissions. To blame is the city's reliance on electricity largely generated from coal. This confirms the point that focusing on electricity supply is crucial to reducing greenhouse gases, although recognising that the municipality has relatively little say over the grid supply.

The Durban Climate Change Strategy low carbon-related themes include transport, waste and energy. The eThekwini Municipality Energy Strategy 2008 seeks to track estimated GHG reductions from renewable energy/energy efficiency interventions compared with business-as-usual scenarios.

Energy indicators

In 2013, the total energy consumption (including aviation and marine) in eThekwini Municipality was 255,700,252 Giga Joules and the total energy demand was 191,013,550 Giga Joules. The renewable energy share was only 0.09% of the total energy supplied.

Electricity generated by eThekwini Municipality for 2014 was 41,191,818 kWh and the total electricity consumption was 11,900,000,000 kWh in 2012. Ninety-five percent of this is supplied from Eskom, which is mainly coal based. Over the last seven years it is evident that losses experienced by eThekwini Municipality in electricity have averaged around 5% and have remained constant. This is quite a good achievement when the South African average is around 8-10%.

Durban remains highly dependent on relatively 'dirty' energy. There have been efforts to reduce that dependence, where 0.4% of the total electricity consumption in Durban comes from renewable sources and where 14% of the total municipal 'own' electricity comes from renewable sources. There is potential for Durban to increase its level of generation from renewable sources and from local generation. This is supported by the fact that eThekwini Municipality spends over R6 billion a year on buying electricity from Eskom and the electricity bought from local generation is a very small percentage, totalling only 41 million kWh out of a total of 11 billion kWh, less than 1%. This provides further argument for eThekwini Municipality to focus on generating some of its own electricity supply and reducing its dependence on Eskom.

The regulatory framework is fairly new to Local Government, but concerted efforts have been made to put the necessary processes, with authorisation from other governmental institutions, in place to allow local producers of 'green electricity' to feed into the eThekwini Municipal electricity grid.

Waste indicators

In eThekwini Municipality, 100% of households have access to a basic level of solid waste disposal and 92% have access to a basic level of water provision. General solid waste accounts for the bulk of the waste tonnage and this has been increasing over the period. All municipal waste is disposed of in landfills, and wastewater treatment is via anaerobic digestion. In recent years there has also been a significant and steady decline in garden refuse going to landfill, which is a positive development.

According to the South African Waste Information Centre database about 1,198 million tonnes of waste was recycled in eThekwini Municipality in 2014. Metals contributed 68% of this total, followed by plastic (30%) and paper (2%). It proved to be difficult to get more accurate figures on waste and more particularly on recycling from eThekwini Municipality. However, it is a sector that plays an important part not only in the reduction of GHG but also in the waste-to-energy field.

Transport indicators

Road and rail transport infrastructure in Durban is mainly along two main corridors: the coastal corridor, which includes the N2 national road and coastal rail lines, and the western corridor that links the CBD with the inland areas and includes the N3 national road. Urban passenger transport in Durban is strongly reliant on public transport, with only 36% of the population having access to a car. More than half (57%) of all passenger-km is undertaken by public transport, and 39% of the total mobility is undertaken by non-motorised transport (i.e. population that walks/cycles to school or work).

In terms of growth in registered vehicles in eThekwini Municipality, from 2006 to 2014 the growth rate in heavy load vehicles is the highest, which would correlate with the data on diesel consumption within the municipality, likely associated with industrial areas and in particular, the Port of Durban. There has also been a steady increase in the private motor vehicle category which is to be expected given the population growth rate. Light passenger vehicles form by far the biggest category class within eThekwini Municipality. This supports data by the Department of Energy estimating that 66% of fuel sales relate

Vertical axis wind turbine designed and manufactured by the late Allan Rumney and Adrian Padt.

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to passenger transportation. When compared, the growth rates of light passenger vehicles is faster than that of the population growth rate of eThekwini Municipality.

Car ownership rates over the period 2015 to 2030 are projected to grow at an average rate of 8% while population growth over the same 15-year period will grow at 4.1%. Therefore, car ownership is predicted to be growing at double the rate of the population. This indicates that the issues around fuel consumption and expenditure will continue to be very pertinent for the future of eThekwini Municipality. Breaking this trend and shifting from new car ownership to public transport will require significant effort and investment; and incentivising of low emission vehicles will be critically important, but not so favourable an option when supplied via 'dirty' grid power.

Monitoring, Reporting, Verification, Evaluation (M&E and/or MRV)

This is a fundamental pillar of climate planning and implementation, as it enables the transparent tracking and reporting of activities and their impacts, typically across emissions, mitigation actions, finance and adaptation.

The DCCS states that a monitoring and evaluation (M&E) system for the climate change responses will be developed to track progress in reducing climate vulnerability and transitioning to a low carbon city. The Energy Office is working to develop an MRV system that will assist with monitoring and tracking progress over time. Although the system hasn't been developed yet for Durban (it should be developed by June 2021 as part of the development of the integrated implementation plan for the DCCS), there have been other ways of monitoring and reporting.

Durban's GHG Inventory 2016

From a mitigation perspective, the city produces a GHG inventory annually, which tracks changes in GHG emissions from the previous year. However, the inventory does not track against the city's targets and results are not used to inform future planning. The GHG inventory and progress is reported annually in the city's Integrated Development Plan and it is articulated that the Energy Office will be providing this information.

The compilation of the eThekwini Municipality GHG Emission Inventory is an important step in documenting the municipality's government and community emissions that are contributing to human induced climate change. The 2016 inventory suggests that total GHG emissions have increased from 27,067,912 tCO2e in 2015 to 28,417,885 tCO2e in 2016. The largest contribution to this footprint was the transportation sector (39% of the total GHGs) followed closely by Industry emissions (33%). Further details can be found in the eThekwini Greenhouse Gas Emissions Inventory 2016 in the GHG inventory section of the Energy Office web page: http://www.durban.gov.za/City_Services/energyoffice/Pages/GHG-Inventory.aspx

C40 CITIES CLIMATE LEADERSHIP GROUP

Over half of the world's population lives in towns and cities and this is expected to increase to about 70% by 2050. Cities have a significant role to play in adapting to the impact of climate change and reducing carbon emissions. Since the early 2000s, Durban has been playing a leading role in recognising the need to adapt. In 2015, Durban joined the C40 Cities Climate Leadership Group – a network of global megacities that are taking bold climate action, leading the way towards a healthier and more sustainable future.

Following the local government elections in South Africa in 2016, the new eThekwini Municipality Mayor, Her Worship Councillor Zandile Gumede was elected C40 Vice-Chair representing Africa.

As Vice-Chair, Her Worship participates in the C40 Steering Committee on behalf of all African cities, representing our interests and advocating for climate action and support. Cllr Gumede oversees a number of city initiatives with C40, including the Deadline 2020, the New Buildings Energy Efficiency, the Cities Finance Facility and the Urban 20 Sherpa programmes, as well as Durban's participation in a number of C40 networks.

Deadline 2020 and Durban Climate Action Plan

Commitment to the Paris Agreement motivated C40 to research how member cities can deliver the goals set out in the Agreement at a city-level. In December 2016, C40 launched pioneering research, called Deadline 2020, demaonstrating that the global carbon budget is running out. We have until 2020 to make far-reaching changes to prevent global average temperatures exceeding 1.5°C and to show how cities can make the transition. To support cities to meet the outcomes of the Paris Agreement, C40 started a Climate Action Planning Pilot Programme and developed a Climate Action Planning Framework. Durban was among the cities selected to pilot the 1.5 °C Paris compatible Climate Action Plan (CAP).

Developing an ambitious CAP that responds to the four criteria within the C40 Framework will enable Durban to address its climate needs and other sustainable development goals, especially those with a social and environmental focus. Durban's CAP is in its final stages of development and will be submitted to the City Council for approval early in the new financial year.

Priority interim and long term targets for climate action in Durban

Theme	Medium term - 2030	Long term - 2050
Electricity *"Durban is a carbon neutral city"*	40% of Durban's electricity is supplied by renewable energy	100% of Durban's electricity is supplied by renewable energy
	30% of all buildings are energy efficient	100% of all buildings to be energy efficient
	All new buildings to be net zero carbon	
	All municipal infrastructure to be net zero carbon	
Transport *"All citizens have access to clean, efficient, affordable transport"*	55% of all passengers use public and non-motorised transport	70% of all passengers use public and non-motorised transport
	Shift 20% of vehicles to low emission vehicles	Shift 70% of vehicles to low emission vehicles
Waste *"Waste is recognised as a resource and waste management is smart"*	Divert 50% of waste from landfill	Divert 90% of waste from landfill
Water "There is sufficient access to clean water for all"	Increase alternative water supply capacity to meet 100% of escalated demand resulting from climate change impacts.	
Health *"All citizens are safe and healthy"*	Air quality in Durban complies with National Ambient Air Quality Standards	Air quality in Durban complies with World Health Organization (WHO) Standards
	Promote implementation of heat mitigation measures to maintain urban heat levels at average 2005 – 2015 temperatures	
Ecological infrastructure *"Ecological infrastructure is protected"*	Transform 3600 km of riverine corridors to be climate resilient, clean, safe and healthy	Transform 7400 km of riverine corridors to be climate resilient, clean, safe and healthy
Flooding	80% of eThekwini's drainage infrastructure is upgraded to respond to increased flooding	100% of eThekwini's drainage infrastructure is upgraded to respond to increased flooding

Durban CAP summary:

As part of the process to develop the CAP, the city developed three critical pieces of work, including modelling emissions reduction scenarios for priority sectors; updating climate projections in line with the Intergovernmental Panel on Climate Change's (IPCC) Representative Concentration Pathways and a climate change risk assessment (which led to the development of an online tool) and highlighted areas in the city most vulnerable to climate change.

CAP Priority Actions:

The CAP development process builds on the existing work of the city, particularly the DCCS, and aims to align strategic documents. The CAP development process adopted the themes outlined in the DCCS, namely: Energy, Transport, Water, Waste and Pollution, Biodiversity, Health, Food Security, Sea-level Rise and Urban Flooding. A new category, 'Building Resilience in Vulnerable Communities' was added to ensure the protection of vulnerable communities was made a priority. The themes of Economic Development and Knowledge Generation and Understanding are acknowledged as cross-cutting and thus embedded within all the other themes.

The CAP contains 149 sub-actions, now summarised to 29 high-level actions with targets (refer to Box below), timeframes and the financial implications for implementation. The actions outlined in the CAP are in line with the city's ambition to be a climate resilient and low-carbon economy.

The MILE Learning Note

The project team partnered with the eThekwini Municipal Institute of Learning (MILE) to develop a project learning journey – a document outlining the process for developing the city's Climate Action Plan. The document notes the challenges and some of the learning outcomes of this process. This learning note will be used as an information sharing tool and MILE training modules for other cities, locally and internationally, developing their own climate action plans. The document will be finalised by the end of August 2019.

C40 Cities New Building Programme

The C40 New Buildings Programme aims to develop regulations, policies and programmes to ensure new buildings are energy efficient. Energy used in buildings accounts for nearly a quarter of the greenhouse gas emissions produced by South African cities, so actions that make buildings more efficient have considerable potential to reduce emissions.

There has been good progress during 2018/2019. Approval has been obtained from the Economic Development Committee to begin drafting a by-law for green buildings. In fact, a section of the municipality's rates policy for 2019/2020 already provides for such policy. The City is also developing a green building incentive policy.

Another initiative involves developing a technical guide for energy in subtropical climates. This is being done in collaboration with the American Society of Heating, Refrigerating and Air-Conditioning Engineers. Meanwhile, a survey has been commissioned for 2019/2020 to gauge the extent to which new buildings comply with existing energy standards.

The city also plans to ramp up efforts to meet its C40 commitments and is working to ensure new buildings are net zero carbon by 2030. Typically, this is achieved by highly energy efficient buildings, powered by renewable energy sources and offsets. The goal is to make existing buildings, including municipal buildings, net zero carbon by 2050.

Other important work for the year ahead includes drafting legal mechanisms that will bring together the Spatial Planning and Land Use Management Act, Development Planning, Building Control, and Electricity bylaws. The updated regulations and policies will build on and improve existing systems, implementing the South African National Standard 10400 XA, rather than creating a new system.

The legal mechanism will aim for a more unified approach that is consistent with systems followed by other C40 South African cities, while sharing information and liaising with national government departments. Implementing is important so that the municipality sets a good example, and it will be assessing its own new projects to ensure it is building green.

DURBAN CLIMATE CHANGE STRATEGY

Cities Finance Facility and Sihlanzimvelo Stream Cleaning

The C40 Cities Finance Facility (CFF) is a joint project of the C40 Cities Climate Leadership Group (C40) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, funded by the German Federal Ministry for Economic Cooperation and Development, the British Department for Business, Energy and Industrial Strategy as well as the United States Agency for International Development (USAID). It is implemented by a partnership of GIZ and C40. The objective of the CFF is to reduce greenhouse gas emissions and make cities more resilient by mobilising finance for city-level climate change action.

Sihlanzimvelo Stream Cleaning Programme

Excessive solid waste and alien vegetation in eThekwini Municipality river corridors increase the risk of blockage at river crossings as well as erosion and flooding. The more intense rainfall that climate change is expected to bring suggests flooding will be more frequent. Dealing with blocked pipes and culverts will become more urgent, while higher temperatures are likely to increase the spread of disease through, for example mosquitoes. This will need more disease vector control.

The Sihlanzimvelo programme was implemented to address waste, blocked culverts and road damage. This work under the Municipality's Engineering function has emerged as a critical mechanism to adapting to climate change. The programme is also designed to tackle the poverty of communities living near watercourses by creating jobs and small business development.

The pilot programme is being run in the upper catchment streams of the isiPhingo River, in the south of eThekwini Municipality, and the uMhlangane River, in the iNanda, Ntuzuma and KwaMashu (INK) region, in the north. INK is home to up 16% of eThekwini Municipality's population. Less than one-third of the region's population have jobs and over three-quarters of households earn a combined household income of less than R2,000 a month. The uMlazi Township, which is skirted by the isiPhingo River, is home to 11% of the municipal population.

The Municipality contracts service providers to support and monitor cooperatives to maintain a 3m strip on either side of 5km stretches, within the 300km of streams covered by the programme. This includes cutting grass, clearing blockages and removing litter and alien vegetation. The cooperatives are paid R340,000 per year per 5km strip maintained, which brings the total annual cost to the City to about R 26 million.

The project was launched in August 2018 and has made good progress. There are plans to extend the concept to other municipalities in the region.

The Sihlanzimvelo project team hosted Mr Pedro Ribeiro, C40 Urban Flooding network lead during a site visit in July 2018.

DURBAN CLIMATE CHANGE STRATEGY

C40 Urban 20 Sherpas

Urban 20 (U20) was developed under the Mayor of Buenos Aires, Horacio Rodríguez Larreta, and the Mayor of Paris and Chair of C40 Cities, Anne Hidalgo in 2017. The initiative is chaired by the two cities and convened by the Climate Leadership Group of C40 Cities, in collaboration with United Cities and Local Governments.

U20 seeks to coordinate a joint position between the mayors of the main cities of the G20 and other global urban centres to inform and enrich G20 Summit meetings. The most recent meeting was in Milan on 5-6th March. The initiative attempts to raise the profile of urban issues within the G20 agenda and will be a stepping stone to ensuring a dialogue between the U20 cities and the G20.

Urban 20 is composed of 25 global cities: Beijing, Berlin, Buenos Aires, Chicago, Durban, Hamburg, Jakarta, Johannesburg, London, Los Angeles, Madrid, Melbourne, Mexico City, Milan, Montreal, Moscow, New York, Paris, Rio de Janeiro, Rome, Sao Paulo, Seoul, Sydney, Tokyo, and Tshwane.

This text was adapted from: http://www.urban20.org

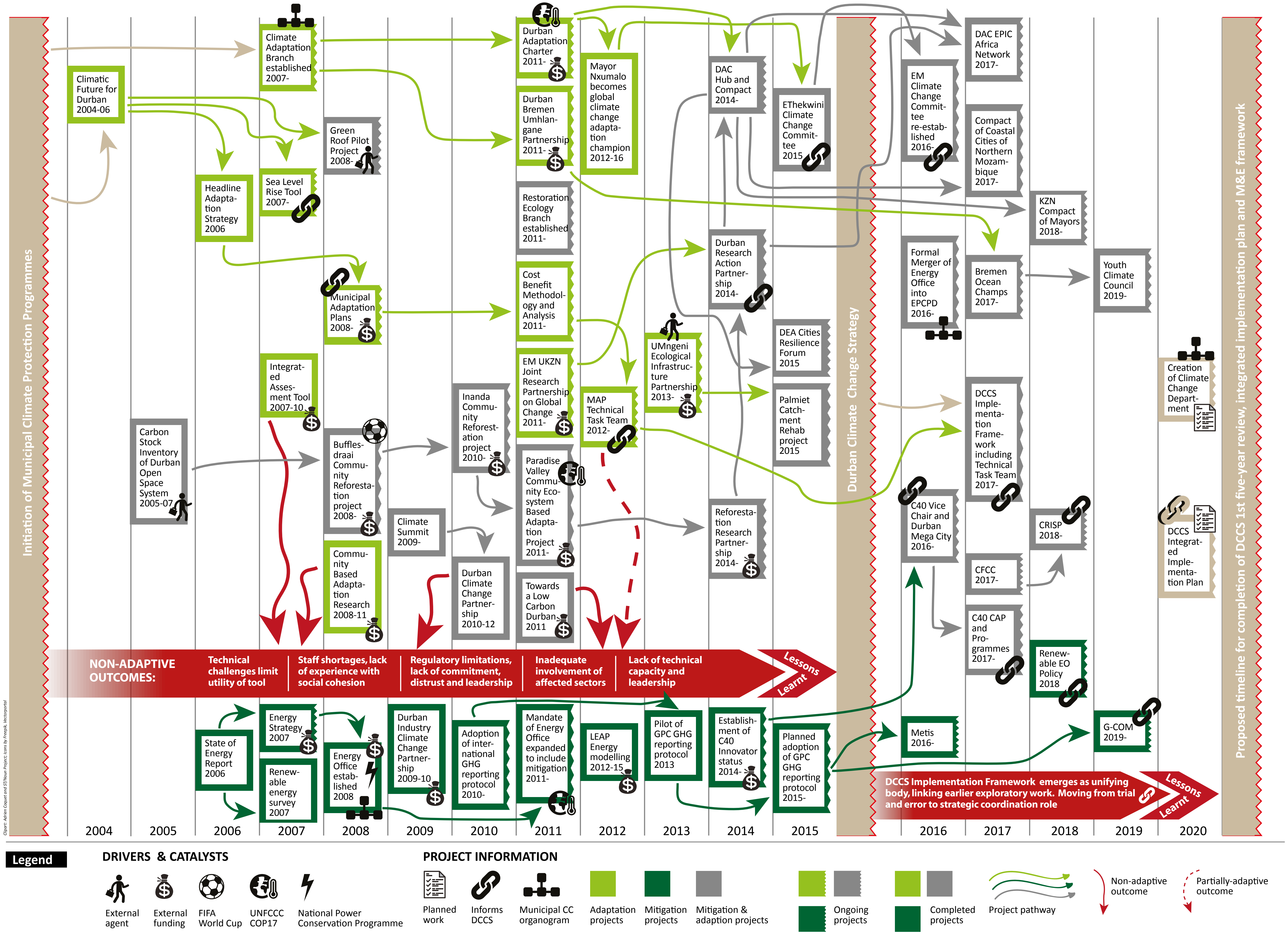
C40 Networks

EThekwini Municipality is engaging in a number of C40 Networks, including Coastal Delta Cities, Cool Cities and Urban Flooding. Participation in networks brings opportunities to learn from other cities that have faced similar challenges and access to support. Durban hosted a C40 Urban Flooding webinar on the Forecast Early Warning System in December last year, and attended the Urban Flooding network global workshop this year, amongst other activities. A C40 Network reporting template is being developed by the DCCS Secretariat to help monitor progress across all networks.

Participants of the C40 Urban Flooding Network global workshop in Sao Paolo, June 2019.

DURBAN CLIMATE CHANGE STRATEGY

Municipal Climate Change Work Flow Diagram 2004-2020



DURBAN CLIMATE CHANGE STRATEGY

CITIES FIT FOR CLIMATE CHANGE

Partner cities Durban (South Africa), Chennai (India) and Santiago (Chile) are part of the Cities Fit for Climate Change (CFCC) programme, with help from international actors and funders, including Germany and Sweden. The programme aims to strengthen cities in their sustainable development programmes and supports the development of integrated, resilient and low carbon instruments for urban development. It is part of the International Climate Initiative, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

Lessons learned from existing projects are analysed and the partner cities are supported, with the overarching goal of making climate change an integrated and strategic part of urban development.

Overview of project activities (governance)

EThekwini Municipality has a global reputation for being at the forefront of addressing climate change. It is an active member of several international networks on climate change and has renowned climate change experts among its staff.

City representatives expressed strong interest in the CFCC programme, requesting its support in structural local governance changes rather than limiting itself to implementing projects. The key partners in the Municipality are the Strategic Spatial Planning Branch, the Energy Office (Climate Change Mitigation and Energy), and the Climate Protection Branch (Climate Change Adaptation). They have been responsible for driving the project in the municipality and coordinating with other departments, for example stakeholder consultation activities when developing the Climate Resilience Implementation Plan for Spatial Planning (CRISP).

The CFCC project initiated a steering committee in the municipality that consists of its partners and other departments involved indirectly in the project through the CRISP, such as Coastal, Storm water and Catchment Management; Water and Sanitation; Transport; Economic Development; and Land Use Management. The CFCC Steering Committee is a platform for exchange among partners in the municipality, reporting on progress, and for seeking comment and support for activities. The project's partners are the national Department of Co-operative Governance and Traditional Affairs, the South African Local Government Association and the Department of Environmental Affairs.

Flooding in Durban following the storm of April 22nd 2019.

CRISP: Breaking down the silos in urban development planning

The eThekwini Municipality has adopted CRISP as a tool for promoting the integration of the municipality's climate change response and its spatial planning. The CRISP has taken recommended adaptation and mitigation actions from the Durban Climate Change Strategy (DCCS) that are relevant to spatial planning and integrated these into the Municipal Spatial Development Framework (MSDF) and lower-order plans. The MSDF is the spatial development master plan for the city. Through CRISP, the master plan reflects specific climate-resilience actions across the ten DCCS themes and proposals that sectors must manage and implement as part of their sector plans.

The CRISP can help to modify or complement existing sector plans. This encourages more collaboration between departments and actors and requires dealing with climate risk proactively. Actions include identifying areas of open space that could provide flood mitigation services or amending land use schemes to accommodate new renewable energy projects.

Other examples include establishing a working group to identify where coastal infrastructure, which is at risk from rising sea levels could be relocated.

The CRISP can help to identify priority transport nodes, priority feeder-routes, stations and transport corridors and promote densification around transport nodes. Once integrated in the city's budgeting and development planning process, implementation of these actions can occur and help make the city more climate-resilient.

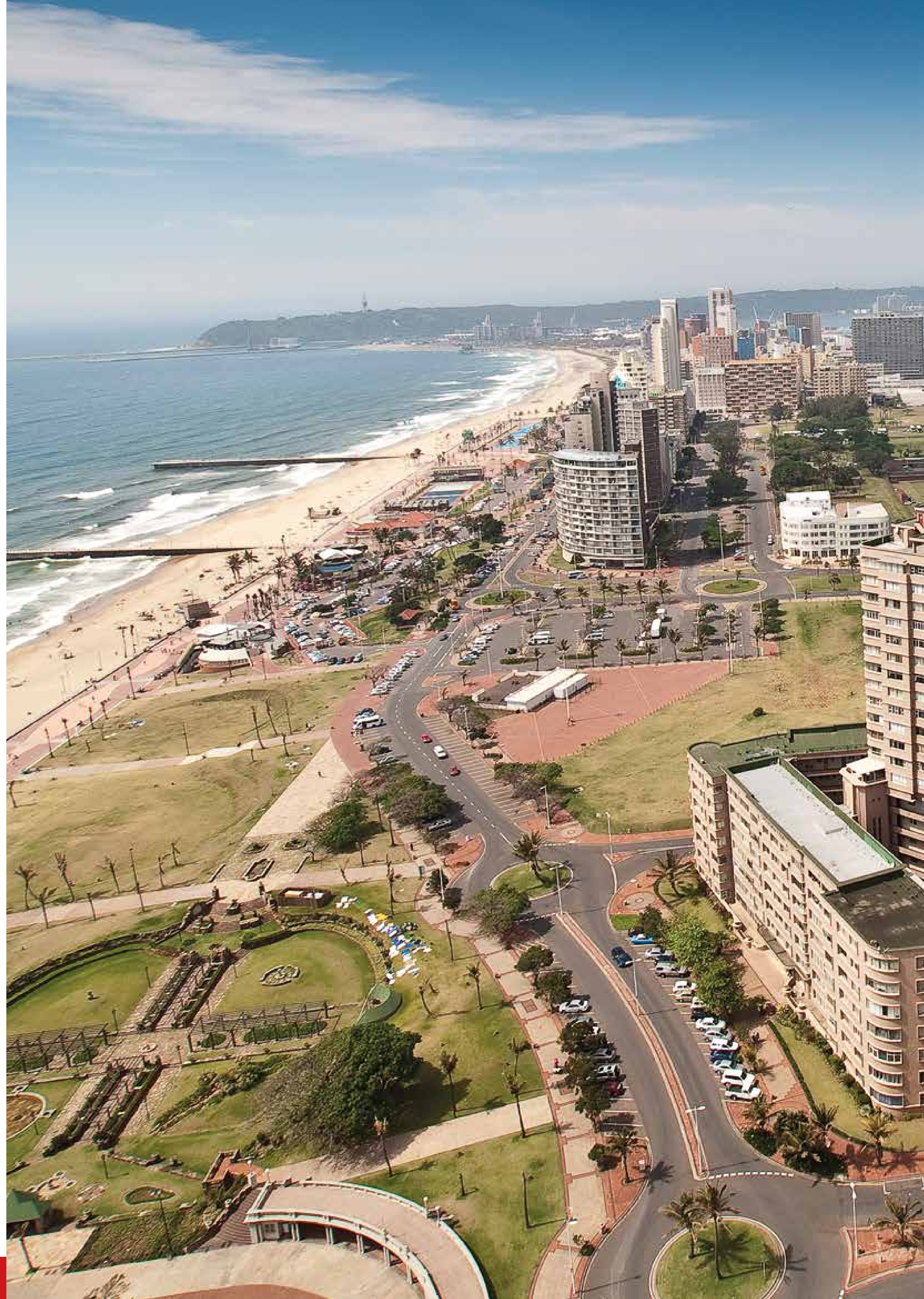
The final MSDF for 2017/2018, was accepted and approved by the Council in May 2017 and provided a legal mandate for departments to act. One of the most important results of the CRISP has been to help break down the "silo" culture prevalent in many government organisations and cities around the world. It has also helped to shape the Climate Action Plan developed by the city. Implementing the CRISP results into citywide and sector planning and budgeting processes has been continuing since September 2018 and formed part of the annual MSDF review.

isiPhingo Urban Design Climate Workshop

To enhance eThekwini Municipality's regeneration initiatives in its isiPhingo area, an Urban Design Climate Workshop was conducted by the Urban Climate Change Research Network (UCCRN – *www.uccrn.org*) in Durban, in February 2019. UCCRN is a worldwide research network that specialises in urban climate change research and includes eThekwini Municipality (Durban) as the main African hub in its global knowledge network. The workshop was supported by GIZ through the CFCC programme.

The UCCRN workshop sessions allowed officials from the eThekwini Municipality to integrate and scale up mitigation and adaptation principles by reducing energy consumption, strengthening urban climate resilience, and enhancing human comfort and quality of life. Through the engagement of the City Teams, the workshop demonstrated that through energy-efficient urban planning and urban design, compact urban districts can work better. Synergies can be achieved with high-performance construction and landscape configuration to create interconnected, protective, and attractive urban areas that promote mitigation, adaptation, resilience, and transformation.

Participants of the isiPhingo Urban Design Climate Workshop site visit.



DCCS IMPLEMENTATION DURING 2018/19

The DCCS Implementation Framework is described in detail in the Introduction section above. The framework has three themes: governance, implementation and strategic development. This section describes progress in implementing the themes during 2018/19 financial year.

Governance:

The Technical Task Team (TTT) provides an effective, cognisant and synergised response towards implementing the DCCS. The TTT maintains compliance with existing municipal governance structures, by reporting and accounting its actions to the Strategic Management Forum, and all statutory Section 79 Committees as well as the including the EThekwini Municipality Climate Change Committee (EMCCC). It is supported by a sub-committee of Deputy Heads and Senior Managers who coordinate implementation across projects.

During the 2018/ 19 financial year, the EMCCC convened quarterly and the DCCS TTT monthly, (until March 2019, when it was agreed by the TTT Quorum that a bimonthly approach would be acceptable). During this period the TTT adopted a set of Terms of Reference (ToRs) for TTT participation. The Heads of Units also nominated their management representatives (at the level of Deputy Heads and Senior Management) to participate in the Subcommittee. The Sub-committee convened towards the end of the financial year to begin the process of developing an implementation dashboard for TTT decision-making. Projects being implemented that address the ten themes of the DCCS are evaluated for their contribution towards implementing the DCCS.

Implementation theme

During the 2018/19 financial year, the draft Climate Action Plan (CAP) was developed. Once approved by Council, the CAP will function as an interim implementation plan for the DCCS. An integrated implementation plan will be developed over the next two financial years to pull the various climate change-focussed strategies and action plans into a single coordinated response, which will be implemented throughout the City.

Strategic Development theme

Currently, the DCCS Secretariat is in the final stages of appointing a service provider to lead the development of the integrated implementation plan. This process will include the first five year review of the DCCS and the development of a monitoring and evaluation framework and reporting tool. Reporting will align, as far as possible, with the city's international, national and local reporting commitments, and will be underpinned by the City's research programmes. One such example is the Durban Research Action Partnership, which is described below.

Climate Change Research in eThekwini Municipality

Implementation of the Durban Research Action Partnership

The complex impacts of climate change and the climate protection role of ecological infrastructure can be better understood through scientific research. To do this, the eThekwini Municipality formed a research action partnership with the University of KwaZulu-Natal (UKZN) in 2011. Known as the Durban Research Action Partnership (DRAP), the aim was to jointly develop knowledge to guide projects. Positive results have been achieved in improving our understanding of ecological infrastructure and building the capacity of students and municipal officials.

Within DRAP, the Global Environmental Change (GEC) research programme aims to improve our land use management decisions for climate change adaptation. This includes quantifying the ecological impacts of climate change, understanding the socio-economic benefits of ecosystem-based services and the role of ecological infrastructure in water security and biodiversity conservation. Another aim is to define the ecological processes and enhancements that underpin these benefits. A significant benefit of the partnership has been the emergence of a local pool of scientific talent over the past ten years.

By working with the UKZN in co-designing research projects, the municipality continues to make informed decisions, backed by research. For example, our understanding of informal settlement dynamics has improved while working with researchers from the university's School of Built Environment and Development Studies. This trans-disciplinary research guides implementation of the DCCS and helps to bridge the gaps between research, action and policy.

Global Environmental Change Research Programme: Phase 3 (2019-2021)

Research is just beginning in this third phase of the GEC programme, which started early in 2019 and will run to the end of the 2021 academic year. The focus of this phase will be Rivers: Source to Sea. DRAP supports two other research programmes that are mid-stream: the Sustainable and Healthy Food Systems (SHEFS) and the NRF Community of Practice (CoP) research programmes. DRAP is also planning for the second phase of the Reforestation Research programme.

DURBAN CLIMATE CHANGE STRATEGY

These programmes will guide implementation in the following themes of the DCCS: Water, Biodiversity, Food Security, Health, Energy, Waste and Pollution and Economic Development. Having a DRAP Steering Committee does help to attract funding from international and national research organisation, like the Wellcome Trust and the National Research Foundation, which are funding the SHEFS and CoP research programmes respectively.

Significant achievements have been made in the DCCS themes researched, but translating research outputs into action, while important is challenging. Successful implementation of research findings ensures that actions are backed by scientific evidence and leads to policy change or shifts. For the KwaZulu-Natal sandstone sourveld research programme (Phase One of GEC) this was done through the development of a set of guidelines for the management of this ecosystem. For D'MOSS (Phase Two of GEC), this took the form of an embedded researcher who worked with the Biodiversity Planning Branch to develop a monitoring framework to track environmental change in Durban.

EPIC A: Developing lessons from the Quarry Road West Informal Settlement

EThekwini Municipality is collaborating in a pilot research project known as the Educational Partnerships for Innovation in Communities – Africa (EPIC-A). The City and UKZN have piloted an EPIC-A programme in the Quarry Road West Informal Settlement (QRWIS), with plans to use lessons learned from this settlement elsewhere.

The aim of EPIC is for universities, cities and communities to work together to develop an understanding of communities' challenges, for example in QRWIS, to achieve significant outcomes for all involved. An EPIC partnership fosters community innovation and leverages untapped university expertise to solve real community problems, while giving students the applied learning experiences they need. Some of the priority issues identified in QRWIS include waste collection or management, water pollution, water quality and climate adaptation strategies.

A first tranche of interns for the EPIC-A pilot focussed on these long-term challenges, however, the flood event of April 22nd, which badly affected this settlement, has shifted the research towards looking at disaster risk reduction and management, and how the resilience of this community can be enhanced during extreme weather events. Here, the flexibility of the EPIC-A approach provides a neat example of the benefits of this approach to transdisciplinary research. An important outcome of working with communities was the role played by a Flood Early Warning System in safeguarding human lives.

Participants in the DRAP student research symposium 2018.

Palmiet Catchment Rehabilitation and the Durban EPIC-A pilot

Waste, industrial pollution and alien vegetation infestations have harmed the health of eThekwini's rivers and streams, with a huge impact on water security. Affecting the Palmiet River are sewage discharge, industrial effluent and the dumping of solid waste, including waste from the QRWIS, near the confluence with the uMngeni River. The loss of natural vegetation in the catchment, and changes to its hydrology through storm-water engineering interventions have exacerbated the impact of extreme rainfall events in the catchment, resulting in erosion, flooding and sewage discharge. Flooding on April 22nd resulted in infrastructure damage to the QRWIS. Climate change is expected to make matters worse.

EPIC-A students working with the Quarry Road West informal settlement community to identify houses damaged by the April 22nd floods.

The Palmiet Catchment Rehabilitation Project (PCRP) is an innovative shared-governance approach to catchment-scale ecological infrastructure management with a climate change adaptation focus. The project focuses on conserving, rehabilitating and restoring natural systems in the catchment to improve community resilience to climate change. The project owes its success to an interdisciplinary approach to the effects of climate change in the informal settlement. It involves researchers from the University of KwaZulu-Natal (UKZN) and key stakeholders working together in a community of innovation.

The university continues to play an influential role in this shared governance system and leads the research part of the project. For example, UKZN researchers recently helped the community to map the settlement, including locating their structures and identifying risks. It was an important step in the community taking ownership and driving the project.

The PCRP provided the perfect place for Durban to pilot its EPIC-A project, with two sets of interns producing research to guide implementation in this project. The second set of interns has now begun working with the Disaster Management Unit to understand and reduce risk in informal settlements, through lessons learnt at the QRWIS.

April 22nd flooding in the Quarry Road West Informal Settlement.

DURBAN ADAPTATION CHARTER

The Durban Adaptation Charter (DAC) was the historic outcome of the Durban Local Government Convention held in Durban, South Africa, in 2011, during the 17th Conference of the Parties of the UN Framework Convention on Climate Change (COP17). The DAC commits signatories to ten principles of best adaptation practice (see DAC annual reports in the publications section at *www.durban.gov.za/EPCPD*), which align with the articles in the Paris Agreement.

This has been a year of innovation for DAC implementation through the Hub and Compact approach. Besides the regular focus on city-to-city learning exchanges and climate change compact activities, the DAC Secretariat has worked closely with the global secretariat for Educational Partnerships for Innovation in Communities-Network (EPIC-N) to host an African research network called EPIC-A. Durban also hosted an Urban Design Climate Workshop in collaboration with the Urban Climate Change Research Network (UCCRN) in isiPhingo.

During 2018, the Central KZN Climate Change Compact hosted a city-to-province learning exchange with an Mpumalanga provincial Cooperative Governance and Traditional Affairs delegation. Developing transdisciplinary research partnerships was a key focus and establishing a provincial Compact the intended outcome. The Provincial delegation has indicated that they will be launching their compact in November 2019. EPIC is a model for transdisciplinary research partnerships between cities and universities to harness the power of students to address sustainability challenges in communities (*http://www.epicn.org/*). Following a training event in Cape Town in December 2017, a nascent EPIC Africa network was launched, which Durban co-Chairs. Members have worked hard during 2018/19 to establish their EPIC-A network and support implementation within the three pilot cities (Durban, Lusaka and Nairobi), as well as to extend the network to other cities (*https://www.facebook.com/epicn.africa*). Funding has been secured through the United States Environmental Protection Agency's advocacy efforts to host a second training session in Durban early in 2020. This will help expand the EPIC-A network.

The Central KwaZulu-Natal Climate Change Compact (CKZNCCC) continued to meet quarterly and is going from strength to strength. The highlight of the year was the launch of the Compact of Mayors in KZN. The Compact is providing political support for climate change work in member organisations. The CKZNCCC also started moving from capacity building towards support for coordinated implementation. Through the C40 Cities Finance Facility's support of Durban's Sihlanzimvelo programme, Compact members will apply to join as satellite cities and realise similar benefits as Durban, and push for coordinated implementation of the Sihlanzimvelo programme. This programme employs community cooperatives to manage 5km stretches of water courses in two pilot areas in Durban. The cooperatives handle a range of river management activities which, on aggregate, should be a cheaper and more effective method of river management and bring benefits including flood risk reduction, health benefits and improved security.

In the Compact of Coastal Cities of Northern Mozambique, the winds of political change blew in 2018, with local government elections heralding a change in political leadership in some of the Compact members. That notwithstanding, some important climate change achievements are noted in the Compact section of the 2018 DAC Annual Report, including strengthening participation in the global Covenant of Mayors, reporting on the carbonn Climate Registry and building capacity in other Mozambican cities.

The DAC Secretariat had a successful year with one of its early partners, the Urban Climate Change Research Network (UCCRN). This included participating in an Urban Design Lab Session in the Adaptation Futures Conference in Cape Town in June.

The session was a precursor to the Urban Design Climate Workshop (UDCW), held in Durban in February 2019. It focused on the redesign of isiPhingo; a satellite city in the south of Durban that was subjected to severe flash flooding in October 2017. The UDCW formed part of a triad of engagements with the City's Development Planning, Environment and Management Unit staff to build their climate change capacity. The DAC Secretariat have also been working with UCCRN researchers to develop a special edition for the Ocean and Coastal Management Journal looking at coastal adaptation in small cities and towns.

The DAC Secretariat continued to work with the South African National Government through the Cities Resilience Forum during 2018. The Forum seeks to link the country's eight metropolitan municipalities with national government departments through the Department of Environmental Affairs. The Forum provides an opportunity for the metros to contribute to policy development in South Africa. During 2018, this included developing the Climate Change Bill and the National Climate Change Adaptation Strategy.

The production of the DAC Annual Report, maintenance of the DAC website and representation of the DAC at international, national and local events were the main forms of DAC communication in this recent financial year. This was supplemented by ad-hoc articles published on other websites e.g. Global Adaptation Network article on the Mozambican city-to-city exchange series with Durban.

At the launch of the Climate Change Compact of Mayors are: King Cetshwayo District Mayor and deputy chairwoman of SALGA KZN, Ntombenhle Nomfundo Penelope Mkhulisi, the then MEC for Economic Development, Tourism and Environmental Affairs (and now KZN Premier) Sihle Zikalala, eThekwini Mayor Zandile Gumede, and KwaDukuza Mayor Ricardo Mthembu.
Picture: Romita Hanuman-Pillay

LINE FUNCTION PROJECTS

This section of the annual report show-cases some of the innovative climate change-related projects that are being implemented as either pilots, full-scale projects or strategies. This is by no means an exhaustive list, but rather a selection of the type of innovative work being done in the City.

Durban Resilience Strategy

The Durban Resilience Strategy was developed previously, and this year the focus has been on developing an implementation plan. Implementation is the responsibility of a number of line functions and a dedicated line item budget is still to be allocated. Two of the strategy's chief aims are reducing the vulnerability of informal settlements to climate change and improving the resilience of communities in traditional governance areas.

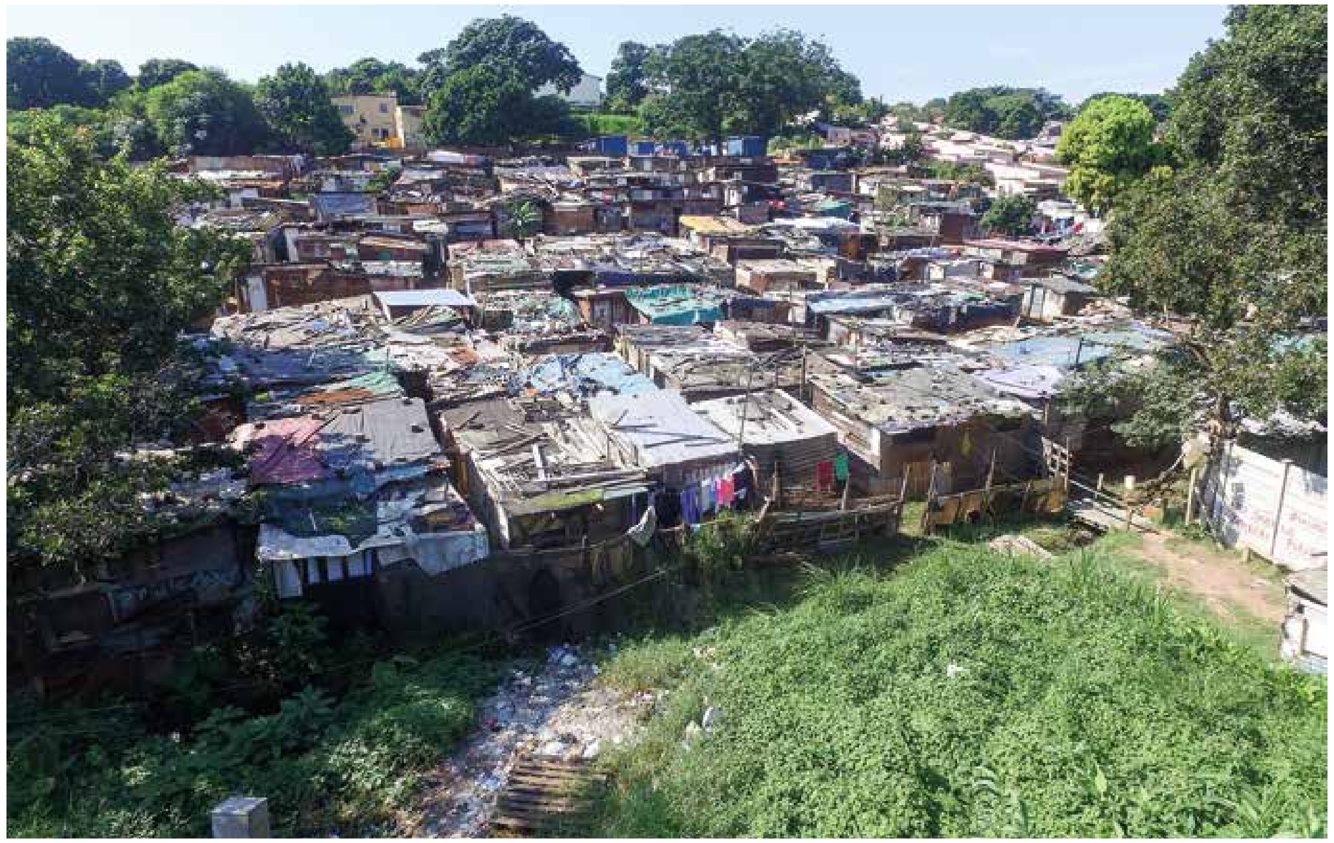
Fostering collaboration around informal settlement is a pillar of the Resilience Strategy. The idea is to encourage coordination and innovation, while building on the existing, incremental approach to upgrading settlements, where providing essential infrastructure and social services are the priority. Focus areas include: making informal settlements a priority; strengthening governance and institutional coordination; integrating data better to inform planning and decision-making; enhancing innovation to make settlements more sustainable and climate-smart; and facilitating monitoring and evaluation. Project information and documentation can be found at *www.durban.gov.za/EPCPD*.

Buffelsdraai Community Reforestation Project

The communities of Buffelsdraai, near Verulam, have the global infatuation with football to thank for a reforestation project on their doorstep. With Durban being a host city for the FIFA World Cup in 2010, the eThekwini Municipality was keen to host a "climate neutral" event, by offsetting carbon emissions related to the football showpiece.

The carbon footprint was calculated to be 307,208 tonnes of carbon dioxide equivalent (tCO^{2}e) and the City signed up to mitigate this by planting indigenous trees and restoring natural habitats in eThekwini Municipality . In November 2008, a reforestation project aimed at offsetting the equivalent of about 42,000 tCO^{2}e was established as a natural carbon sink – a natural reservoir that stores and removes carbon from the atmosphere. It's expected to take more than 20 years to achieve the target.

The project is happening in a buffer zone around the municipality's Buffelsdraai regional landfill site. The project area was previously either farmland, typically under sugarcane,



The Durban Resilience Strategy aims to reduce the vulnerability of informal settlements, like Havelock settlement, to climate change.

of limited productive capacity, or infested with invasive alien plants. The project was originally aimed at climate mitigation, but now the priority has shifted to local climate adaptation, through restoring ecosystems. It brings many benefits. Water quality and river flow regulation has improved, while the risk of flooding reduced and sediment is better controlled. It's also created a richer refuge for plants and animals, aiding biodiversity. All these things improve the climate change adaptation needs of the people of the area.

The buffer zone at Buffelsdraai covers 800 hectares. The reforestation project makes up about 520 hectares of this, with the balance being existing woodland and riverine forest.

INanda Mountain Community Reforestation Programme

The iNanda Mountain Community Reforestation Project does its good work – mitigating and adapting to climate change – immediately north of iNanda Dam. The project site spans two tribal authorities, the Amaphephetheni and Amaqadi, near what is one of eThekwini Municipality's main water sources.

There are two distinct ecosystems within this project: grassland on the top of the mountain (under the Amaqadi authority); and forest on its slopes (under the Amaphephetheni authority). The reforestation programme involves people from surrounding communities. They are employed to help control invasive alien plants, manage natural forest regrowth and remove waste. The project aims to restore about 360 hectares of coastal scarp forest, as well as about 200 hectares of KZN Sandstone Sourveld grassland on top of iNanda Mountain.

Uncontrolled fires, overgrazing, wood harvesting and an infestation of alien plants have degraded the area. But the project seeks to undo this. At the same time it will help better regulate river flow, reducing the risk of flooding. Sediment will also be better regulated, while natural refuges for plant and animal life restored or improved. It helps deals with carbon emissions, creates jobs and fosters skills. All these benefits bolster Durban's resilience to climate change and build awareness among poor communities.

Lucky Sheppard Ndlovu at work in the iNanda Mountain Community Reforestation Project's nursery.

Workers prepare holes for seedlings in Buffelsdraai. Picture: Errol Douwes.

Working for Ecosystems

Ecosystems are important in helping us adapt to climate change, but are under threat from invasive alien plants in eThekwini Municipality, and indeed globally. So tackling the spread of aliens and restoring ecosystems, and with it biodiversity, is crucial.

In 2006 the municipality's Environmental Planning and Climate Protection Department (EPCPD) began its Working for Ecosystems programme. The idea was to foster holistic and positive interaction between the environment and the people who live in it through managing invasive alien plants. The programme provides training and work for marginalised communities while ensuring better management of environmentally important areas. It helps communities operate in more sustainable ways and adapt better to natural disasters that may be exacerbated by climate change.

Through continued management and ecosystems restoration, sustainable development is possible and green jobs can be created. Everyone on the Working for Ecosystems programme receives training and skills development. In some cases, small businesses are mentored. Project areas in several of eThekwini's large water catchment areas have been made a priority. That's because the EPCPD recognises these areas are crucial to our freshwater supply and they work better when biodiversity is improved.

Clearing invasive alien plants – plants which originate from other parts of the world – has an immediate benefit to local people. It improves water flow, reduces soil erosion and boosts biodiversity – all good news for communities and their livestock. Apart from normal clearing in specific project areas, the programme plays an important role in identifying and clearing emerging weeds. Rapid containment or control, now, is expected to result in a big saving in the long run. A stitch in time saves nine.

Fire and Invasive Species Control Programme

The Environmental Planning and Climate Protection Department is helping to maintain the quality of natural ecosystems in eThekwini through its Fire and Invasive Species Control Programme. The programme uses mechanical and chemical means as well as controlled fires to tackle invasive alien plants in open spaces owned by the municipality.

Most grasslands require periodic burning to promote biodiversity. A site-prioritisation study helps schedule the work, with an annual veld condition assessment study generating indices that assist in determining when to use fire. The indices are also used to develop decision-making tools. These are based on several years of fire-control data. Fire control is used in other protected areas owned by the Natural Resources Department. Fire season starts in late autumn, with the burning of firebreaks on site boundaries and planning for block burning during the season. Strips of trimmed vegetation, known as tracer belts, are placed where teams will later burn firebreaks. The tracer belts and firebreaks contain fires which can quickly spread through the dry grasslands, especially on windy days.

Working on Ecosystems project workers clear invasive species in Ntshongweni. Picture: Errol Douwes.

The Fire and Invasive Species Control project workers used controlled fires to tackle invasive alien plants in open spaces owned by the eThekwini municipality.

Solar panels for reservoir sites

EThekwini Water and Sanitation (EWS) is planning to install photovoltaic solar panels at some of its reservoir sites, allowing it to harvest renewable energy. There is potential to save money and reduce carbon emissions, but the project involves a complex renewable resource technology, beyond the unit's area of expertise. For this reason it is looking to appoint an external contractor to manage the installations and maintain equipment in a public-private partnership over 15 to 20 years. Thereafter the plant would be transferred to the municipality.

The project would aim to generate 2.25 MWh of electricity and the municipality would make its grid infrastructure available for connection. A transaction advisor was appointed to look at reservoir sites and suggest which would be best, before doing a feasibility study. The thinking is to try to use as much space as possible for solar installations. The Unit expects to have completed the feasibility study by May 2019. It would then be legally vetted and the job put out to tender in August. Work is likely to begin by year end. Full commissioning of the plant is expected within three years of the start of the project. The total cost of the project was estimated at R12 million.

Gas to energy at eThekwini Municipality wastewater works

Poo can have a nasty pong and a sewage farm can be a smelly place. But far from turning up their noses at this, the engineers at EWS have spotted an opportunity. The Unit is planning a feasibility study to examine the case for installing biogas-to-electricity plants at 10 of its 27 wastewater treatment works.

These are works which use an anaerobic digestion process to treat the solids part of effluent, producing biogas which contains about 65% combustible methane. Anaerobic digestion is a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen. At present, some biogas is used to heat the digester, but the remainder, about 65%, is flared to the atmosphere.

A consultant will be appointed to investigate the ten sites. A study is expected which will report on the quality and quantity of the gas produced and recommend which will be viable to form part of a public-private partnership. A single, consolidated project is envisaged with the partner managing all the sludge and using the right gas-to-energy technologies for each site. The unit would like to see the heat and power from the digestion process used as a combined source of energy to make the most of the renewable resource.

There is certainly cause for optimism. A feasibility study that was completed on the Northern Wastewater Treatment Works in 2014, which like the ten sites also uses anaerobic digestion, produced positive results. It estimated the plant could generate 700 kW of electricity and that this would reduce electricity costs at the Northern works, cutting the municipality's power bill. This in turn would reduce the treatment works' carbon footprint, while serving to demonstrate how a treatment works could run on its own energy potential.

The concept design and specifications for the Northern works have already been prepared. The unit has decided it would be best for the municipality, and expose it to the least risk, if the partner designed, built and operated the plants on a ten-year contract and that the project duration would be 13 years. About R35 million has been allocated for capital expenditure on the Northern plant and a further R 30.8 million for operating expenditure over the years. The project will extend beyond three years, so the Unit will be seeking approval from the National Treasury, as required by the Municipal Finance Management Act.

Small and mini hydro projects

The EWS unit is finding ways to generate electricity using water flow in its pipes and other infrastructure. A host of small-scale renewable energy projects are under way, or are at the feasibility study stage, and they hold the promise of each shaving a little off the city's electricity bill while reducing greenhouse gas emissions, with all the climate change mitigations benefits this offers.

Studies found there was sufficient hydraulic head – a technical term referring to liquid pressure — and flow in some major pipes that would allow for the generation of hydro-electric power. A feasibility study identified two suitable points on the Western Aqueduct bulk line from Pietermaritzburg to Durban – at the Ashley Drive and Wyebank break pressure tank sites. These are points on the line used to ease pressure and it was estimated that up to 2.8 MW and 3.7 MW respectively could be generated with turbines at the sites.

The unit has received funding for the project and the appointment of a transaction advisor and the publishing of a request for proposals is expected in 2019. Full commissioning of the plants is expected within four years of the start of the project. Once commissioned, a public-private partner would have 15 to 20 years to operate and maintain the plant before the asset is transferred to the municipality. The project is expected to produce a stable income and a relatively high rate of return, buoyed by support mechanisms such as green certificates. A green certificate is a tradable asset which proves electricity has been generated by a renewable energy source.

Meanwhile, designs have been completed for two pilot mini-hydro projects on inlets of the Sea Cow Lake and Phoenix 2 reservoirs. But these will only be implemented if the unit has sufficient technical capacity to handle the projects. There were also plans to construct mini-hydro schemes elsewhere on the water network, based on the findings of a renewable energy and energy efficiency partnership feasibility study. The study recommended 30 locations at inlets and outlets of reservoirs and pump stations in eThekwini, where turbines would generate electricity. This would be fed into the municipal grid, reducing demand from the national supplier, in support of eThekwini Municipality and the country's renewable energy goals. However, this would only be done where water flow was not compromised.

Re-inventing the toilet

The concept of a "circular economy" could be a key factor in reducing climate change. As the name suggests, waste can be re-used, instead of polluting the environment or being dumped on the scrap heap.

The aim of this project is to reuse and recycle water, energy and other materials to minimise the impact of using new resources in a wasteful manner. The development of innovative sanitation systems – such as those developed under the Bill & Melinda Gates Foundation's "reinventing the toilet challenge" – contribute to the circular economy by treating sanitation waste to produce water that is suitable for recycling and reuse, or solid waste that can be reused as a fuel source or as a potential soil conditioner.

The aim is to develop systems that work off the grid, or with minimal energy use. From 2017 to 2020, at least ten of these re-invented toilets will be tested in Durban, under the Engineering Field Testing programme.

This is a collaborative project involving EWS, Khanyisa Projects and the Pollution Research Group at the University of KwaZulu-Natal (UKZN). The tests will be done in three informal settlements, a primary school and up to ten households. Further tests will be done in the Pollution Research Group laboratories where a more controlled environment is available.

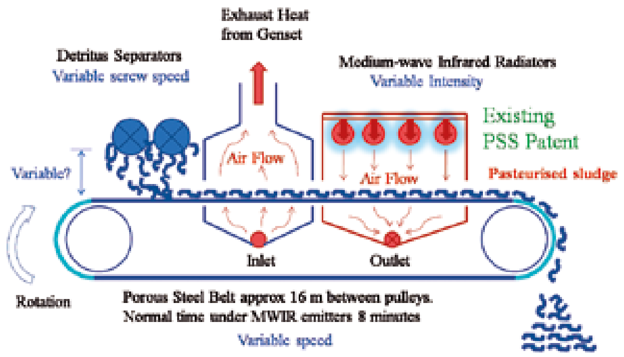
These systems include pedestal designs, processing systems and fully-integrated systems such as the Caltech/ EcoSan toilet block.

It is important to test a system with novel technologies in the field, in the country for which it is targeted, as all areas have context-specific challenges that need to be addressed. The Engineered Field Testing platform provides benefits to the developers, users, regulators and researchers and will allow for the development of innovative toilets that have been tested in a real-world environment before manufacture and widespread installation.

Turning solid and liquid wastes into fertiliser

Removing faecal waste safely and efficiently from on-site sanitation systems continues to be a challenge in urban and rural environments. Although the eThekwini Municipality provides a free service to empty Ventilated Improved Pit (VIP) latrines every five years, the faecal sludge cannot be disposed at wastewater treatment works as it creates problems with the nitrification process. Organic matter can also overload the digesters, while limited space sometimes prevents burial of faecal sludge on-site.

Because disposing sludge into landfills comes with high transport costs and emission of greenhouse gases, there is an increasing need to find other ways to safely manage VIP faecal sludge. EWS division and its technology partner, Particle Separation Systems, have developed a machine that dehydrates and pasteurises VIP sludge and turns it into pellets.



Schematic representation of dehydration and pasteurisation processing of VIP sludge into pellets.

The machine is branded LaDePa (latrine dehydration and pasteurisation) and provides a containerised method of producing a nutrient-rich soil conditioner. Located at the Tongaat water treatment works, the system uses heat and medium-wave infrared technology to deactivate the pathogens. There is an opportunity to collect millions of litres of mineral-rich urine from nearly 80,000 urine diversion toilets in eThekwini Municipality and to use these nutrients for fertiliser.

DURBAN CLIMATE CHANGE STRATEGY

LaDePa (latrine dehydration and pasteurisation) provides a containerised method to produce a nutrient-rich soil conditioner.

Harvesting phosphorous and nitrogen for reuse as fertilisers also reduces greenhouse gas emissions. One such project was conducted in collaboration with Eawag, the Swiss Federal Institute of Aquatic Science and Technology, and the Pollution Research Group at UKZN. It involves processing urine into phosphorous-based struvite and nitrified urine concentrate. Crop trials using these products showed promising results in growth and yield and urine-based fertiliser was approved for use on plants in Switzerland in 2008. In eThekwini, an innovative low-flush urine diversion toilet pedestal was developed to separate urine and faecal material at source and is now being field-tested. If it works well, it will be rolled out in high-density housing areas linked to the Decentralised Wastewater Treatment System (DEWATS) wastewater treatment system.

Struvite processed from source-separated urine.

Perennial ryegrass grown using urine-based fertiliser.

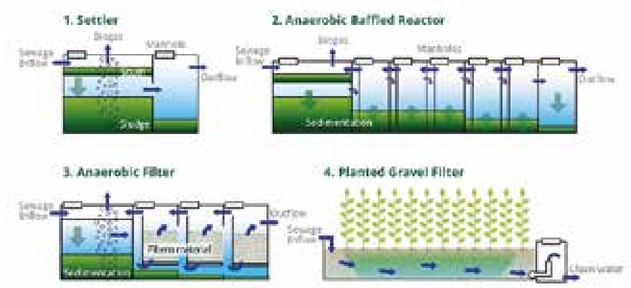
DEWATS cleaner water project and farm trials

The Decentralised Wastewater Treatment System (DEWATS) project aims to encourage the reuse of wastewater, as well as resources such as nitrogen and phosphorus in agricultural fertiliser. The low-technology system can be made locally and is designed to treat domestic wastewater, pit latrine sludge, and organic industrial and institutional wastewater. The components include a settler, reactor and various filters.

DEWATS requires no energy input. It is also a semi-centralised technology that has a low ecological footprint and can be built close to communities. Effluent from the reactors has a high nutrient content. If it can be shown that effluent has no adverse effects on the soil, groundwater or farm crops, there is potential to link these treatment systems to community gardens, in support of the circular economy.

Several farm trials at the Newlands-Mashu Research Facility have investigated the effect of DEWATS effluent on plants. Plant tissue analysis measured the presence of important mineral elements such as nitrogen, phosphorus, potassium and selected micronutrients. The risk of pathogen contamination to workers and consumers was also assessed.

Crops that have been tested so far include bananas, rice, amadumbes, taro, soya beans and cocoyam. Tests results will help the municipality roll out further DEWATS systems in eThekwini Municipality.



Schematic representation of a typical DEWATS module.

Water becomes progressively cleaner with each stage of the DEWATS treatment system.

Using black soldier flies to save water and recycle waste

Millions of litres of clean water are literally flushed down the toilet every day in conventional water-borne sanitation systems. To help conserve water in a changing climate, the eThekwini Municipality is hoping to identify other safe, efficient and cost-effective options to remove faecal matter for nearly 80,000 households with urine diversion toilets.

Over the past few decades there has also been increasing concern over the safe removal and disposal of faecal matter and potentially pathogenic sludge from these urine diversion toilets. One option is to bury the waste on-site, using local labour and strictly adhering to health, safety and environmental requirements. Another option is to remove the waste to a decentralised processing plant which can also produce valuable by-products, with the help of black soldier flies.

A new black soldier fly larvae processing plant was established at the isiPhingo wastewater treatment works in 2017. The larvae of this fly species consume organic waste as part of their life cycle to grow to adult size. The adult larvae can then be processed into products such as animal feed and oils while the remaining residue can also be used as a soil conditioner or converted into biochar fertiliser.

By creating new jobs and reducing the volume of water used to flush away human waste, the black soldier fly technology is seen as a socio-economically and environmentally viable option that relates well with changing climate conditions, and supports a circular economy.

The processed larvae from Black Soldier Flies can be turned into animal feed.

Waste water reuse in eThekwini

Water resources are stretched in eThekwini Municipality. The metropolis is home to more than 3.5 million people and research shows there isn't enough water to go around. A Department of Water Affairs and Forestry study in 2008 concluded the water supply needs in eThekwini and surrounding areas exceeded the reliable yield of the local water resources. New supply schemes are being developed or investigated but they won't be enough. Treating effluent and reclaiming it for re-use could ease the shortage in the medium-term.

The Durban Water Recycling plant, north-east of the Umlaas Canal at eThekwini's Southern Wastewater Treatment Works, is one such project. It has proved to be a success since it was commissioned in May 2001. The sewage-to-clean-water recycling plant treats 47.5 million litres of domestic and industrial wastewater to a near-potable standard. The nearby Mondi paper mill, which first approached the municipality about such a project, is the major buyer of the recycled water. Another big client is the SAPREF oil refinery. The R74m plant has effectively freed up drinking water for about 300,000 people. The Durban Water Recycling project was privately financed and is operated by Vivendi Water. The concession expires in 2019 and a City Council decision on whether to continue the contract is expected by December.

In the north of Durban, a technical study has recommended that potable water treatment plants, capable of producing 115 million litres a day, be installed at the Northern and KwaMashu wastewater treatment works. The new potable water reclamation plants will take sewage and flocculate and clarify it until it is clear and colourless. It will then be passed through filtration membranes to remove organic substances, pyrogens, viruses, bacteria and colloids. Reverse osmosis, stabilisation and ultraviolet light disinfection will complete the treatment process to ensure the water was safe for drinking.

An environmental impact assessment has found no fatal flaws in the plan. The project, with a price tag of R1.15 billion, would be undertaken as a public-private partnership over five years. The eThekwini Water and Sanitation unit expects to appoint a transaction adviser in August 2019 and to advertise the partnership in October.

COMMUNICATING THE DCCS DURING 2018/19

Communicating about Durban's climate change work is an important part of motivating residents and giving them the capacity to act. Many of the major events described in this annual report have been covered in articles in the Durban Metro ezaseGagasini newspaper, or the mainstream media. There were also radio interviews on uKhozi FM, East Coast Radio and SA FM. During the 2019/20 financial year, the DCCS Secretariat will work with the Development, Planning, Environment and Management Unit's communication officers to ensure progress with the Strategy is well advertised, particularly through public stakeholder engagement events around the development of the integrated implementation plan.

During the year, more reprints were completed of the DCCS popular document, and these were freely distributed at the Energy Office stand during the Sustainable Living Expo in May 2019. The popular document is printed in both English and isiZulu, and the public are welcome to contact the DCCS Secretariat (using the contact details on the back inside cover) to obtain a hard copy (subject to availability). An electronic version of the popular document can be downloaded in the publications section at www.durban.gov.za/EPCPD, as can this document.

IMPLEMENTING THE DCCS DURING 2019/20

It's been a productive year for Durban's climate change team and officials and politicians who have contributed to advancing the City's climate change agenda. In 2019/20, the first order of business will be seeking approval for the 1.5 °C Climate Action Plan (CAP) from Council and then developing the dashboard for implementation. The Technical Task Team will use the dashboard to drive the implementation of the DCCS. Efforts will be made to finalise procurement of a service provider to lead the development of the integrated implementation plan, which will be built around the CAP and Climate Resilience Implementation Plan.

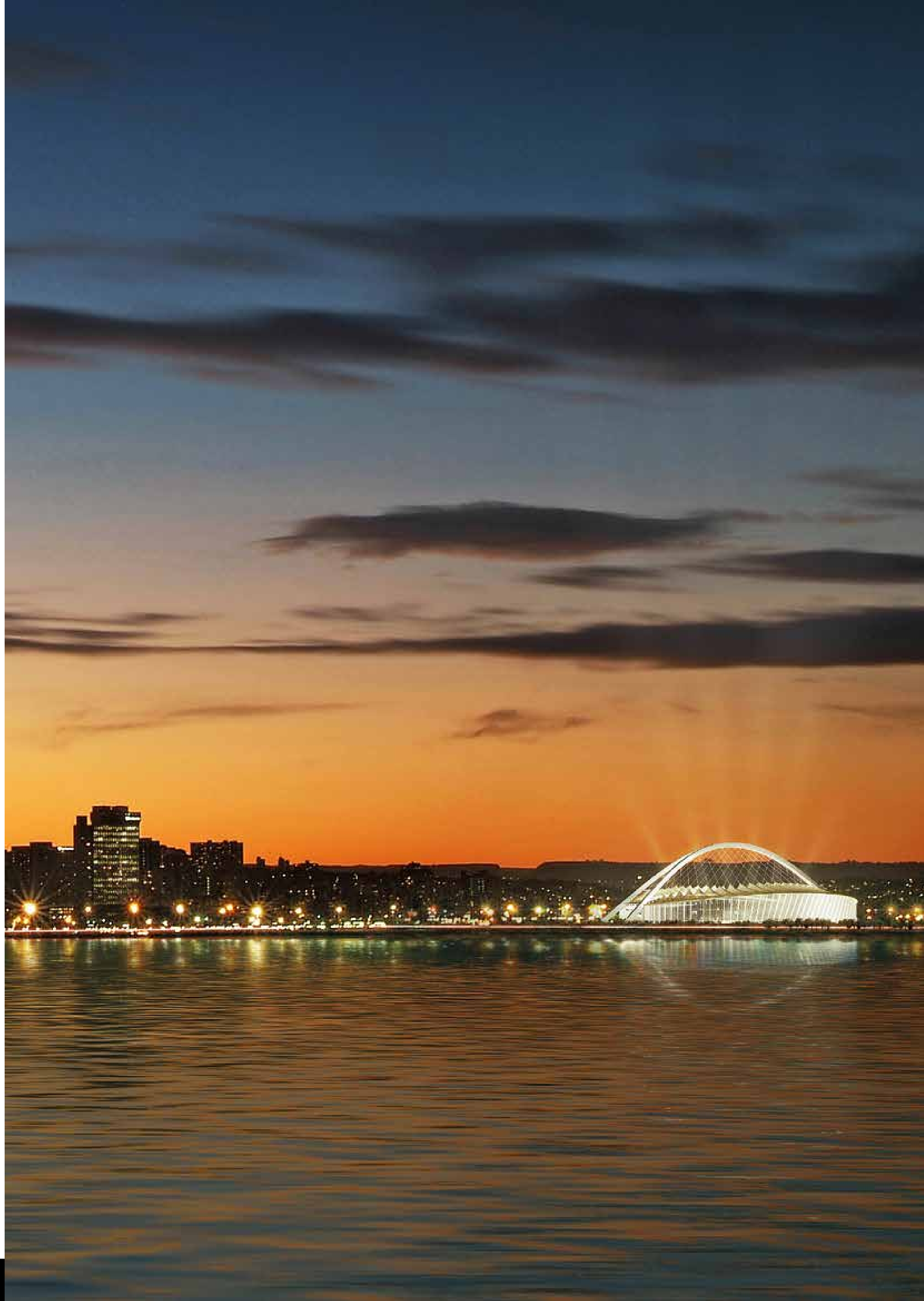
We will continue to support our engagement with C40 projects and networks. The Cities Finance Facility aims to complete a cost-benefit analysis for the implementation of the Sihlanzimvelo programme in Durban. If successful, this will be a game-changer for adaptation in African cities. The programme aims to provide the financial argument for African cities to self-fund river management through creating employment for communities, thus addressing development and service delivery challenges through a climate change lens.

Another C40 Durban team will work to realising a set of by-laws to guide our development towards a low carbon and sustainable pathway in the New Buildings Efficiency Programme. If successful, this programme will provide incentives to Durbanites to prepare their properties for the impacts of climate change and to install energy-saving and renewable energy devices. Durban will continue to play an important role in the U20 programme as the only African city representative. The U20 will seek to influence meetings of the global G20, as cities flex their climate change muscles in furtherance of the global aim to reduce warming to no more than 1.5 °C.

Finally, as the DCCS Secretariat, we will continue to strive to provide support to our governance committees to ensure that they have the best information available for decision-making and implementation. Communication will be key to ensuring that Durbanites participate in the first five-year review of the DCCS and development of the integrated implementation plan.

ACRONYMS USED IN THIS REPORT

CAP	Climate Action Plan
CFF	Cities Finance Facility
CFCC	Cities Fit for Climate Change
CRISP	Climate Resilience Implementation Plan Spatial Plan
CKZNCCC	Central KwaZulu-Natal Climate Change Compact
CoM	Compact of Mayors
COP	Conference of Parties
CoP	Community of Practice
DAC	Durban Adaptation Charter
DCCS	Durban Climate Change Strategy
DEWATS	Decentralised Wastewater Treatment System
DRAP	Durban Research Action Programme
EMCCC	EThekwini Municipality Climate Change Committee
EPCPD	Environmental Planning and Climate Protection Department
EPIC-A	Educational Partnerships for Innovation in Communities – Africa
EPIC-N	Educational Partnerships for Innovation in Communities – Network
EWS	EThekwini Water and Sanitation
GEC	Global Environmental Research
GHG	Greenhouse Gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
IPCC	Intergovernmental Panel on Climate Change
KZN	KwaZulu-Natal
LaDePa	Latrine dehydration and pasteurisation
MILE	Municipal Institute of Learning
MSDF	Municipal Spatial Development Framework
PCRP	Palmiet Catchment Rehabilitation Project
QRWIS	Quarry Road West Informal Settlement
SHEFS	Sustainable and Healthy Food Systems
TTT	Technical Task Team
UCCRN	Urban Climate Change Research Network
UDCW	Urban Design Climate Workshop
UKZN	University of KwaZulu-Natal
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VIP	Ventilated Improved Pit latrine



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