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Department:
Cooperative Governance and Traditional Affairs
PROVINCE OF KWAZULU-NATAL

KZN-COGTA

CHIEF DIRECTORATE: MUNICIPAL PLANNING

ADOPTED PROVINCIAL NORMS AND STANDARDS FOR CLIMATE CHANGE AND ENERGY EFFICIENCY IN LAND USE MANAGEMENT

DATE OF APPROVAL: 7 JANUARY 2020

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PROVINCE OF KWAZULU-NATAL

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Foreword

We have forgotten how to be good guests, how to walk lightly on the earth as its other creatures do."

Barbara Ward

"Because we don't think about future generations, they will never forget us."

Henrik Tikkanen

"Our environment, the world in which we live and work, is a mirror of our attitudes and expectations."

Earl Nightingale

"There is a sufficiency in the world for man's need but not for man's greed."

Mohandas K. Gandhi

Energy efficiency and Climate Change is perhaps one of the most current and talked about topics globally; and while the World is responding in different and various ways, custodians of the built environment, in this Province too have a responsibility to preservation and sustainability of the Earth. This Consultation Paper, while it has a specific focus, in assisting and guiding Municipalities in their daily application of their tasks; provides directives and opportunities to be more responsible to both Climate Change and Energy Efficiency within their areas of jurisdiction. What better way to contribute to this global phenomenon?

It must also be noted that while there are initiatives that contribute to C40 and other International Work streams, this Paper is part of work resulting from Provincial Planning Legislation viz the Planning and Development Act, 2008, read together with SPLUMA. This paper looks to Municipalities to do their share to ensuring a better life for future generations.

Custodians of the built environment are therefore encouraged to make this work part of their daily contributions in being responsible guests that promote both climate change and energy efficiency that results in preservation and sustainability of this Earth.

M ALLOPI (Steering Committee Chair person)

Executive Summary

These Norms and Standards are prepared in terms of Chapter 11 of the KwaZulu-Natal Planning and Development Act, Act No. 6 of 2008 (PDA) which requires that the Province of KwaZulu-Natal prepare Planning and Development Norms and Standards on various themes. They also represent Provincial Norms and Standards as contemplated within Section 10(4) of the Spatial Planning and Land Use Management Act, Act No. 16 of 2013 [SPLUMA] and thereby have effect on planning activities undertaken in terms of SPLUMA.

Whilst Climate Change and Energy Efficiency are in many ways interlinked, for the purposes of presenting these as Norms and Standards they have been split into two discrete sections (namely *Climate Change* and *Energy Efficiency*). However, the reader should understand that there are cross cutting elements that sit across both themes.

Climate Change Adaptation

With regards to Climate Change Adaptation, four key risks are addressed in the norms and standards, namely:

i. Increased flooding
ii. Increased impacts on coastal environment
iii. Increased impacts on human health
iv. Drought

- Increased flooding

There are already existing policies and guidelines to help developers prepare for flooding events and to better manage stormwater runoff in South Africa. However, climate change is expected to further increase rainfall intensity and frequency resulting in increased runoff into stormwater management systems that are already under strain. To address this increased risk, norms and standards for preparing flood lines, managing major storm risk, and incorporating sustainable drainage systems have been listed.

- Increased impacts on coastal environment

South Africa's coastal zone is particularly vulnerable to the impacts of climate change from sea level rise and the increase and intensity of coastal storms. South Africa's Integrated Coastal Management Act, Act No. 24 of 2008 (ICMA) is a critical piece of legislation that provides guidance on the development of coastal management programmes and associated coastal protection zones (CPZ), and coastal management lines. To address these risks and align with the ICMA, the following norms and standards have been listed: including coastal protection zones (CPZ) and coastal management lines on planning schemes, limiting development that is not consistent with the purpose of the CPZ or the relevant coastal management line, and, providing guidance on mitigation measures and solutions to prepare for increasing coastal storms and sea level rise.

- Increased impacts on human health

Climate change is predicted to have a negative impact on the health and wellbeing of South Africans. The increase in the frequency and intensity of disasters will result in damage to infrastructure, injury and loss of life. Whilst the increasing temperatures will lead to increases in heat stress and cardiovascular diseases. Vector and water borne diseases are also likely to become more common, especially after storm events. Although there is existing health related legislation and policies, there is a need for the health-related impacts of climate change to be considered in development planning. Therefore, the following norms and standards have been listed: planning for health risks, managing health risks related to disaster events,

managing health risks related to vector borne diseases, and, managing health risks related to increased temperatures.

- Drought

Drought is a key risk associated with climate change that South Africa is already experiencing. With the changes in climate, it is expected that South Africa will experience increased periods of drought and that when rain does arrive, we will experience it in the form of extreme rainfall events. Drought not only has an impact on drinking water availability but also on water availability for agriculture which impacts on food security. Dry periods coupled with high temperatures may also result in the increase in the occurrence of wild fires.

Energy Efficiency

With regards to energy efficiency, two key themes are addressed in the norms and standards, namely:

i. Planning for an Energy Efficient Spatial Form
ii. Renewable Energy Technologies

- Energy Efficient Spatial Form

Spatial form is shaped by many underlying social and economic forces, other than planning and is constantly changing as a result of changes in the evolution of technology. Energy efficiency is thus only one consideration in planning and may be of lesser importance in some situations. However, planning principles can and should be applied and these are addressed in this document. Energy efficiency can be achieved in 2 ways through planning:

- Plan an environment that reduces the need for energy i.e. reduces the need for transport, heating and cooling
- Address unavoidable energy demand in an efficient way through the use of renewable energy and planning efficient spatial structure

Norms and standards on how to address the above include: including energy efficiency as a goal in spatial plans; planning for settlements that reduce the need for travel, reduce the need for heating and / or cooling, reduce heat islands, manage carbon sinks, promote bioclimatic design of buildings, promote the use of green star ratings in the design of buildings, consider shadowing and spacing of buildings, increased planting, and adherence to the building regulations.

- Renewable Energy Technologies

A key component of land use management relates to ensuring that amenity is protected appropriately through the mitigation of undesirable externalities of development. This is done by ensuring that land uses are appropriate for both the site and in relation to the surrounding area, and that any other impacts (such as noise, shadows and visual impact) are minimised or mitigated. Certain Renewable Energy Technologies may have an impact on amenity and therefore Norms and Standards are useful for providing officials with the ability to assess these. The following technologies are addressed in the Norms and Standards: Solar Water Heaters, Photovoltaics and Wind Turbines.

Definitions

1 in 100 year flood line: refers to “lines in a township layout plan, indicating the maximum level likely to be reached by floodwaters on average once in every 100 years” (National Water Act, 1998). eThekwini Municipality Procurement and Infrastructure Cluster (undated) explains the term as follows: “The term “100-year flood” is really a statistical designation, and means that there is a 1 in 100 chance that a flood of this size will occur in any year.”

1 in 50 year flood line: refers to “lines in a township layout plan, indicating the maximum level likely to be reached by floodwaters on average once in every 50 years” (National Water Act, 1998). The term “50-year flood” is a statistical designation, and means that there is a 1 in 50 chance that a flood of this size will occur, in any year.

Air Quality Management Plan: refers to a management plan that “provides definitive objectives, strategies, plans and procedures, for the relevant spheres of government to meet the requirements of the National Environmental Management: Air Quality Act, with respect to good air quality management planning and reporting” (eThekwini Municipality, 2015). The National Environment Management: Air Quality Act, Act No. 39 of 2004, defines “air quality management plan” in section 15 as follows: 15. (1) Each national department or province responsible for preparing an environmental implementation plan or environmental management plan in terms of Chapter 3 of the National Environmental Management Act must include in that plan an air quality management plan. (2) Each municipality must include in its integrated development plan contemplated in Chapter *5* of the Municipal Systems Act, an air quality management plan.

Coastal erosion line: refers to a line determined by the municipality to demarcate and area within which development will be prohibited, typically eastward of the coastline in eThekwini Municipality.

Building Plan Submission: refers to a full building plan submission which is required for any development in terms of the National Building Regulations.

Carbon sink: anything that absorbs and stores more carbon from the atmosphere than it releases as carbon dioxide (http://climatereality.co.za/what-are-carbon-sinks-and-why-are-they-important-in-africa/)

Climate Change Adaptation: refers to "The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects" (Pachuri & Meyer, 2014).

Climate Change Mitigation: refers to "A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs)" (Mach *et al.,* 2014) .

Coastal management/setback line: refers to “a line determined by an MEC in accordance with section 25 in order to demarcate an area within which development will be prohibited or controlled in order to achieve the objects of this Act or coastal management objectives” (National Environmental Management: Integrated Coastal Management Amendment Act, 2014).

Energy Efficiency: means using less energy to achieve the same outcome

Flood risk areas: For the purposes of this document, these areas refer to those areas that fall within the 1: 100 and 1:50 year flood lines and the Coastal Management / Setback line as determined by the Province or the Municipality. **Fossil fuel:** means any combustible material such, as oil, coal, or natural gas, which originates from the remains of former life.

Green Roofing Systems: A green roof, also known as a living roof, is the use of the space on top of a building to grow plants, either decorative vegetation or food crops.

Greenhouse Gases (GHG): A gas that contributes to the greenhouse effect by absorbing infrared radiation. Carbon dioxide and chlorofluorocarbons are examples of greenhouse gases.

Heat Island: an urban area having higher average temperature than its rural surroundings owning to greater absorption, retention and generation of heat by its buildings, pavements and human activities.

Land use management system: means the system of regulating and managing land use and conferring land use rights through the use of schemes and land development procedures; A Land Use Management System refers to all the actions required by a municipality to manage land, of which Schemes are one component. Typically, key elements of a Land Use Management System include: The Spatial Development Framework, various Spatial Plans, Frameworks and Schemes prepared in terms of SPLUMA and any relevant Municipal Planning Bylaw; Valuation and rating system; Property registration, ownership and tenure; Infrastructure and services provision; Planning bylaws; Building bylaws, including signage and elevation control; Health bylaws; Environmental issues and requirements; and Road and transportation requirements.

Land use scheme: means the documents referred to in Chapter 5 of SPLUMA for the regulation of land use;

Minor Building Works Submission: refers to small building related installations that have fewer application requirements than a full building plan application

Photovoltaic Installations: refers to installations that convert light energy, normally from the sun, into electricity. Solar PV panels produce direct current when exposed to the sun which is later converted into alternating current (AC) using an inverter.

Rainwater Harvesting refers to the process of temporarily concentrating rainwater run-off from a large catchment area into a small target area. The collected runoff is typically used to supplement water supply. Rainwater harvesting include ground catchment and roof catchment options (Botha, 2012).

Recurrence interval: "Recurrence interval or return period is the average interval between events. The recurrence interval is usually expressed in years and is the reciprocal of the annual probability. That is, the event having an annual probability of occurrence of 2% (0,02) has a recurrence interval of 50 years. This does not imply that such an event will occur after every 50 years, or even that there will necessarily be one such event in every 50 years, but rather that over a much longer period (like a 1 000 year period) there will very likely be 20 events of equal or greater magnitude." (South African Council for Scientific and Industrial Research et al., 2000:31)

Renewable Energy Installations: refer to installations that produce electricity from renewable sources such as the sun and wind. For the purposes of these norms and standards, this refers to Solar Water Heaters, Photovoltaic Installations and Wind Turbines.

Solar Water Heater: refers to installations that use solar energy to heat water.

Special Consent / Consent: Refers to an application by an applicant to the Municipality for consent or special consent i.e. permission or authority to amend a land use in terms of SPLUMA, the Municipal Planning Scheme and relevant Town Planning Legislation. Conditions may be attached to any approval given.

Sustainable Drainage Systems (SuDS) refers to a sequence of management practices and/or control structures or technologies designed to drain surface water in a more sustainable manner than conventional techniques (Armitage, 2013).

Water borne diseases: refers to "diseases caused by pathogenic microorganisms that are most commonly transmitted in contaminated fresh water. Infection commonly results during bathing, washing, drinking, in the preparation of food, or the consumption of food thus infected" (Weiss, 2015).

Wind Farm: refers to a land use whereby multiple wind turbines are installed for the purposes of farming energy for resale.

Wind Turbine: refers to an installation that uses the kinetic energy of the wind to generate electricity.

1 Introduction

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This document sets out the norms and standards prepared by the appointed steering committee for Climate Change and Energy Efficiency in Land Use Management. The Norms and Standards must also align with the requirements of Section 8 of the Spatial Planning and Land Use Management Act, Act No. 16 of 2013 (SPLUMA). Section 7 (d) which sets out the SPLUMA development principles states: "*the principle of spatial resilience, whereby flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks."*

2 Background and Need for the Norms and Standards

2.1 What are Norms and Standards

The Merriam Webster Dictionary defines Norms as "a principle of right action binding upon the members of a group and serving to guide, control, or regulate proper and acceptable behaviour."

A standard is defined as "something established by authority, custom, or general consent as a model" or "something set up and established by authority as a rule for the measure of quantity, weight, extent, value, or quality"

Source: https://www.merriam-webster.com/dictionary/norm

These Norms and Standards have been prepared by a Steering Committee appointed by the KwaZulu-Natal MEC for Cooperative Governance and Traditional Affairs to establish principles and models of action to guide planning practice in relation to Climate Change and Energy Efficiency.

2.2 Background to Climate Change and Energy Efficiency

Climate change refers to the long-term change in global weather patterns as a result of human activities. Increasing levels of carbon dioxide and other Greenhouse Gasses (GHGs) have already seen an average temperature increase of 0.8 degree Celsius since the industrial revolution. A recent report by the Intergovernmental Panel on Climate Change (IPCC) states that society only has 12 years within which to limit the average increase in global temperatures to 1.5 degrees Celsius. Even with an increase of 1.5 degrees Celsius the impacts and costs of this increase in temperature are far greater than initially expected. Furthermore, if global average temperatures increase to 2 degrees Celsius the climate change impacts would be substantially worse. The report states that current national commitments are insufficient to prevent the increase of 1.5 degrees and more is required. Systemic changes, and the acceleration and upscaling of mitigation and adaptation efforts are required in order for the 1.5 degree target to not be exceeded (IPCC, 2018).

Research shows that South Africa can anticipate increased average temperatures, increased numbers of extreme heat events, increased incidence of extreme rainfall events and shifting of overall rainfall away from

the west of the country to the eastern seaboard as a result of climate change (DEA, 2014). These changes will have significant economic impacts affecting food security, health, and the economic costs of increased storm events. Responding to climate change is generally considered in terms of ways to reduce the amount of GHGs in the atmosphere (climate change mitigation) and ways to adapt to the impacts of inevitable climate change (climate change adaptation). Both mitigation and adaptation measures will need to become part of the Municipal IDP vision and strategic goals if the impacts are to be successfully addressed. Land use management has been identified as one area that can assist in climate change mitigation and adaptation and contribute to improved resilience.

In terms of **climate change mitigation**, there are a number of ways in which GHGs can be reduced, including alternative and renewable forms of electricity production, reducing energy inputs by becoming more efficient, alternative modes of transport and managing carbon sinks through land use change. Many of these mitigation measures are coordinated at a national level (for example setting renewable energy targets) and implemented at a local level. Of the set of mitigation strategies available, energy efficiency is generally considered the "least cost" option. Energy efficiency interventions (i.e. using less energy to produce the same outcome and using renewable energy sources) generally result in a reduction in operating costs and therefore make immediate financial sense to implement. As a result, **energy efficiency is a core focus on the national climate change mitigation response** (DEA, 2011, NPC, 2012)).

In term of **climate change adaptation**, the key sectors in South Africa that will be impacted by climate change are water, agriculture and forestry, health, biodiversity and human settlements (DEA, 2014) As with mitigation, climate change adaptation is also coordinated at a national level through strategic planning and implementation of measures within and across different sectors. However, there are wide variations in local environments that impacts on the ability of a particular area to respond to climate change impacts. Climate change adaptation therefore has a much stronger local level focus with regards to planning and implementation.

In the local planning environment, both climate change mitigation and adaptation options need to be considered. Planning responses need to consider potential future impacts from climate change (such as flooding) while at the same the need to reduce energy requirements into the future.

An often cited example of urban sprawl is Atlanta, GA (US), which has a similar population as Barcelona but occupies an urban area that is 26 times as large.

	Sprawling City	Compact City
Location	Atlanta	Barcelona
Urban Population (million inhabitants)	2.5	2.8
Urban Area (km²)	4,280	162
Urban Density (pph)	6	173
Energy Consumption Per Capita for Private Transportation (MJoules)	80	9

Source: Bertaud and Poole 2007.

Susan E. Owens in her article entitled Land Use Planning for Energy Efficiency (Cullingworth 2017, 53) points out that the use of energy is impacted on significantly by the spatial form that urban and rural settlements take. She notes a Swedish study that estimates that 60-75% of total energy use is related in some way to spatial structure. The text box illustrates the difference in the energy consumption between Atlanta and Barcelona, clearly demonstrating the benefits of a more

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compact urban form for energy consumption.

> *"Planners should therefore be aware of the energy implications of alternative development policies, should include energy efficiency among their objectives, and may be able to make a more positive contribution to energy planning through urban design which is compatible with particular supply and conservation options. Neglect of energy considerations in the planning process risks the development of energy intensive land use patterns by default."*
>
> Source: Susan E Owens (Cullingworth 2017, 53)

The spatial form influences the way energy is supplied, distributed and used; thus, land use planning and management needs to incorporate the concept of energy efficiency in its efforts to influence spatial form. Cheap energy (along with the increased availability of the private motor vehicle) has permitted urban sprawl at decreasing densities. The spatial form also influences the demand for energy through the need for heating and cooling, and the need for travel. Promoting a spatial form that is more energy efficient is thus an important component of climate change mitigation and adaptation.

The drive towards energy efficiency as a result of climate change, environmental constraints as well as energy shortages within the country has resulted in a shift towards Renewable Energy (RE) installations. However, the regulatory processes that should be followed and complied with do not necessarily accommodate these uses and activities and the installation of Renewable Energy fixtures should to be managed through land use management and planning schemes to encourage their use and to ensure that any negative externalities of the installations is mitigated.

2.3 The Need for these Norms and Standards

Chapter 2: Bill of Rights Clause 24 of the Constitution of South Africa (Constitution of the Republic of South Africa, 1996) states that everyone has the right

a) *to an environment that is not harmful to their health or wellbeing; and*
b) *to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that—*
    i. *prevent pollution and ecological degradation;*
    ii. *promote conservation; and*
    iii. *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*

Recently there has been recognition that a changing climate, higher demand for fossil fuels and therefore a linked need to promote renewable energy has led to a call for Land Use Management to address these topics in order to ensure sustainable and resilient development going forward. Municipal Planners and MPT members also have a constitutional obligation to address climate change and as part of the mitigation measures towards addressing this, energy efficiency, in order to ensure an environment that is not harmful to health or wellbeing. To assist them in these efforts these norms and standards have been developed by the Steering Committee appointed by the KwaZulu-Natal Province in terms of the PDA and SPLUMA.

2.4 Approach

With regards to Climate Change mitigation, energy efficiency interventions are seen as the priority responses as they reduce energy input costs and generally improve the overall quality of the product and service.

Planning responses where Energy Efficiency and Climate Change Adaptation are mutually supportive should be prioritised (for example improved building shading decreases the need for air-conditioning while also reducing the heat island effect in cities).

In situations where planning responses for Energy Efficiency and Climate Change Adaptation are in conflict, managing risk should take preference over efficiency (for example including additional flood management infrastructure may increase overall energy inputs, but will ensure safety of the development over its lifespan).

2.5 Key Issues Addressed

With regards to Climate Change Adaptation, three key risks are addressed in the norms and standards, namely:

i. Increased flooding
ii. Increased impacts on coastal environment
iii. Increase impacts on human health

With regards to Energy Efficiency two key areas are of relevance namely:

i. Spatial form and energy efficiency
ii. Energy efficient technologies

3 Objectives of the Norms and Standards

The objectives of these norms and standards are to provide a set of norms and standards for Climate Change and Energy Efficiency in Land Use in terms of chapter 4 of the KwaZulu-Natal Planning and Development Act, Act No. 6 of 2008

- Which promote the five spatial principles as set out in SPLUMA:
  - Principle of spatial justice
  - Principle of spatial sustainability
  - Principle of efficiency
  - Principle of spatial resilience
  - Principle of good administration
- Which work towards ensuring that climate change and energy efficient considerations and responses are incorporated into land use management in KwaZulu-Natal
- Which contribute to the mitigation of climate change by reducing greenhouse gases
- That facilitate the fitting of compliant renewable energy installations
- Avoid or minimise and appropriately mitigate the potential impact that may arise from the installation of renewable energy structures
- Which assist in co-ordination between different spheres of government to achieve this.

4 The Legal Effect of the Norms and Standards

a) The MEC of Cooperative Governance and Traditional Affairs has prepared these Provincial Planning and Development Norms and Standards in terms of Chapter 11 of the KwaZulu-Natal Planning and Development Act, Act No. 6 of 2008.

b) These Norms and Standards represent Provincial Norms and Standards as contemplated within Section 10(4) of the Spatial Planning and Land Use Management Act, Act No. 16 of 2013 [SPLUMA] and thereby have effect on planning activities undertaken in term of SPLUMA.

4.1 Persons to Whom These Norms and Standards Apply

Section 138 (1) of the PDA states:

" Municipalities, the Appeal Tribunal and any other organ of state on which the power has been conferred to consider

- *applications for the amendment of schemes,*
- *the subdivision and consolidation of land,*
- *the development of land outside the area of a scheme,*
- *the phasing or cancellation of an approved layout or the alteration,*
- *suspension or deletion of restrictions relating to land*

must consider provincial planning and development norms and standards that have been promulgated by the responsible Member of the Executive Council *as contemplated in section 144(2) when deciding in terms of the Act or any other law."*

4.2 How These Norms and Standards must be Applied

Municipalities, the Appeal Tribunal and any other organ of state must use these norms and standards in making decisions on any land development application for the following:

- the amendment of schemes
- the subdivision and consolidation of land
- the development of land outside the area of a scheme
- the phasing or cancellation of an approved layout, or
- the alteration, suspension or deletion of restrictions relating to land

4.3 Area to which These Norms and Standards Apply

These norms and standards apply to the whole Province of KwaZulu-Natal, including urban and rural areas.

4.4 More Stringent Norms and Standards

A municipality may impose requirements for climate change and energy efficiency that are more stringent than these norms and standards.

4.5 Monitoring, Exceptions and Deviations

The municipality will notify the Department of Cooperative Governance and Traditional Affairs (CoGTA) of all exceptions and deviations from these norms and standards. Such notification will include clear description of the deviation and considered reasons therefore in the format which may by prescribed by the KwaZulu-Natal Department of Cooperative Governance and Traditional Affairs.

5 Legal Framework for Climate Change and Energy Efficiency

Table 1 summarises the legislative context within which these Norms and Standards have been framed.

TABLE 1: LEGISLATIVE FRAMEWORK

	National	Provincial	Local
Planning	Spatial Planning and Land Use Management Act, Act No. 16 of 2013	KwaZulu-Natal Planning and Development Act, Act No. 6 of 2008	Municipal Planning Bylaws Municipal Planning Schemes, including Open Space and Environmental Layers if developed
Building	National Building Regulations and Standards Act, Act No. 103 of 1977		Municipal Minor Building Works lists prepared in terms of National Building Regulations and Standards Act, Act No. 103 Of 1977
Heritage	National Heritage Act, Act No. 25 of 1999	KwaZulu-Natal Heritage Act, Act No. 4 of 2008	
Agriculture	Draft Preservation and Development of Agricultural Land Bill, 2016		
Environment	National Environmental Management Act, Act No. 107 of 1998 (NEMA)		Environmental Management Frameworks
Climate Change	Climate Change Bill 2018		
Flooding	The National Water Act, Act No. 36 of 1998 Conservation of Agricultural Resources Act, Act No. 43 of 1983		
Stormwater	National Building Regulations (Part R Stormwater Disposal)		
Coastal	National Environmental Management: Integrated Coastal Management Act, Act No. 24 of 2008 (amended by Act No. 36 of 2014)		Municipal Spatial Development Frameworks
Human Health	National Environmental Management Act: Air Quality Act, Act No. 39 of 2004 (amended by Act No. 20 of 2014) National Health Act, Act No. 61 of 2003 Disaster Management Act No. 57 of 2002 (amended by Act No. 16 of 2015) National Climate Change and Health Adaptation Plan 2014-2019 for South Africa	KwaZulu-Natal Policy Framework for Disaster Risk Management 2011	Municipal Disaster Management Plans

6 Norms and Standards for Climate Change

6.1 Introduction

6.2 General Policy Measures

A “sequential, risk-based approach” should be applied to planning responses in adapting to the risks of climate change. A sequence of planning responses where risks from climate change are least likely should be considered. If the least risk prone option is not viable, then the alternative response must demonstrate that it will be able to accommodate potential impacts from climate change into the future (see text box below).

The Sequential Risk Based Approach for Flooding

Sequential Test: The sequential test refers to the process of ensuring development takes place in areas least likely of being flooded. If similar sites are available that are less likely to be flooded then these should rather be used.

Exception Test: The exception test refers to the process where it is not possible to use the site with the least likely flood risk. In this instance, a site specific flood risk assessment on an alternative site should show that the development will be safe over its lifespan for the users and not further increase the flood risk elsewhere (Great Britain Department for Communities and Local Government and Department for Communities and Local Government, 2012).

The following general policy measures are proposed for planning applications in and outside the municipal scheme area in order to respond adequately to climate change.

6.3 Flooding

6.3.1 Introduction

Flooding is one of the key risks associated with climate change. Climate models show that there is an increased likelihood of intense rainfall events across South Africa and in particular on the east coast. Climate models also show that there will likely be increased frequency of rainfall events on the east coast of the country. Increased rainfall intensity and frequency results in increased runoff into stormwater management systems that are already under strain. This often results in localised flooding, with damage to property and livelihoods, as the systems are not able to cope with the increased volume of water.

6.3.2 Policy and Legislative Framework

The policy environment in South Africa of managing the risk of increased flooding linked to climate change is well established. The National Water Act, Act No 36 of 1998 requires 100-year flood lines to be indicated in plans for new township developments. Some municipalities also require additional information if portions of sites are being developed within the 1:50 year flood lines (see text box below). Government Notice R1048 of the Conservation of Agricultural Resources Act also states that "No land user shall ... cultivate any land on his farm unit within the flood area of a water course or within 10 metres horizontally outside the flood area of a water course (Conservation of Agricultural Resources Act, Act No. 43 of 1983, as amended)".

The CSIR Red Book - *Guidelines for the provision of Engineering Services and Amenities in Residential Township Development Volume 2* notes that, although the regulations only require a 100 year flood line assessment, "for areas where the risk of monetary loss, loss of revenue or loss of utilities is unacceptably high, a more stringent (or higher) recurrence interval and a higher level of service may need to be considered"(South African Council for Scientific and Industrial Research et al., 2000)[1].

eThekwini Municipality Flood Assessment Information Requirements (eThekwini 2005)

A **Professional Engineer experienced in hydrological and hydraulic matters** must provide the

[1] Note that the Red Book (2000) is currently being updated by CSIR

following in relation to all development of properties:

1. The level in metres above mean sea level (M.S.L.) of the 1:50 year and 1:100 year flood line on the property.
2. Calculations by the Engineer indicating method of determining the flood line employed.
3. The position of the flood line on the property, whether the proposed development is inside or outside the floodplain and the floor level of the proposed development in metres M.S.L. where appropriate.
4. The information from 3 is to be shown on all plans relating to the development.
5. If all or part of the development including the earthworks is inside the existing 1:50 year flood plain, then the Engineer must certify _
    a. that the foundations are capable of withstanding any forces or flood effects on the development and be prepared to provide design calculation to that effect if called upon to do so;
    b. that the development in the floodplain will not affect the flooding or flood levels on adjacent properties, upstream, downstream and opposite as the case may be, and such certification to be backed up by calculations.

In addition to flood risk assessment, the National Building Regulations (Part R Stormwater Disposal) state that owners of any site must provide suitable means of managing stormwater runoff. This system for stormwater management must be subject to an acceptable rational design prepared by or under the supervision of a competent person (civil engineering)[2] (SANS 10400-R:2012 Edition 3). The regulations also list a number of "deemed-to-satisfy rules" for stormwater disposal for dimensions of valleys and gutters, access to stormwater drains, connection to stormwater sewers and use of street surface drainage systems. The CSIR Red Book also provides significant detail of response measures that can be used to better manage stormwater runoff. Details are provided for the following technical interventions in the Red Book:

- Detention and retention facilities
- Outlets at stormwater-detention facilities
- Bridge backwaters
- Erosion protection
- Transitions
- Kerb inlets
- Side weirs
- Road drainage
- Roof drainage

Consequently, there are already existing policies and guidelines to help developers prepare for flooding events and to better manage stormwater runoff in South Africa. The purpose of these Norms and Standards,

[2] A "competent person (civil engineering)" is defined in Section 3.1 of SANS 10400-R:2012 Edition 3 as "a person who a) is registered in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), as either a Professional Engineer or a Professional Engineering Technologist, b) has a tertiary qualification (degree or diploma) in civil engineering, and c) is generally recognized as having the necessary experience and training to undertake rational assessments or rational designs in the field of civil engineering.

however, is to look specifically at managing the additional impacts of flooding resulting across KwaZulu-Natal from climate change.

6.3.3 Objectives

In order to manage flooding risks due to increased frequency and intensity of storm events linked to climate change, the following objectives are proposed:

- To encourage municipalities to assess potential impacts from more frequent and more intense flooding events as a result of climate change
- To ensure that surface water runoff from a site post-development does not exceed the runoff pre-development taking into account increased rainfall volumes resulting from climate change where possible
- To promote the use of source and local control Sustainable Drainage Systems (SuDS)

6.3.4 Norms and Standards

6.3.4.1 Preparing Flood Lines

A professional engineer with **hydrological and hydraulic experience** should prepare a 1:50 year and 1:100 year flood line on the development site that considers impacts from climate change[3], if the property is situated within the flood plain. (The engineer would need to take responsibility and sign off these calculations to protect the Municipality from any future claims).

1. Planning applicants should demonstrate that the development is taking place in areas outside the existing 1:100 year flood plain.
2. If areas outside the existing 1:100 year floodplain are not available, then;
    a. alternative site options must demonstrate adequate flood risk mitigation strategies
    b. flood risk mitigation strategies should not increase the risk of flooding in adjacent properties.
3. Applicants should demonstrate that run-off for post development is not higher than pre-development, taking into account scenarios for climate change where possible

6.3.4.2 Managing Major Storm Risk

According to the CSIR Red Book - *Guidelines for the provision of Engineering Services and Amenities in Residential Township Development Volume 2*, a major storm event is defined as "a severe, infrequent storm event", whilst a minor storm event is defined as "the frequent, common storm events" (South African Council for Scientific and Industrial Research et al., 2000:6).

1. Planning applicants should demonstrate that the risk associated with increased likelihood of major storm occurrence have been accounted for over the following return periods[4]:
    1.1. Residential - 50 years
    1.2. Institutional (e.g. schools) - 50 years
    1.3. General commercial and industrial - 50 years

[3] The University of KwaZulu-Natal has undertaken research that may assist Municipalities in this regard. Schulze, R.E, D.M Knoesen, R.P. Kunz, and L.M. van Niekerk. 2010. "Impacts of Projected Climate Change on Design Rainfall and Streamflows in the eThekwini Metro Area." Report 62. School of Bioresources Engineering and Environmental Hydrology University of KwaZulu-Natal, Pietermaritzburg, South Africa. https://goo.gl/GjbCGh.

[4] To be reviewed when the revised Red Book is published.

1.4. High value central business districts - 50 to 100 years

2. Planning applicants should demonstrate that the risk associated with increased frequency of minor storm occurrence have been accounted for over the following return periods[5]:
   2.1. Residential - 1 to 5 years
   2.2. Institutional (e.g. schools) - 2 to 5 years
   2.3. General commercial and industrial - 5 years
   2.4. High value central business districts - 5 to 10 years (South African Council for Scientific and Industrial Research et al., 2000).

3. The applicant shall provide a storm water management plan, including:
   3.1. An assessment of stormwater run-off for pre and post scenarios for 1:50 and 1:100-year recurrence Interval storms, taking into account scenarios for climate change where possible.
   3.2. A description of what measures are to be taken in order to reduce stormwater runoff.

6.3.4.3 Incorporating Sustainable Drainage Systems

1. The design and layout of development should make use of source control sustainable drainage systems (SuDs) including:
   1.1. **Porous surfaces** which allow water to pass through the surface into the ground. This reduces the amount of stormwater run-off, improves groundwater resources and promotes biodiversity. This could include porous asphalt, pervious concrete, porous turf and open-jointed blocks and other porous surfacing options.
   1.2. **Green roofing systems** in new development which reduce rates of stormwater by absorbing rainwater and slowing the rate of runoff.
   1.3. **Water harvesting systems** which reduce rates of stormwater runoff while improving water supply constraints. Different water harvesting systems should be considered such as Roof Top Rain Water Harvesting, Jojo tanks, or underground tanks.

2. The design and layout of development with surfacing should make use of local control sustainable drainage systems (SuDs) including:
   2.1. **Filter strips** which are areas of vegetated land that can absorb shallow stormwater runoff.
   2.2. **Swales** which are vegetation-lined ground gutters which partly absorb and redirect stormwater runoff
   2.3. **Infiltration trenches** which are deep trenches that are lined with large granular porous materials such geotextile and rock.
   2.4. **Bio-retention** which are areas that are able to absorb and use larger quantities of run-off as part of biological and sedimentation processes
   2.5. **Sand filters** which are usually underground chambers filled with sand, which act as a storage and filter system of the stormwater for later use (Armitage et al., 2013)

3. Planning applicants should consider potential loading capacity requirements for green roof systems for new developments[6].

[5] To be reviewed when the revised Red Book is published

[6] http://www.durban.gov.za/City_Services/development_planning_management/environmental_planning_climate_protection/Publications/Documents/Guideline%20for%20Designing%20Green%20Roof%20Habitats1.pdf

4. A description of how source and local control Sustainable Drainage Systems (SuDS) were included in the design of the development.

6.4 Coastal Impacts

6.4.1 Introduction

The coastal zone in South Africa is particularly vulnerable to the impacts of climate change. Sea level rise coupled with extreme rainfall events will result in flooding of certain coastal areas (with associated damage to property and infrastructure). KwaZulu-Natal has the highest rate of sea-level rise in the country, rising by +2.74mm per year, and together with the increase in the severity of coastal storms, will have a negative impact on the KwaZulu-Natal shores, especially the sandy shores (Mather *et al.* 2009). Sea level rise is also expected to cause seawater backwash into sewage and stormwater systems. Sea level rise and storm surges will also erode coastlines causing loss of land and associated infrastructure to the sea. Furthermore, sea level rise will have an impact on estuaries and river systems and their associated ecosystems. The current sea level rise data for the KZN Province is outdated and needs to be updated to incorporate climate change predictions.

6.4.2 Policy and Legislative Framework

The National Environmental Management: Integrated Coastal Management Act, Act No. 24 of 2008, amended by Act No. 36 of 2014 (ICMA) , requires provinces and municipalities to develop coastal management programmes that provide an integrated approach to coastal management at a provincial and municipal level respectively. These programmes must align with each other and with the national coastal management programme. The ICMA identifies the boundaries of different types of areas in the coastal zone, including the Coastal Protection Zone (CPZ). The CPZ is "*established for enabling the use of land that is adjacent to coastal public property or that plays a significant role in a coastal ecosystem to be managed, regulated or restricted.*" The CPZ is generally identified as land within 100m from the high watermark in urban areas and 1000m from the high-water mark in rural areas. However, due to South Africa's varied coastline, the ICMA makes allowances for the adjustment of these boundaries. Municipalities are required to include the CPZ on maps that form part of their zoning schemes (KZN DEDTEA, 2017).

The ICM Amendment Act (ICMAA) states that the MEC must establish provincial Coastal Management Lines through Notice in the Government Gazette in consultation with municipalities. These coastal management lines are used to manage development along the coast, in ecologically sensitive or hazardous coastal areas, by prohibiting or controlling development seaward of the line. There are different types of coastal management lines that can be implemented. For example, a management line in respect of expected erosion, or a management line that is put in place to ensure that building heights are controlled to protect the views of a certain natural landscape. Municipalities are required to include these lines on maps that form part of their zoning schemes. The coastal management line for KwaZulu-Natal is currently under development, and some municipalities like KwaDukuza, and eThekwini, have developed their own set of coastal management lines in the interim.

eThekwini Municipality coastal erosion line, development setback line

The KZN EDTEA is currently developing a provincial coastal management line according to the guidelines set out in NEMA: ICMA. In the interim, eThekwini Municipality has determined a coastal erosion line and a development setback line for the municipal area. No development is permitted

eastward of the coastal erosion line, and development is discouraged eastward of the development setback line (eThekwini Municipality, 2018, pp. 2018–2019).

Furthermore, eThekwini Municipality has developed a sea-level rise tool that considers different sea-level rise scenarios in the next 100 years. This tool is currently being used by practitioners to assess development applications (eThekwini Municipality, 2018, pp. 2018–2019).

6.4.3 Objectives

1. To identify areas of high coastal related risk due to the potential impacts of increased coastal storms and sea level rise.
2. To encourage the assessment of the potential impacts from sea level rise and more frequent and intense coastal storms, as a result of climate change, on new and upgraded coastal developments.
3. To protect existing ecology, estuaries and river systems, public property, and infrastructure in areas of high coastal related risk through the use of appropriate and cost-effective mitigation measures.
4. To encourage managed retreat from the shoreline where other mitigation solutions have failed.
5. Adopt a risk-averse approach.

6.4.4 Norms and Standards

1. Planners must include the CPZ and coastal management lines (where they have been established by the MEC through Notice in the Government Gazette in terms of the ICM Amendment Act (ICMAA)) on municipal and provincial planning schemes.
2. In terms of Section 63(1) of the ICMA Planning applicants must ensure any proposed development within the CPZ and coastal management lines is consistent with the purpose of the CPZ or the relevant coastal management line. Within the context of climate change the relevant purposes of the CPZ as specified in Section 17 of the ICMA are:
    a. *avoid increasing the effect or severity of natural hazards in the coastal zone; and*
    b. *protect people, property and economic activities from risks arising from dynamic coastal processes, including the risk of sea-level rise*.

    With regards to the coastal management lines the specific purposes will be identified once the coastal management lines have been established by the MEC.

    Except where development has been prohibited in terms of the Coastal Management Lines, planning applications in the CPZ or seaward of a Coastal Management Line must provide details of mitigation measures (consistent with international best practice standards*, and the Best Practice Guideline Living with Coastal Erosion in KZN (*Breetzke et al., 2008)), undertaken by an appropriate engineering professional.

Where planning applicants are developing in the CPZ or seaward of any promulgated Coastal Management Line they should be encouraged to use soft engineering solutions, that work with natural processes, such as geofabric bags and the planting of appropriate indigenous dune vegetation, to mitigate the impacts of sea level rise and coastal storms.

Coastal Erosion Mitigation Measures as per the Best Practice Guideline *Living with Coastal Erosion in KZN* (Breetzke et al., 2008)

Hard engineering solutions: These types of solutions use permanent structures to protect coastal infrastructure, such as fixed seawalls and groynes. These structures can provide protection to the targeted site, but often have negative impacts on the erosion of surrounding areas and are costly to implement.

Soft engineering solutions: These types of solutions work with the natural coastal processes and involve the rehabilitation and protection of natural defences such as primary dunes, the revegetation of sand dunes with indigenous vegetation, and the use of geofabric sandbags and gabion baskets to assist with the building up of sand. These cost-effective solutions are growing in popularity internationally.

Managed retreat: This solution involves the removal of infrastructure from areas at high risk of coastal erosion. While this measure is advocated internationally, especially with the increase in coastal storms and sea level rise, it is extremely costly and is not always possible in built up urban environments.

3. Where soft engineering is not practical and hard engineering solutions will be employed, the applicant must provide a plan of how they will maintain this infrastructure in the event of increased coastal storms and sea level rise.
4. Where planning applicants are redeveloping damaged coastal infrastructure, managed retreat should be employed.

6.5 Human Health Impacts

6.5.1 Introduction

South Africa is projected to experience a number of direct impacts as a result of climate change. These impacts include; increases in temperature; variability in rainfall and an increase in the severity of storms; increases in coastal storms and sea level rise; and an increase in disasters such as floods and fires. These climate change impacts will affect the health and wellbeing of many South Africa's people, especially the more vulnerable communities.

The increases in temperatures are likely to cause heat stress, particularly in dense urban areas where the "heat-island effect" (see below) will be more severe. Increasing temperatures will also result in increases of cardiovascular, respiratory, and other infectious diseases. The increase in, and severity of storms is projected to cause impacts on health as a result of flooding, especially in low-lying areas which may result in loss of life, and damage to infrastructure. Other impacts such as landslides, fires, and damage from lightning are also projected to occur. Water-borne diseases, such as cholera, and vector-borne diseases, such as malaria, will become more common post disasters due to contaminated water and high temperatures. Infrastructure damage and loss of life will also occur on the coast, due to the increase in the severity of coastal storms and sea-level rise. Air quality is expected to worsen due to changes in climate, especially in urban and industrial areas. Food security may also be affected due to the changes in climate and the direct impact on agriculture. This may impact on the number of malnutrition cases, especially in children (DEA, 2013).

The heat-island effect and climate change

The heat-island effect refers to the phenomena where the temperatures in urban built up areas are warmer than the surrounding rural areas. This occurs due to the significant area of hard surfaces in the cities that absorb heat in comparison to the naturally reflective spaces in the rural areas. With the increase in temperatures that are predicted in South Africa due to climate change, the heat-island effect will result in further temperature increases in urban areas. The use of air-conditioners to cool urban spaces down, also results in heat production as well as increased energy usage and greenhouse gas emissions.

Planning for health-related climate change impacts should not only be the responsibility of the health sector. Development planning that considers climate change can assist in the prevention of certain diseases and injuries by providing guidance on suitable areas for development that are not prone to disaster, such as flooding, or vector-borne diseases, such as malaria. Furthermore, development planning that considers climate change and health impacts can guide the design of infrastructure that can better withstand changes in climate, such as ensuring that new buildings are thermally efficient, and that public transport nodes have sufficient shade. Additionally, urban planning can facilitate the promotion of active lifestyles which can also help to reduce the rate of cardiovascular and respiratory disease.

Urban planning and the promotion of active lifestyles

Development planners can help to promote active lifestyles by investing in the development of safe public green spaces and promoting active transportation like cycling and walking. These investments not only help to reduce greenhouse gases and air pollution, but also stimulate active lifestyles and thereby can assist in reducing the rates of cardiovascular and respiratory diseases (The Lancet Commissions, 2015).

The CSIR Red Book on Guidelines for Human Settlement Planning and Design includes a chapter dedicated to the design of “soft open spaces” and networks (South African Council for Scientific and Industrial Research et al., 2000).

6.5.2 Policy and Legislative Framework

As the health sector is cross-cutting, the policy and legislation relating to climate change and flooding, and climate change and coastal storms is covered in the sections on flooding and coastal management. Similarly, the policy and legislation regarding efficient building design that ensures thermal and energy efficiency can be found in the energy efficiency section.

6.5.2.1 National Environmental Management Act: Air Quality Act, Act No. 39 of 2004

According to the National Environmental Management Act: Air Quality Act, Act No. 39 of 2004, amended by Act No 20 of 2014, Provincial Government is required to develop an Air Quality Management Plan (AQMP) that needs to be included in the provincial environmental management plan or provincial environmental implementation plan. This Act also requires municipalities to develop AQMPs that are included in their Integrated Development Plans (IDP) (Department of Health, 2014, pp. 2014–2019). In addition to this, the National Health Act, Act No. 61 of 2003, notes that the implementation of this AQMP should be monitored,

as part of the environmental health monitoring standards. Currently, an AQMP for KwaZulu-Natal has not yet been developed, but some municipalities, such as the eThekwini Municipality, have developed AQMPs which are incorporated into their respective Municipality IDPs. The overall objective of eThekwini Municipality AQMP is to ensure that the ambient air quality in the Municipality is not harmful to the health and wellbeing of communities and the environment (eThekwini Municipality, 2015).

Air Quality and Climate Change

Despite the setting of national legislation and standards on air pollution, high levels of air pollution are experienced in many parts of South Africa. Fossil fuel and biomass burning as well as emissions from transportation are the major sources of air pollution in South Africa. Some of the direct impacts of air pollution on health include respiratory infections and diseases, as well as Tuberculosis (DEA, 2013, p. 6). With the changes in climate, such as the increase in temperatures, changes in precipitation, and air stagnation, the concentrations of pollutants may be altered. Two of the most commonly identified pollutants that are affected by changes in climate include ground level ozone and particulate matter (PM) ((DEA, 2013, p. 6; (The Lancet Commissions, 2015)). Globally, it is expected that air quality levels will get worse with the changes in climate (Western Cape Government Environmental Affairs and Development Planning 2015). However, there is also the potential for air pollution to decrease as a result of commitments set at an international level to reduce greenhouse gas emissions (The Lancet Commissions, 2015).

Legacy of poor apartheid spatial planning and air pollution

Poor land use planning under apartheid resulted in the location of low-income communities in close proximity to industrial areas. This has resulted in severe health impacts in these residential communities. The South Durban Industrial Basin in Durban is an example of this where heavy industry, including petrol refineries, paper mills and other heavy industry, were planned together with low-income suburbs which has resulted in severe health impacts for communities due to high air pollution levels (DEA, 2012).

6.5.2.2 The Disaster Management Act, Act No. 57 of 2002

The Disaster Management Act, Act No. 57 of 2002, amended by Act No. 16 of 2015 requires that municipalities conduct disaster risk assessments for their respective areas, and identify and map all the areas and communities that are vulnerable to different types of threats, including physical and human-induced threats. Thereafter, municipalities are required to prepare disaster management plans for their municipal area. As quoted in the Disaster Management Amendment Act of 2015, Section 53, subsection 1, a municipal disaster management plan should include:

1. "the way in which the concept and principles of disaster management are to be applied in its municipal area, including expected climate change impacts and risks for the municipality;
2. its role and responsibilities in terms of the national, provincial or municipal disaster management framework;
3. its role and responsibilities regarding emergency response and post disaster recovery and rehabilitation;
4. its capacity to fulfil its role and responsibilities;
5. particulars of its disaster management strategies;

6. contingency strategies and emergency procedures in the event of a disaster, including measures to finance these strategies; and
7. specific measures taken to address the needs of women, children, the elderly and persons with disabilities during the disaster management process." (Disaster Management Act as Amended, 2015).

The Disaster Management Act as amended also requires that the implementation of municipal disaster management plans is aligned with other state organisations and institutional role-players. The amended act also highlights that municipalities must demonstrate the measures that they intend to use for disaster risk reduction and climate change adaptation. Specific mention is made of using ecosystem and community-based adaptation approaches. Municipalities are also required to implement early-warning systems for the identified risks.

The KwaZulu-Natal Policy Framework for Disaster Risk Management was published in 2011. The Framework recognises the many risks and disasters that could occur in the province and it emphasises a disaster risk reduction approach and mitigation as the main principles to guide disaster management in the province. In addition to this, the provincial disaster management framework informs the development of municipal disaster management frameworks and plans (COGTA, 2011). Some of the municipalities in KwaZulu-Natal that have developed Disaster Management Plans include eThekwini Municipality, Msunduzi Municipality uMzinyathi District Municipality, iLembe District Municipality and Harry Gwala District Municipality.

The core focus of the eThekwini Municipality disaster management plan is to support the organisational structures in order to manage and prevent the occurrence of disasters and reduce the impacts of those hazards that cannot be avoided (eThekwini Municipality, 2016). The eThekwini Municipality disaster management plan also provides the operational procedures for risk reduction planning and the emergency procedures to be implemented should a disaster occur.

Disaster and communicable disease

In addition to the direct impacts that disasters, such as floods, can have on health in terms of damage to infrastructure and loss of life, there are also other indirect health related impacts that occur. For example, flooding may result in the overflow of sewage plants into local rivers and the contamination of water supplies. This can lead to increases in diseases such as diarrhoea and outbreaks of cholera especially in communities that are dependent on surface water sources and that have poor access to sanitation (DEA, 2013, p. 6; Department of Health, 2014, pp. 2014–2019; The Lancet Commissions, 2015).

6.5.2.3 The National Health Act, Act No. 61 of 2003

The National Health Act, Act No. 61 of 2003, notes that provincial Heads of Health are required to develop Strategic Health Plans and ensure that the Provincial Health Plan is in line with the National Health Policy. The Act also notes that health managers in district and metropolitan municipalities are required to develop District Health Plans that are in line with the national norms and standards as well as national guidelines issued by the Director General. The National Health Act has set National Environmental Health Norms and Standards (NEHNS) for premises and acceptable monitoring standards for environmental health practitioners. For example, the NEHNS sets the monitoring standards for the control of pests in premises which plays a major role in preventing and controlling major vector borne diseases that are expected to

increase because of climate change impacts. These Norms and Standards are based on the fact that government recognises the importance of disease prevention in all areas of healthcare and are applicable to provincial and municipal levels of government.

Planning for the spread of vector-borne diseases
Malaria transmission in South Africa occurs mostly in the provinces of Limpopo, Mpumalanga and KwaZulu-Natal, with very few cases reported in the other provinces. Malaria cases and deaths decreased dramatically from the year 2000-2011 (85% and 81% respectively). Due to the changing climate in South Africa, however, the distribution areas of certain vectors that carry disease, such as mosquitoes that transmit malaria, and ticks that transmit tick bite fever may change, as climatic conditions become more suitable for these vectors (DEA, 2013, p. 6). Furthermore, in the case of malaria, other non-climatic factors, such as land-use change and rates of HIV infection are also important factors that impact on malaria transmission (DEA, 2013, p. 6).

Development planners can play a role in reducing the occurrence of mosquito transmitted diseases like malaria, by including maps of mosquito related risk areas in strategic spatial plans and developing mosquito management guidelines for new developments in areas of risk. An international example of a local municipality that has used urban planning to manage mosquito related disease is Byron Shire Council in Australia. Byron Shire Council developed a mosquito management plan that included recommendations to reduce mosquito related diseases in areas at risk. Some of these recommendations included:

- Ensuring that buffer zones are included in proposed developments that are adjacent to mosquito and other habitats, such as wetlands
- Ensuring that the technologies used to store water, including rainwater collection tanks, are designed to minimise the breeding of mosquitoes (e.g. use of screens) (Byron Shire Council, 2014; The Conversation, 2012)

In accordance with The National Health Act, Act No. 61 of 2003, the KwaZulu-Natal Department of Health developed a Strategic Plan that is aligned with the nine health goals listed in the National Development Plan 2030. The strategic objectives of the plan provide a detailed framework for achieving maximum health outcomes for the KwaZulu-Natal Province. In the KwaZulu-Natal Province, some of the district municipalities that have developed district health plans include iLembe District Municipality, uMzinyathi District Municipality, Amajuba District Municipality, and Ugu District Municipality.

6.5.3 Objectives

- To encourage identification and assessment of potential health impacts resulting from climate change.
- To ensure that health risks associated with increase climate change related disaster events are incorporated into planning processes.
- To ensure that health risks associated with increased temperatures linked to climate change are incorporated into planning processes.
- To ensure that health risks associated with increased vector-borne diseases resulting from climate change are incorporated into planning processes.

6.5.4 Norms and Standards

6.5.4.1 Planning for health risks

1. Planners should include climate change health related risks identified in disaster management plans in municipal strategic plans and identify communities that are most vulnerable to these impacts.

6.5.4.2 Managing health risks related to disaster events

1. Planners should discourage applicants from developing in areas of high climate risk (e.g. 1:50 year floodplains, areas adjacent to the coast at risk of sea level rise, areas at risk of landslides or subsidence, and areas of high risk identified in Disaster Management Plans), and if there is no alternative, they must include climate mitigation efforts to reduce the potential health risks.
2. Planners should ensure that public green open spaces are included in all levels of plans, including lower order plans, to assist with ecological infrastructure/ ecosystem services such as flood attenuation and cooling services, especially in urban areas. The *Red Book: Guidelines for Human Settlement Planning and Design (2000)* provides a set of guidelines for the planning and design of networks of soft open space[7].
3. Planners should ensure that new developments and infrastructure, where existing developments and infrastructure are to be extended or altered, minimise the area of hard surfaces and maximise the use of permeable surfaces, including green surfaces, for flood attenuation and cooling services (See section on flooding for more detail). This may be managed through the scheme with the inclusion of relevant clauses e.g. at least 25% of a residential property must have permeable surfaces and planting. This may be motivated for variation through a special consent procedure if this is not feasible.
4. Private property owners should be encouraged, and incentivized, to maintain indigenous gardens rather than converting their gardens to paving and other hard surfaces. The cumulative effect of multiple gardens can help to curb the heat island effect and reduce runoff. The Municipality may encourage this through the provision of a list of indigenous species and holding plant fairs where the municipal nursery sells indigenous plants.
5. New water and sanitation infrastructure must be planned for areas that are at low risk of flooding, and plans should be put in place to relocate existing water and sanitation infrastructure that is at risk of flooding, unless a high-level of flood mitigation/protection is demonstrated.
6. Planners should guide the implementation of ecosystem-based adaptation responses in responding to and preparing for climate change related health impacts. Such responses could include restoring coastal mangrove forests for protection against coastal storms or encouraging green urban infrastructure to reduce urban temperatures.

Ecosystem services, climate change and health

Natural ecosystems provide services such as flood attenuation and water filtration. These ecosystems are however undervalued. With the changes in climate, the services that ecosystems provide can help to build the resilience of an area, especially in the case of natural disaster events. Ecosystem based adaptation is an approach that involves the management and protection of ecosystems so that they can provide these services and help communities adapt to the potential impacts of climate change (The Lancet Commissions, 2015). For example, protecting natural sand dunes on a local beach instead of replacing these dunes with hard infrastructure can provide a natural buffer in the event of coastal storms.

According to the LUMS guidelines, some of the ecosystem services provided by green spaces

[7] Note that the Red Book (2000) is currently being updated by CSIR

include:

- Recreation
- Cultural
- Gas regulation
- Climate regulation
- Disturbance regulation e.g. flood control
- Water regulation
- Water supply
- Erosion control
- Soil formation
- Nutrient cycling
- Waste treatment
- Pollination
- Biological control e.g. predator control, rodents, monkeys, mynahs
- Habitat for resident and migratory population e.g. nursery for fish
- Food production
- Raw materials
- Genetic resources

6.5.4.3 Managing health risks related to vector borne diseases

1. Planners should ensure that planning applicants include buffers between new developments and potential vector breeding locations such as wetlands. Consideration of mosquito and other vector breeding locations which are outside of the focus area (and the migration patterns) may also be necessary. This may have to be addressed through intergovernmental forums between municipalities.
2. All rainwater harvesters should include screens to minimise the potential for mosquitoes to breed.

6.5.4.4 Managing health risks related to increased temperatures

1. When submitting building plans planning applicants must demonstrate the application of the SANS 10400-XA standard, which is part of the South African National Building Regulations, to ensure energy and thermal efficiency of new buildings and retrofits (See section on energy efficiency for more detail).
2. Planners should ensure that public green open spaces are designed using "environmental design for safer communities" principles that promote safety to allow for residents to actively use these spaces and improve cardiovascular health. Guidelines on designing for safer communities can be found in the Red Book: Guidelines for Human Settlement Planning and Design and Crime Prevention Through Environmental Design, (CPTED) principles.
3. Planners should design safe non-motorised and pedestrian infrastructure and transport routes that connect key transport nodes, business districts, public spaces, and residential areas to promote good cardiovascular health. These interventions should be accompanied by awareness campaigns on the links between health and an active lifestyle. The Department of Transport's NMT Facility Guideline Manual (2014) is a good resource in this regard.
4. Public spaces and transport nodes should include soft and hard infrastructure that provide shade for pedestrians.
5. Planners should consider the impacts of new developments on air quality in an area and avoid the development of heavy industry in close proximity to residential areas through appropriate zoning in the planning schemes.

Cooling Mitigation Measures- The C40 Cool Cities Good Practice Guide

The C40 Cities Climate Leadership Group, an international network of cities which includes Durban, Cape Town, Johannesburg and Tshwane, has developed a guideline for cities on responding to the increased temperatures experienced in cities as a result of climate change and the urban heat island effect. The guideline focuses on the design of surfaces in cities, on rooftops

and on the ground, to reduce temperatures in cities (C40 Cities Climate Leadership Group, 2016).

For rooftops, the following interventions are proposed in the *Cool Cities Good Practice Guide*:

- **Green roofs:** Green roofs are roofs planted with vegetation that reduce temperatures within buildings and also help to manage stormwater and promote biodiversity
- **Cool roofs:** Cool roofs are white roofs that help to reduce temperatures by reflecting rather than absorbing heat

For on the ground surfaces the following interventions are proposed in the *Cool Cities Good Practice Guide:*

- **Cool paving:** Lighter paving materials are more reflective than conventional paving materials and help to reduce surface temperatures. Permeable paving that incorporates grass can also help to reduce temperatures
- **Green spaces**: The planting of trees and vegetation helps to reduce temperatures in cities by providing shade, absorbing heat, and cooling the air through evapotranspiration (C40 Cities Climate Leadership Group, 2016)

6.6 Drought

6.6.1 Introduction

Drought is a key risk associated with climate change that South Africa is already experiencing. With the changes in climate, it is expected that South Africa will experience increased periods of drought and that when rain does arrive, we will experience it in the form of extreme rainfall events. Drought not only has an impact on drinking water availability but also on water availability for agriculture which impacts on food security. Dry periods coupled with high temperatures may also result in the increase in the occurrence of wild fires.

6.6.2 Policy and Legislative Framework

The South African Drought Management Plan was developed in 2005 (Department of Agriculture, 2005) and provides guidance on drought related interventions at both a preventative and response level.

The South African Disaster Management Act, Act No 57 of 2002, and Disaster Management Amendment Act, Act No 16 of 2015 requires each sphere of government to establish coordinated structures and invest in disaster risk reduction, response and recovery interventions, particularly in response to climate change impacts. In early 2018, the drought that South Africa was experiencing was reclassified as a national disaster (Herman, 2018).

6.6.3 Objectives

1. To identify areas of high drought risk and prevent new developments from taking place where water availability is currently a challenge.
2. To implement water storage mitigation infrastructure to store enough water, during rainfall events, to last in periods of drought.
3. To ensure existing water resources are protected by limiting developments surrounding strategic water resources.

6.6.4 Norms and Standards

1. Planners to ensure that a water availability study, that takes climate change projections into account, is done prior to the approval of new developments.

2. Planners to implement suitable buffers between strategic water resources, such as dams and rivers, and developments to ensure the continued supply of quality water resources.
3. Planners to require the inclusion of water harvesting systems in all new developments. Possible options include micro (e.g. Roof Top Rain Water Harvesting) and macro (flood water capture) rain water harvesting (RWH) systems.
4. Planners to encourage residents to plant indigenous vegetation so that the amount of water needed for irrigation is limited.

7 Norms and Standards for Energy Efficiency

7.1 Introduction

Energy efficiency refers to using less energy to achieve the same outcome. Becoming energy efficient is a key strategy required to reduce Green House Gas Emissions and thus mitigate climate change.

The incentive for energy efficiency is not only to reduce cost, but more importantly it is the environmental need to reduce GHG emissions and other environmental hazards and degradation.

Energy efficiency can be dealt with at all scales of planning from the building to the region. Most research has been done at the level of the building (reducing the need for heating, cooling and lighting) and is dealt with in the SANS 10400 Building Regulations Part X and XA and Green Star rating tools, as well as a number of guidelines for architects on energy efficient layout, siting, orientation and landscaping.

This section addresses energy efficiency from a broad land use management perspective, as well as site specific renewable energy installations. The site-specific energy installations addressed in these norms and standards include:

- Solar Water Heaters
- Photovoltaics
- Wind Turbines

The above are the most common installations that have a Land Use Management implication.

7.2 Energy Efficient Spatial Form

7.2.1 Introduction

Energy efficient spatial design norms and standards are inappropriate at a broad spatial planning level simply because spatial form is shaped by many underlying social and economic forces, other than planning and is constantly changing as a result of changes in the evolution of technology. Moreover, energy efficiency is only one consideration in planning and may be of lesser importance in some situations. However, planning principles can and should be applied and these are addressed in this document. Planning policy in isolation is unlikely to contribute significantly to energy efficiency, but an energy conservation policy will not be effective if it does not include planning proposals.

Energy efficiency can be achieved in 2 ways through planning:

- Plan an environment that reduces the need for energy i.e. reduces the need for transport, heating and cooling.
- Address unavoidable energy demand in an efficient way through the use of renewable energy and planning efficient spatial structure.

Considering that each site or location is different (topographically, demographically, economically, climatologically, ecologically etc), developing a one size fits all set of standards is not appropriate. For example, higher density buildings require less heating in a cool climate, however in a warm climate they require more cooling. S E Owens (in Cullingworth, 2017, 64) notes that it is impossible to define an ideal energy efficient spatial form as energy demand is a result of a complex set of factors, however some spatial forms may be more robust. “What is an "energy efficient form" may depend upon factors specific to particular locations, such as climate, rate of change in the built environment or socio-economic characteristics of the population.” She continues by noting that we should “plan for a physical environment which permits people to carry out their daily activities using energy as efficiently as possible” (Owens in Cullingworth, 2017, 64).

At the regional, city and town scale, planning for energy efficiency focuses on reducing the need for travel that uses traditional fossil fuels by promoting pedestrian scale, walkable neighbourhoods with increased densities and a mix of uses where people can live, work and play. However, densification has its limitations as congestion and loss of accessibility, increased heat island effect and loss of access to passive solar power may be counterproductive. Moreover, travel is a derived demand and influenced by many factors so cross commuting may still be an issue in a context of relatively low-priced fuel and could result in increased energy demand. The legacy of Apartheid planning also provides challenges given the spatial structure of former townships and many informal settlements that are separated from places of employment and require long commutes.

Research suggests that the most energy efficient cities have the following characteristics:

1. “Built-up areas are compact and the densities of buildings, residents, and jobs are strategically distributed along transit corridors and matched with social and environmental services and amenities;
2. Street networks are dense and interconnected and display a variety of sizes and functions that consider the needs of all users, particularly pedestrians, cyclists, and transit users;
3. Public transport modalities correspond to population and job densities and the stops are accessible by walking;
4. Social services and environmental amenities, such as schools, hospitals, parks, and green spaces, are designed to maximize accessibility by walking;
5. Urban blocks are small sized and buildings are aligned along streets to create various street fronts and vibrant sidewalks;
6. Multi-functional (or mixed) uses are ingrained in neighbourhoods, blocks, and even individual buildings;
7. Streets are places for people and promote walking; and
8. Design and layout of buildings and streets are adapted to local climatic conditions.”

(Mayoral Guidance Note #6, Energy Sector Management Assistance Program, Knowledge Series 022/14).

At the more detailed scale, planning for energy efficiency focuses on the design of buildings and space about buildings to reduce the need for heating, cooling and artificial light, as well as the use of alternative, renewable energy sources that reduce the demand for fossil fuels that result in environmental degradation and contribute to climate change.

7.2.2 Policy and Legislative Environment

7.2.2.1 Spatial Planning and Land Use Management Act, Act No. 16 of 2013

This Act has been promulgated with the intention of standardizing and regularizing Spatial Planning and Land Use Management across South Africa. It addresses all aspects of spatial planning at a macro and micro level. It thus includes requirements for Municipalities to prepare Spatial Development Frameworks as well as Land Use Schemes. Provinces and Municipalities must then formulate their own legislation within this framework. In KwaZulu-Natal, this will be achieved by a Provincial iteration of SPLUMA (which will replace the PDA) or by Municipal bylaws. The National SPLUMA provides the following:

- Development Principles (Chapter 2)
  - Spatial Justice
  - Spatial Sustainability
  - Spatial Resilience (flexibility in spatial plans, policies and land use management systems are accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks)
  - Good Administration (e.g. policies, legislation and procedures must be clearly set in order to inform and empower members of the public)
- Planning instruments (Spatial Development Frameworks Chapter 3 and Schemes Chapter 4)
  - The Act sets out the content and legal effect of Spatial Development Frameworks and a Land Use Scheme as well as the framework for procedures to amend the scheme.
- Planning approval structures (Chapter 6)

The Department of Rural Development and Land Reform has developed the following Checklists to assist with integration of climate change into IDPs and SDFs

1. Integrated Development Plan Climate Change Checklist (https://goo.gl/Tg1LTJ)
2. Spatial Development Framework Climate Change Checklist (https://goo.gl/FtUrAE)

7.2.2.2 KwaZulu Natal Planning and Development Act, Act No. 6 of 2008

The Planning and Development Act, Act No 6 of 2008 (PDA) provides for the preparation and amendment of Schemes; Subdivision and Consolidation of land; development of land outside a Scheme; phasing or cancellation of approved layouts plans for sub-division or development of land, Alteration, suspension and deletion of restrictions relating to land; general principles for permanent closure of municipal roads and public places; enforcement; compensation; appeal tribunal; and provincial planning and development norms and standards.

The act is likely to be repealed in 2019 and replaced by a Provincial version of SPLUMA.

7.2.2.3 National Building Regulations and Standards Act, Act No. 103 of 1977 as amended by National Building Regulations and Standards Amendment Act, Act No. 36 of 1984

This Act and associated building regulations, provides for the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities; for the prescribing of building standards; and for matters connected therewith. Part X and XA of the National Building Regulations relate to energy usage.

7.2.3 Objectives

1. To encourage the design of spatial plans that promote energy efficiency in order to contribute to the mitigation of climate change impacts
2. To provide Municipal officials with the tools to assess spatial plans from an energy efficiency perspective

7.2.4 Norms and Standards

7.2.4.1 Addressing Energy efficiency at the Spatial Plan level

1. At all scales of planning planners should:
    a. Consider the efficient use of energy at all scales of planning. This includes consideration from Regional Plans such as Spatial Development Frameworks to Site Development Plans and Schemes, which are intended to manage land use and development, and should be enriched with climate change and energy efficient considerations. It is noted that the level of detail will vary across the nature of plans. When preparing plans cognisance should be taken of community and indigenous knowledge and practice.
    b. Consider various climate change scenarios.
    c. Municipalities, as part of their IDP, should consider preparing energy profiles that reflect existing and future energy supply and demand, as well as mapping of heat islands, carbon sinks and areas that provide ecological services such as natural cooling etc.
    d. Include the goal of reducing energy consumption. This requires the measuring and mapping of current energy use in order to monitor success.
    e. Introduce the specific objectives of energy efficient planning in the preparation of the plans.
    f. Plan for a robust energy efficient spatial form
        i. Compact, well connected and dense (whilst avoiding high levels of congestion, overshadowing, lack of ventilation)
        ii. Pedestrian scale (typically a 5-minute walking distance, or approximately 400 metres depending on topography), walkable neighbourhoods designed for people not cars (small block size with a mix of uses)
        iii. Multi-functional/complete streets including landscaping. This includes adequate green open spaces, and energy efficient street lighting.
        iv. Mixed use (building, site, neighbourhood level to provide access to jobs, social facilities and environmental services, with adequate open spaces attached to mixed use)
        v. Public Transit-orientated development
        vi. Optimise design of neighbourhoods and buildings to suit local climate conditions
        vii. Ensure access to safe open space and promote Indigenous landscaping/planting, and water bodies
2. Planners should take the following into consideration when planning for an energy efficient spatial form:
    a. Location of the site/s
    b. The climate of the area
    c. Layout of the sites, including street network and open space
    d. Orientation of buildings
    e. Design of buildings including walls, floor heating and fenestration and any other elements that are of relevance to energy efficiency
    f. Density of buildings
    g. Distance between buildings
    h. Shading

i. Landscaping and any soft engineering solutions
j. Planting both on individual sites, and in the public realm
k. Building Typology and materials used, including percentage of glazing, lighting and ventilation as well as operational aspects

7.2.4.2 Reduce the need for travel

One means to assist in reducing the reliance on non- renewable energy resources and to reduce the production of Greenhouse Gasses is to ensure that there is a reduction in the need for travel. Spatial plans should consider the following where possible:

1. Promoting Mixed Use development, especially in centres and along transport corridors
2. Promoting Densification, especially along public transport routes, and areas of high accessibility including pedestrian routes
3. Promoting Non- Motorised Transport through pedestrian scale, mixed use neighbourhoods
4. Promoting Public Transport through Transit Orientated Development, including Mixed Use and public realm interventions - higher densities along public transport routes and around public transport stations

7.2.4.3 Reduce the demand for energy generated Heating and Cooling

Reduce the need for energy powered heating and cooling through good urban and building design e.g. space about buildings for adequate air flow, increase space for shade planting in hot areas, increasing insulation, draught proofing, installing good-quality double-glazed windows in cold areas, switching to more efficient appliances and light bulbs, improved ventilation, etc. Consideration should also be given to green walls, maximising shading, natural ventilation and amplifying light. The South African National Standard (SANS) 10400-XA addresses the energy efficiency of buildings.

7.2.4.4 Reduce Heat Islands

Heat Islands (i.e. urban areas with higher temperatures than surrounding areas) result in the need for more cooling. These can be reduced through promoting the use of reflective surfaces; more planted surfaces including roofs and walls that cool through shade and evapotranspiration; more water features (from large dams to ponds, pools and fountains); and more permeable surfaces.

Heat Islands should be mapped for all large towns and attention given to reducing the overall heat island effect. Some areas will, by design, remain as hotter heat islands e.g. CBDs, industrial areas, however, overall Municipalities should consider measures to reduce the overall impact of development on increased temperatures.

7.2.4.5 Manage Carbon Sinks

At the spatial plan level, it is essential that sufficient space is allocated for carbon sinks that will assist in absorbing greenhouse gases that are contributing to climate change. “A carbon sink is anything that absorbs and stores more carbon from the atmosphere than it releases as carbon dioxide.”

These may include, but are not restricted to:

1. Conservation areas
2. Forests
3. Grasslands
4. Oceans and coastal wetland systems
5. Soils

6. Artificial man-made sinks such as man-made wetlands and planted ecosystems

(Source: http://climatereality.co.za/what-are-carbon-sinks-and-why-are-they-important-in-africa/)

At the city/ urban context, consideration should be given to solutions such as roof gardens, green walls, indigenous planting and the like.

From a land use management perspective, there are a number of opportunities to increase carbon sinks:

1. Biomass to energy through the combustion of sugar and forestry biomass
2. Commercial small-grower afforestation
3. Restoration of sub-tropical thicket and forests
4. Restoration and management of grasslands
5. Reduced tillage that leaves sufficient biomass residue in place to cover a minimum of 30% of the soil surface after planting

(Source: http://climatereality.co.za/what-are-carbon-sinks-and-why-are-they-important-in-africa/)

Potential Carbon sinks should be mapped for all large towns and attention given to promoting and protecting these areas.

7.2.4.6 Promote Bioclimatic Design of Buildings, Passive Solar Design and Natural Ventilation

Passive Solar Design (harnessing of solar energy for heating and cooling through design) can lead to significant savings in the demand for conventional fuel at little or no environmental cost. This affects layout and density as it requires a north south orientation and the placement of buildings to avoid overshadowing.

7.2.4.7 Green Building Energy Efficiency Ratings

At the site level, the Municipality can promote buildings that are designed to meet Energy Efficiency Ratings determined by the Green Building Council (https://gbcsa.org.za/). This is done both in conjunction with the building design as well as various site planning elements. Each Municipality should determine the need and appropriateness of this approach, considering the financial implications of attaining energy ratings. This will require adequate capacity building and training of officials to ensure a sound understanding and thus implementation of this.

7.2.4.8 Shadowing

Excessive shadowing can cause neighbouring buildings to require additional heating and lack of exposure for solar panels. Therefore, where appropriate, the Municipality shall ensure that adequate height controls are addressed in the Town Planning Scheme so as to reduce the impact of shadowing on buildings and public amenities.

7.2.4.9 Spacing

Where appropriate, sufficient side and rear spacing should be applied to ensure that adequate airflow between buildings can take place. Municipal planners should determine the minimum space between buildings as part of the Scheme.

7.2.4.10 Use of Planting to Aid in Energy Efficiency

Where appropriate, the Municipality shall insert into its Planning Scheme, a requirement that a minimum percentage (the Municipality shall determine this percentage) of the site shall have porous paving and be

planted so as to reduce the carbon footprint, provide shade, assist with stormwater runoff and contribute to biodiversity.

Subject to capacity and need, the Municipality may also require certain development types provide a landscaping plan which addresses planting as a means for promoting cooling of buildings and reduced energy usage. The Environment Department would need to assist the Planning Department in assessing these plans and the Municipality would need to ensure compliance with these plans.

7.2.4.11 SANS 10400 Part X and XA

Planning applicants must demonstrate the application of the SANS 10400-XA standard, which is part of the South African National Building Regulations, to ensure energy and thermal efficiency of new buildings and retrofits.

7.3 Renewable Energy Technology

7.3.1 Introduction

Spatial Planning is a field that covers a range of urban, peri-urban and rural issues. One key component of land use management relates to ensuring that amenity is protected appropriately through the mitigation of undesirable externalities of development. This is done by ensuring that land uses are appropriate for both the site and in relation to the surrounding area, and that any other impacts (such as noise, shadows and visual impact) are minimised or mitigated. Thus, the management of areas through Spatial Planning and other approval processes in the public interest is critical.

Renewable Energy technology is a growing field that has implications for Land Use Management and protection of amenity. Renewable energy installations seek to:

1. Contribute to mitigating climate change by reducing greenhouse gases.
2. Reduce a reliance on fossil fuels.

Most schemes do not as yet address the management of the impacts of RE installations. The intention of these norms and standards is to address the following:

1. Facilitating the fitting of compliant renewable energy installations.
2. Ensuring that impacts of these instillations is minimised, and where appropriate provide guidance on mitigating the potential impact that may arise from the installation of RE structures.

7.3.2 Policy and Legislative Environment

7.3.2.1 Municipal Planning Bylaws

In terms of SPLUMA (2013) Municipalities are required to prepare a single land use scheme for their entire area.

Section 25. specifies that

1) A land use scheme must give effect to and be consistent with the municipal spatial development framework and determine the use and development of land within the municipal area to which it relates in order to promote—
    a. economic growth;
    b. social inclusion;
    c. efficient land development; and

d. minimal impact on public health, the environment and natural resources.

2) A land use scheme must include—
   a. scheme regulations setting out the procedures and conditions relating to the use and development of land in any zone;
   b. a map indicating the zoning of the municipal area into land use zones; and
   c. a register of all amendments to such land use scheme.

The Scheme is thus a legal document which specifies what uses are permitted, permitted by consent and prohibited/precluded on an erf. It also specifies the permitted extent of the development (through means such as height control, bulks, side and rear spaces and building lines).

Schemes prepared in terms of these bylaws (or previous legislation) now need to take the impact of renewable energy technology installations into account.

7.3.2.2 National Building Regulations and Standards Act, Act No. 103 of 1977 amended by National Building Regulations and Standards Amendment Act, Act No. 36 of 1984

The National Building Regulations and Standards Act, Act No. 103 of 1977 as amended and associated building regulations applies to all buildings and requires that all installations obtain Local Authority Approval through a prescribed format. Section 1 (e) of the Act states: "*Any facilities or systems or part or portion thereof, within or outside but incidental to a building, for the provision of […] water supply, […] electrical supply or similar service in respect of the building*" requires approval from the Local Council.

Thus, all installations such as Solar Water Heaters, small wind turbines and Photovoltaic panels require building plan applications.

However, AZ2 of SANS 10400 (a): Minor Building Works(g) gives the Building Control Officer of a Municipality the discretion to define a Minor Building Works List for their Municipality. Minor Building Works applications are, as their name implies, small building related installations that have fewer application requirements (possibly just a motivation and site plan) than a full building plan application. The NBR states that the Local Authority may exempt buildings from requiring **full** building plans that are listed as Minor Building Works. All other building works will require he submission of building plans.

Some renewable energy installations may be classified as minor building works.

7.3.2.3 National Heritage Act, Act No. 25 of 1999 and KwaZulu-Natal Heritage Act, Act No 4 of 2008

The National Heritage Act, Act No. 25 of 1999 and the KwaZulu-Natal Heritage Act, Act No 4 of 2008 set out to protect the national and provincial heritage of the country. This Act focusses on preserving the heritage and culture of buildings that of specific value to the community within KwaZulu Natal. Through this Act, a Council, known as Amafa KwaZulu-Natali (AMAFA) was established as a statutory body that has the purpose of protecting both major heritage projects as well as smaller properties that meet certain criteria. AMAFA administers the permit process for demolition and alteration of protected structures in KZN.

In terms of the Act, as administered by AMAFA, section 33 states:
"33. General protection: Structure—(1) (a) No structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Council having been obtained on written application to the Council."

A building over 60 years old (and/or listed) that is applying for a Renewable Energy installation attached to the building will require an application to AMAFA. This is an online application located here: http://www.sahra.org.za/sahris. Compliance with this Act is required before building plans can be submitted to the Municipality.

7.3.2.4 National Environmental Management Act, Act 107 of 1998

The National Environmental Management Act, Act No. 107 of 1998 is the South African Legislation that deals with environmental issues. This legislation defines and regulates what development requires Environmental Assessments, and whether these are Basic Assessments or full Environmental Impact Assessments.

For most renewable energy installations, especially those as ancillary to a building, such applications would not be required. Larger applications may require environmental authorisation. Therefore, the applicant should always check with the Municipality before commencing their other applications.

The National Environmental Management Act, Act 107 of 1998 listed regulations (2014) includes a section that relates to Renewable Energy installations (Item 26 in listing 1). Listing 1 of the NEMA regulations states:

"The activities listed in Appendix 1 are identified in terms of section 24(2) (a) of the Act as activities that may not commence without an environmental authorisation from the competent authority."

The regulations are:
The expansion of facilities or structures for the generation of electricity from a renewable resource where-

(i) the electricity output will be increased by 10 megawatts or more, excluding where such expansion takes place on the original development footprint; or

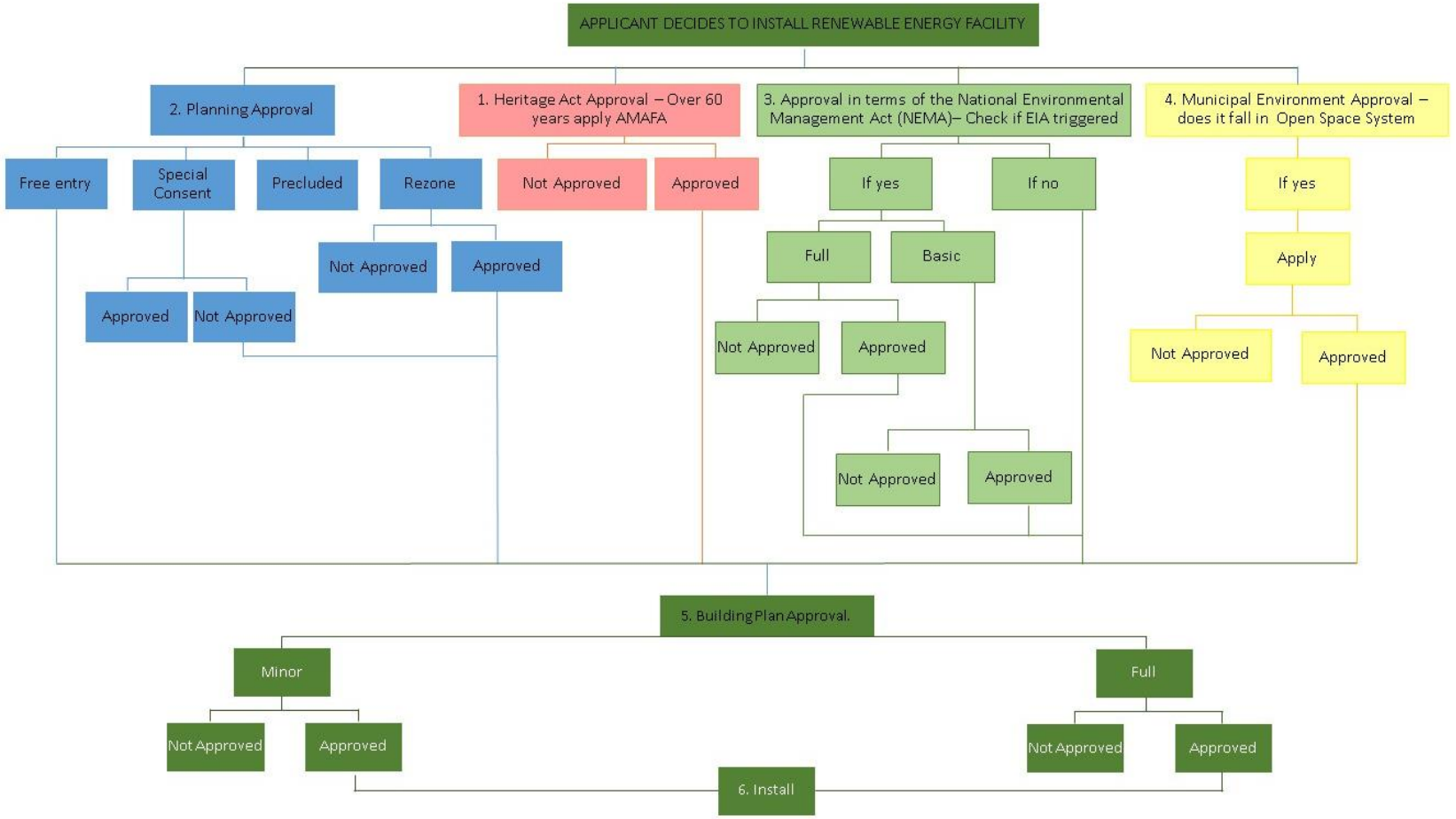
(ii) regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more;

excluding where such expansion of facilities or structures is for photovoltaic installations and occurs within an urban area.

7.3.2.5 Generic Application Process

The following diagram illustrates a generic application process for a renewable energy installation.

FIGURE 1: GENERIC APPLICATION PROCES



7.3.3 Objectives

The objectives of norms and standards for renewable energy technology are to:

1. Promote the use of renewable energy installations in order to contribute to greater energy efficiency and thus reduce greenhouse gas emissions and the impact of these on climate change.
2. Mitigate and manage the potential negative impact of the installation of renewable energy technologies, specifically solar water heaters, Photovoltaic installations, and wind turbines on surrounding land uses.

7.3.4 Norms and Standards

7.3.4.1 Solar Water Heaters

7.3.4.1.1 Solar Water Heater - Free Standing

7.3.4.1.1.1 Planning

(a) A solar water heater located on an erf but not attached to a building, other than through the necessary plumbing, no more than at a height and scale determined by the Municipality, should be treated as ancillary to the land use on the site. Subject to this condition, no Planning Application should be required other than a building plan.

http://www.solarpanelkitschina.com/page-21-55.html

(b) The location of the solar water heater must comply with all building lines, side space and rear space requirements of the relevant Scheme. Any encroachments will require an application to relax the building line, side space or rear space.

(c) The Municipality should determine at what height an application for Special Consent should be required. The Head of Planning (or delegated authority) may waive compliance with the full Special Consent procedure if the written consent of the registered owner of each adjoining property and such other properties as the Head: Planning (or delegated authority) may direct, is first obtained and furnished to the Municipality.

http://blog.intheswim.com/affordable-diy-solar-pool-heating/

(d) The application for Special Consent should address visual impact on surrounding residents or occupants.

(e) A free-standing solar water heater or multiple water heaters should, where possible, be screened to the satisfaction of the Head: Planning (or delegated authority).

7.3.4.1.1.2 Building Plan

(a) Free standing Solar Water heaters should be treated as a minor building works. The Municipality may also consider, under certain circumstances, exempting these from any application.

(b) The building plan application should be accompanied by the proof of appointment of a qualified plumber and sign off by that person confirming that it conforms to relevant safety requirements and industry norms.

7.3.4.1.2 Solar Water Heaters - Attached to Roof

7.3.4.1.2.1 Planning

(a) A solar water heater attached to the roof of a building should be treated as ancillary to the land use on site and no planning application should be required other than a building plan, subject to it being flush with the roof. The Municipality may also consider, under certain circumstances, exempting these from any application.

http://www.solarthermalworld.org/content/south-africa-planned-rollout-650000-solar-water-heaters

(b) The Municipality should determine at what height a Solar Water heater attached to a roof requires an application for Special Consent. The Head: Planning (or delegated authority) may waive compliance with the full Special Consent procedure if the written consent of the registered owner of each adjoining property and such other properties as the Head: Development Planning Environment and Management may direct, is first obtained and furnished to the Municipality.

https://www.greenbuildingafrica.co.za/solar-water-heating/

(c) The Special Consent Application should address the visual impact of the installation on the surrounding residents or occupants.

(d) A solar water heater attached to a roof should, where possible, be screened to the satisfaction of the Head: Planning (or delegated authority).

7.3.4.1.2.2 Building Plan

(a) Solar Water Heater installations should, where possible, sit flush with the roof. However, this is not always efficient for capturing sunlight especially in winter and may not be possible.

(b) For a flat roof installation, a Solar Water heater attached to a building should be treated as a minor building work.

(c) For a pitched roof installation, the Municipality shall determine at what height a Solar Water heater attached to a building should be treated as a minor building work.

(d) The building plan application must be accompanied by an Engineer's certificate confirming that the roof structure is able to withstand the load of the water heater.

(e) A solar water heater installation shall be signed off by a qualified plumber confirming that it conforms to relevant safety requirements and industry norms.

7.3.4.2 Photovoltaic Installations

7.3.4.2.1 Photovoltaic Installations- Free Standing

7.3.4.2.1.1 Planning

(a) The Municipality shall determine at what height a standalone Photovoltaic installation located on an erf but not attached to the building other than through the necessary wiring, shall be treated as ancillary to the land use on site and therefore no application should be required. The Municipality may also consider, under certain circumstances, exempting these from any application.

www.thesolarfuture.co.za/solar-energy-in-south-africa/

(b) The location of the Photovoltaic installation must comply with all building lines, side space and rear space requirements of the relevant Scheme. Any encroachments will require an application for Special Consent to relax the building line, side space or rear space.

www.alamy.com/stock-photo/solar-energy-africa.html

(c) If the installation is more than the height determined by the Municipality then an application for Special Consent should be required. The Head: Planning (or delegated authority) may waive compliance with the full Special Consent procedure if the written consent of the registered owner of each adjoining property and such other properties as the Head: Planning (or delegated authority) may direct, is first obtained and furnished to the Municipality.

(d) The application for Special Consent should address visual impact on surrounding residents or occupants.

(e) A free-standing Photovoltaic installation should, where possible, be screened to the satisfaction of the Head: Planning (or delegated authority).

7.3.4.2.1.2 Building Plan

(a) A Free-standing Photovoltaic installation should be treated as a minor building work.

(b) The building plan application must be accompanied by the proof of appointment of a competent person to undertake the installation. This must include confirmation that the installation conforms to relevant safety requirements.

7.3.4.2.2 Photovoltaic Installations- Attached to Roof

7.3.4.2.2.1 Planning

(a) A Photovoltaic installation attached to the roof of a building shall be treated as ancillary to the land use and no planning application shall be required other than a building plan, subject to it being flush with the roof. The Municipality may also consider, under certain circumstances, exempting these from any application.

Source: http://www.offgridtech.co.za/Projects-

(b) Installations requiring the construction of stands to orientate the installation higher than a height

determined by the Municipality shall be permitted only by application for Special Consent. The Head: Planning (or delegated authority) may waive compliance with the Special Consent procedure if the written consent of the registered owner of each adjoining property and such other properties as the Head: Planning (or delegated authority).

(c) The application for Special Consent should address visual impact on surrounding residents or occupants.

(d) A Photovoltaic installation attached to a roof should, where possible, be screened to the satisfaction of the Head: Planning (or delegated authority)

7.3.4.2.2.2 Building Plan

(a) Photovoltaic installations should, where possible, sit flush with the roof considering the 100mm gap between the installation and the roof that is required for cooling.

(b) For a flat roof installation, a Photovoltaic installation attached to a building shall be treated as a minor building work if it is no more than 1.5 metres higher than the roof structure.

(c) For a pitched roof installation, a Photovoltaic installation attached to a building shall be treated as a minor building work if no portion of the structure is more than 500mm above the apex of the roof.

(d) The building plan application must be accompanied by an Engineer's certificate confirming that the roof structure is able to withstand the load of the installation.

(e) The building plan application must be accompanied by the proof of appointment of a competent person to undertake the installation. This must include confirmation that the installation conforms to relevant safety requirements and industry norms.

7.3.4.3 Wind Turbines

7.3.4.3.1 Free Standing Wind Turbines

7.3.4.3.1.1 General Provisions for free-standing wind turbines

Source: Author (2015)

(a) For a residential site, the Municipality must determine the maximum diameter of the swept area of any free-standing wind turbine blade.

(b) The Municipality must also determine the distance between ground level and the lowest part of any wind turbine blade so as to ensure human safety.

(c) The Municipality should introduce a zone "Wind Farm" into the Scheme. A wind farm refers to a land use whereby multiple wind turbines are installed for the purposes of farming energy for resale. The Municipality shall determine appropriate controls for this zone so as to ensure appropriate safety and amenity.

7.3.4.3.1.2 Planning

(a) All wind turbines, including a wind farm, should be permitted only by a full Special Consent application.

(b) No part of a wind turbine (including blades) may encroach into the building line, rear space or side space of a lot as determined by the Planning Scheme. If an encroachment

Source: ttp://www.eco-h2o.co.za/page/30/

is anticipated this must be addressed in the Special Consent application.

(c) Should a wind turbine exceed the height restrictions of the erf, the Special Consent application must address relaxing the height restrictions with respect to the wind turbine only.

(d) The application for Special Consent should address inter alia:

Information to Provide	Description
Location of property	Street address and erf
Zoning	The zoning of the site
Property Size	Total size of erf
Proposed location of turbines	Site plan showing actual location and proximity to buildings and boundaries etc.
Visibility	Expected visibility from street or other public areas
Height	Proposed height of turbine, either above ground or on roof
Dimensions	Diagrams may be required. Dimension wind-swept area.
Noise	Estimate the noise generated by the turbine
Connection to building	Any connection to the building
Materials used	Main materials that comprise the installed turbine
Grid connection	If it will be connected to the grid or not

7.3.4.3.1.3 Building Plan

(a) Any free-standing wind turbine/s shall be treated as a Full Building Plan submission. The submission must to include site plan, elevations, guy wires and information on adjoining buildings.

(b) The building plan application must be accompanied by the proof of appointment of a competent person to undertake the installation. This must include confirmation that the installation conforms to relevant safety requirements and industry norms.

7.3.4.3.2 Wind Turbines attached to a building

7.3.4.3.2.1 General Provisions for wind turbines attached to buildings

(a) For a residential site, the Municipality must determine the maximum diameter of the swept area of any wind turbine blade attached to a building.

(a) All wind turbines attached to a building shall be permitted only by a full Special Consent application.

Source: www.habitat.com

7.3.4.3.2.2 Planning

(a) No part of the building mounted wind turbine (including blades) may encroach into the building line, rear space or side space of a lot as determined by the Planning Scheme. If an encroachment is anticipated this must be addressed in the Special Consent application.

(b) The Special Consent application must address inter alia:

Information to Provide	Description
Location of property	Street address and erf
Zoning	The zoning of the site
Property Size	Total size of erf

Proposed location of turbines	Site plan showing actual location and proximity to buildings and boundaries etc.
Visibility	Expected visibility from street or other public areas
Height	Proposed height of turbine, either above ground or on roof
Dimensions	Diagrams may be required. Dimension wind-swept area.
Noise	Estimate the noise generated by the turbine
Connection to building	Any connection to the building
Materials used	Main materials that comprise the installed turbine
Grid connection	If it will be connected to the grid or not

7.3.4.3.2.3 Building Plan

(a) A Wind Turbine attached to a building shall be treated as a minor building work.

(b) The building plan application must be accompanied by an Engineer's certificate confirming that the building is able to withstand the load of the installation.

(c) The building plan application must be accompanied by the proof of appointment of a competent person to undertake the installation. This must include confirmation that the installation conforms to relevant safety requirements.

8 Commencement of the Norms and Standards

These Norms and Standards for Climate Change and Energy Efficiency will come into effect on adoption and promulgation by the MEC of Cooperative Governance and Traditional Affairs, KwaZulu-Natal.

9 Revision of the Norms and Standards

Chapter 11, Part 3 of the PDA allows for the amendment to the Norms and Standards, whilst Part 4 makes provision for the withdrawal of the Norms and Standards.

Given that this is the first time Norms and Standards are being drafted on Climate Change and Energy Efficiency, the wide raging nature of the topics and the importance of them in the field of Land Use Management, it is recommended that the Norms and Standards be reviewed in two years' time and amended accordingly.

10 Related Norms and Standards

There are no related Provincial norms and standards at this stage.

11 Copies of the Norms and Standards for Climate Change and Energy Efficiency in Land Use Management

Copies of the Norms and Standards are available on the COGTA website.

12 Other Documents or Materials that may assist in the Interpretation of these Norms and Standards

Other documents that may be of assistance in using these Norms and Standards are:

- **Department of Rural Development and Land Reform: SDF Guidelines: Guidelines for the Development of Provincial, Regional and Municipal Spatial Development Frameworks and Precinct Plans, Final Draft, September 2014**
    - Climate change is addressed through out these guidelines
- **Integrated Development Plan Climate Change Checklist (https://goo.gl/Tg1LTJ)**
- **Spatial Development Framework Climate Change Checklist (https://goo.gl/FtUrAE)**
- **The Green Book: Settlement design guidelines for climate change adaptation in South Africa** currently being produced by CSIR which addresses a range of spatial planning and land use management principles relevant to climate change adaptation, and specifically the design of neighbourhoods, and engineering, economic and ecological infrastructure and services.
    - Workstream 0: Project development phase
    - Workstream 1: Scoping and assessment of existing adaptation strategies, plans and endeavours in South African cities
    - Workstream 2: Analysis of downscaled climate change projections for South Africa
    - Workstream 3: Profiling current and future vulnerability of South African settlements
    - Workstream 4: Identify potential high-risk areas under a changing climate
    - Workstream 5: Develop a risk profile for different types of South African settlements
    - Workstream 6: Develop the most appropriate, innovative adaptation options, strategies and technologies
    - Workstreams 7, 8 & 9: Dissemination, stakeholder communication, engagement and training
- **The Red Book: Guidelines for Human Settlement Planning and Design 2000** (under Revision) which provides general guidelines on the qualities that should be sought in developing sustainable built environments.
- **National Building Regulations & Building Standards Act, Act No. 103 of 1977** as amended by which addressed appropriate building design
- **The South African National Standard (SANS) 10400-XA** which addresses the energy efficiency of buildings, and any future documents to be known as 10400-XB (water efficiency) and 10400-XC (waste).
- **The Green Building Council South Africa and their rating tools.** The GBCSA advocates for all buildings to be designed, built and operated in an environmentally sustainable manner, including addressing climate change and energy efficiency.
- Schulze, R.E, D.M Knoesen, R.P. Kunz, and L.M. van Niekerk. 2010. **"Impacts of Projected Climate Change on Design Rainfall and Streamflows in the eThekwini Metro Area."** Report 62. School of Bioresources Engineering and Environmental Hydrology University of KwaZulu-Natal, Pietermaritzburg, South Africa. https://goo.gl/GjbCGh

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