Nelson Mandela Bay

Climate Change and Green Economy Action Plan

August 2015



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1 Introduction and Background

1.1 Climate change: both threat and opportunity

Climate change is probably the biggest environmental issue of the 21st century – both globally as well as locally. The impacts of climate change are diverse and far-reaching. They affect the individual, the household, the community, the city, the country and the globe. They also affect the economy and jobs, municipal service delivery, quality of life and health of people, and the ability of the natural environment to support life.

Climate scientists predict that unless global greenhouse gas emissions are reduced, Nelson Mandela Bay residents are likely to see more hot days, more frequent droughts, more intense floods, greater wind speeds and a change in the prevailing wind directions, as well as sea level rise and a probability of extreme storm surges. The ability to adapt to the changing circumstances will necessarily determine the range and scale of the impacts.

But climate change also presents opportunities for economic growth. Unlike its larger counterparts, Nelson Mandela Bay is a developing metropolitan city which is at a critical point in terms of development. The city has the opportunity to re-direct its development path from a carbon-based, resource intensive, unsustainable growth path to that of a low carbon, resource efficient, sustainable growth path characterised by greater levels of social integration, and a vibrant green economy.

Action is required at all levels. Local government has a key role to play in ensuring the resilience of their communities, and therefore is taking an active stance with this action plan.

1.2 We're on our way

In recent years various plans, strategies and guidelines in support of climate resilience have been developed by the Nelson Mandela Bay Municipality (NMBM). As it stands the NMBM have adopted an Integrated Environmental Policy with sector specific commitments (2012), and have a Disaster Management Policy as well as Enterprise Risk Management Policy. All of which builds towards climate resilience and the green economy. The NMBM is thus well positioned in terms of incorporating climate resilience interventions into strategic plans and programmes.

Many actions required for building resilience to climate change are also already underway, such as the protection and management of undeveloped urban open spaces, interventions to address the city's water challenges, and eradication of informal settlements. These kind of activities benefit the community and builds resilience to natural hazards, regardless of future climatic conditions.

This report builds upon the current activities of the NMBM that are building resilience to climate change, as well as previous climate-related work, the findings of detailed climate change projections provided by the South African Weather Services and a detailed climate change vulnerability assessment. As a first generation Climate Change and Green Economy Action Plan for the municipality it is intended as a lead-in for prioritisation of intervention actions that will be instrumental in Nelson Mandela Bay transitioning to a resilient city.

1.3 Why do we need to address climate change

Climate change will affect service delivery and infrastructure development – Water shortages, droughts and floods. Coastal storm surges are already posing challenges to sustainable service delivery and the provision of infrastructure. This will continue to do so unless we build resilience to this change.

Spatial development frameworks are key tools for reducing vulnerabilities to climate threats – Strategic thinking and planning decreases future risk and increases future benefits. **Projected impacts of climate change threaten plans for municipal transformation and organisational development –** Embedded in the process of municipal transformation and organisation development is the need for a transformation into a well-functioning institution that understands and manages risk in order to facilitate growth and development, and deliver services to its residents and businesses in a sustainable manner.

Preparing for, and responding to climate change is good governance - The impacts of climate change will affect all the people of Nelson Mandela Bay (especially the most vulnerable i.e. poor, youth and elderly), the city's natural resources, and delivery of services vital for the quality of life of people as well as sustaining economic activity. The NMBM, as the local authority, is thus at the forefront of the impacts of climate change and has a responsibility to respond.

Sustained local economic development requires resilient natural, human and manufactured (infrastructure) capital – Anticipating future changes and taking action to capitalise on opportunities, and reduce the risk associated with threats, will add value to today's investments

Financial sustainability and viability – Proactive interventions are more cost-effective than reactive interventions. Considering future changes in planning ensures greater resilience and longevity of infrastructure investments and reduces damage costs and increased maintenance.

1.4 Who needs to take action

The threats associated with climate change in Nelson Mandela Bay cannot be solved by the NMBM alone – it requires the involvement of other government departments, parastatals, the business and academic sectors, as well NGOs and all residents. However, it is the responsibility of the NMBM to direct and lead the way in terms of building the resilience of the Nelson Mandela Bay community against climate change related threats, but doing so in a participatory manner.

Likewise, none of the climate resilience interventions contained within this action plan can be rolled out without the involvement of multiple directorates. The effectiveness of this action plan will be determined by the level of team work between and within the various directorates. All NMBM directorates are responsible for ensuring climate resilience within Nelson Mandela Bay.

1.5 Acknowledgments

This Climate Change and Green Economy Action Plan was developed under the guidance of the Environmental Management Sub-Directorate of the NMBM, and with inputs and participation from the following sister departments and directorates:

- Electricity and Energy
- Human Settlements
- Infrastructure and Engineering
- Office of the COO

- Public Health
- Safety and Security
- Sports, Recreation, Arts and Culture

The above departments also volunteered representatives for a Project Steering Committee.

The Local Governments for Sustainability (ICLEI) Urban Low Emission Development Strategies (LEDS) programme for support to the NMBM's development of an updated Greenhouse Gas Inventory.

Peer support was also provided in the form of a partnership with the City of Göteborg, Sweden.

Support from local engineering firms and the technical expertise of various individuals are appreciated, and include Dup Van Renen and Hannes Buckle, as well as individuals from AfriCoast and Royal HaskoningDHV.

2 Climate Change Projections

Nelson Mandela Bay's climate is changing, and these changes threaten food security, natural resources, public and private infrastructure, the local economy, household incomes, employment, as well as the welfare and quality of life of people.

2.1 Historic trends

The climate of the Nelson Mandela Bay area is historically variable, both seasonally and annually. When considering observed climate change trends (see sidebar), it should be noted that mean annual precipitation in particular is highly variable throughout South Africa, and especially in Nelson Mandela Bay due to it being located in the transition zone between the winter and summer rainfall areas. As such it becomes quite difficult to identify long term trends with certainty.

Nelson Mandela Bay has a temperate climate with summer and winter temperatures averaging at 25 and 17 degrees Celsius respectively, and with annual rainfall ranging from 500 to 650mm, the majority of which falls between May and October. The winds in this area are predominantly from the southwest during the winter, northwest during autumn and easterly during the summer and spring.

OBSERVED CHANGES FOR SOUTH AFRICA

- Tendency towards a significant decrease in the number of **rain days** in almost all hydrological zones which implies a tendency towards an increase in the intensity of rainfall events and increased dry spell duration
- There has also been a marginal reduction in **rainfall** for the autumn months in almost all hydrological zones;
- 1 degree Celsius increase in mean annual **temperatures** during the past 50 years, with a significant increase in high temperature extremes, and a decrease in frequency of low temperatures for most seasons.

OBSERVED CHANGES FOR THE EASTERN CAPE REGION

- **Rain days** show a fairly consistent decrease along the southern coastal regions
- Above average **rainfall** in the 1970s, the late 1980s, and mid to late 1990s, and below average in the 1960s and in the early 2000s, reverting to mean towards 2010
- Significant increase in both maximum and minimum **temperatures** in all seasons as per the Long-Term Adaptation Scenarios Programme

(DEA, 2013a)

2.2 Our projected future climate

Projections of our future local climate were made by the South African Weather Services (SAWS) using downscaled modelling of global climate models, a first for a South African municipality. Local future climate scenarios were described for the periods 2016-2055 (near term) and 2056-2095 (long term), as calculated relative to the 1976-2005 reference period. A summary of the expected climatic changes is presented in Figure 2-1.

Nelson Mandela Bay's Climage Threats	
Change in temperature patterns	More hot days and heat waves; higher minimum temperatures and fewer cold spells; higher average temperature
Change in rainfall patterns	Decreases in average rainfall and number of rainfall events, BUT increase in rainfall intensity
Change in drought patterns	Increase in frequency (i.e. current 1:10 year drought occurs more often)
Change in flood patterns	Increase in intensity (i.e. 1:100 year flood will increase in magnitude)
Change in fire patterns	More frequent fires
Sea level rise	58cm-75cm rise in sea level
Change in storm surge patterns	Higher probablility of extreme storm surges
Change in wind patterns	Strengthening of easterly winds, weakening of westerly winds

Figure 2-1: Climate change projections for Nelson Mandela Bay

3 Assessing the implications of Climate Change for Nelson Mandela Bay

Some of the threats associated with climate change are less relevant in the immediate future, yet we have to start addressing all of them in order to prepare for a future where all of them will most likely be a reality. This is especially important due to the fact that a large percentage of our population is vulnerable due to socio-economic factors such as poverty and unemployment. All residents are affected by climate change, but not all communities have the same ability to respond to, and recover from, the threats or hazards associated with climate change hence some are more vulnerable than others. In prioritising actions towards climate resilience the NMBM seeks to ensure that the benefits of taking action are shared by the entire Nelson Mandela Bay community.

Identifying and agreeing on how to prioritise the threats of climate change is difficult and at times contentious given the need to address multiple concerns with multiple stakeholders under varying and uncertain conditions. Decision makers are faced with the trade-offs between financial, economic, social, institutional, ecological and legal implications of his/her decision. How does one weigh-up or compare the implications of these different implications within an uncertain and variable context? In addition, as we have little experience of climate change in terms of the extent of the prevailing changes, the threats can only be deduced from historic experiences and may not be 100% accurate.

In order to differentiate between the threats of climate change, a multi-criteria decision making tool was employed to assist in the systematic prioritisation of a number of climate change risk evaluation criteria. This approach not only allows for a comparison of different threats and response actions and weighting of threats in terms of their impact on human welfare, but also encourages interactive municipal stakeholder participation and experiential learning. In such a way the process is made replicable and uniform over time and space for where the specific tool is applied.

A participatory process based on six workshops and direct consultation with municipal officials served to populate a 'threat model' using the decision making tool. This ensured the robustness and legitimacy of the input data. Specifically, the consultation required municipal officials to score the climate change threats for Nelson Mandela Bay in terms of their impact on the community. The vulnerability of the community was defined in terms of four types of 'capitals' based on the understanding that the goods and services we need to improve the quality of our lives are derived from four capitals i.e. Natural, Financial, Manufactured and Social. For each of these four capitals or themes two variables have been selected to serve as proxies for, or to represent, the capitals (Table 3-1). As such they are also the key objectives which the action plan aims to achieve.

Table 3-1: Vulnerability criteria as changes to forms of capital

Capital threatened	Variables	Potential impact of climate change hazard
Natural capital	Food security	Food security changes within the NMBM area as a result of regional climate change effects as defined
	Ecosystem supply and buffering capability	Impact of the loss/gain in environmental goods and services on NMBM area as a result of regional climate change effects as defined
Financial capital	Damage cost to economy	Change in the economic production and growth of the NMBM compensating for losses as a result of regional climate change effects as defined
	Income	Change in income within the NMBM as a result of regional climate change effects as defined
Manufactured capital	Public infrastructure	Change in public infrastructure as a result of regional climate change effects as defined
	Impact on private properties	Change in private property in NMBM as a result of regional climate change effects as defined
Social capital	Impact on employment	Change in employment in the NMBM as a result of regional climate change effects as defined
	Impact on welfare of people	Change in human welfare in the NMBM as a result of regional climate change effects as defined

The **risk assessment**, the outcomes of which are captured in Figure 3-1, concluded that:

- Increased drought is anticipated to be the greatest risk or hazard to society, and is the highest priority for managing possible threats. Drought risk is almost double in magnitude in comparison to the second priority risk.
- Changes in rainfall patterns, especially the anticipated increased unpredictability, are considered the second greatest risk.
- Both the drought and erratic rainfall hazards impact on the entire population of the municipality, and importantly are respectively 4 and 2 times greater risks, than the others.
- Temperature changes, flooding and wind changes are clustered in a similar third position.
- In fourth position are the changes to fire and storm surge patterns, which tend to be locality specific, is of short duration, and impact on a smaller sector of the population.

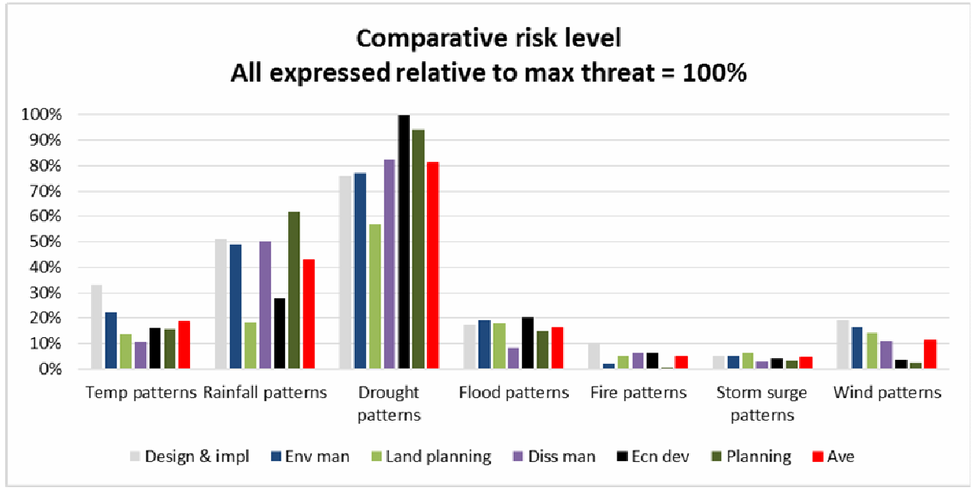


Figure 3-1: A comparison of risk levels accounting for impact on population

Figure 3-2 indicates the **critical threats** to each of the capitals, and provides good direction in terms of the contents of an adaptation action plan.

In summary:

- The welfare of people – is threatened by drought, then flood patterns, and followed by wind and rainfall changes.
- Damage to the economy – is threatened by drought, storm surge and flood patterns. Note that increasing temperatures could stimulate the economy.
- Ecosystem services, especially water supply – is threatened by drought, wind and rainfall changes.
- Public infrastructure - is threatened by floods, storm surge, then wind and drought.
- Employment - is threatened by drought, rainfall and storm surge. Note that an increase in wind could support economic growth.
- Income – is threatened by drought, storm surge and floods.
- Private property - is threatened by flooding and wind, and then storm surge.
- Food security – is threatened by drought, rainfall and temperature changes.

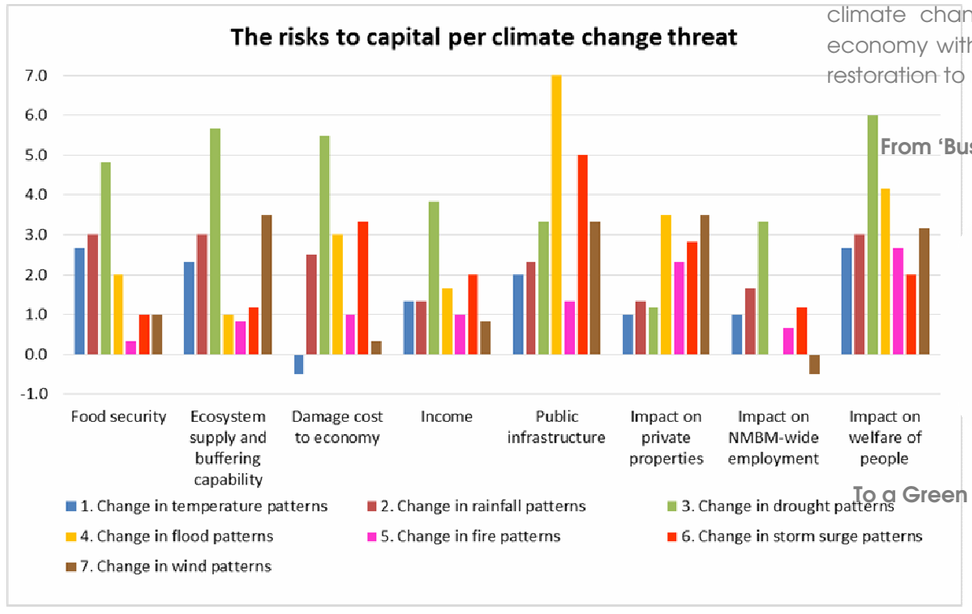


Figure 3-2: The risks to capital per climate change threat

The green economy is defined as an economy that "*…results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities*"

(UNEP, 2011)

4 Green Economy Opportunities in NMBM

4.1 What is a 'Green Economy'?

Current economic practices (i.e. 'Business as Usual') generally consider the natural environment as an infinite resource on which to grow the economy, and an infinite space within which to discharge waste. In contrast, a green economy recognises that the natural environment has thresholds or limits, and seeks to adjust the development trajectory in order to enable society to operate within these limits. It also recognises that the financial, manufactured and social capitals are all fundamentally dependent on natural capital and should be shaped by the ecological assets and services available in a particular region – see Figure 4-1 below. Moving towards a green economy does not mean making current practices and activities look 'green'. It requires a fundamental change in the way the Nelson Mandela Bay society and decision-makers think, work and play.

A green economy action plan involves the restructuring of business, infrastructure and institutions towards more sustainable (green) production, procurement, consumption and distribution processes, creating new economic opportunities and jobs in the process. In addition, the green economy needs to promote social justice, equity and the creation of decent jobs, which are of particular importance in the Nelson Mandela Bay and Eastern Cape contexts. This definition of the green economy aligns well with a climate change adaptation strategy, as there is considerable overlap in terms of operating the economy within ecological constraints, and by investing in activities such as recycling and ecological restoration to reduce risks.

From 'Business as Usual' - where the natural environment is believed to be infinite or unbounded

Growing Economy:
- Separate from the environment
- Free of biophysical constraints

Energy & Resources

Wastes

Infinite Environment:
- Source of resources
- Sink for Wastes

To a Green Economy – where emerging business realisation that the environment is finite or bounded (the green circle)

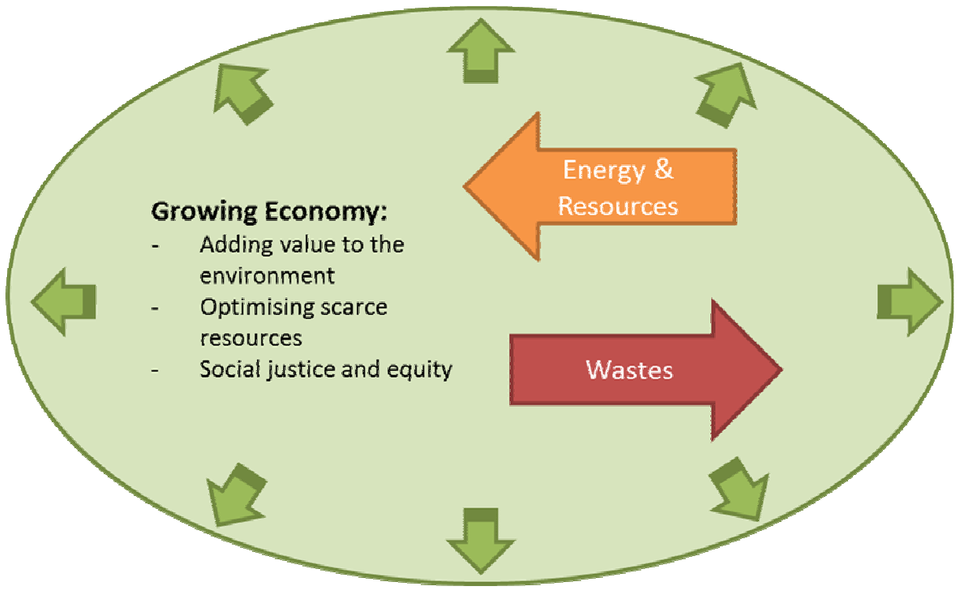


Figure 4-1: Green economy shifts in thinking

4.2 Why shift towards a Green Economy?

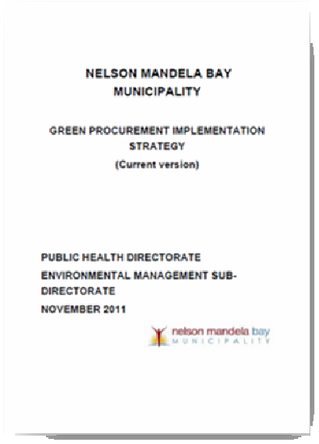
Four main factors has driven the shift towards a green economy both globally and in South Africa:

1. The recent global economic crisis has drawn attention to the need for a more resilient economic model.
2. Growing national and global fear of irreversible environmental damage, which is reflected in the need for climate change adaptation due to increased vulnerability and risk.
3. Recognition of increasing global inequality and poverty and the inability of millions of people across the world to meet their basic needs in terms of food, shelter, water, energy and quality of life and to participate fully in society (Stiglitz, 2010).
4. A shift in economic theory and policy toward the goal of 'resilience' rather than growth. This includes a shift to greater social justice and equity, and *"…investing in the management of the environmental asset base…"* – both of which contribute to the resilience of the economy (IIED, 2009).

4.3 What can we do?

Climate change is having and will have an influence on the availability of goods. The conventional disposal of products (i.e. landfill and illegal dumping) also negatively influences the city's living spaces and contributes to greenhouse gas emissions. By choosing to make lifestyle, purchasing and ethical choices at home, work or play, all roleplayers in Nelson Mandela Bay can create action on climate change.

Local government is one of the biggest procurers of products and services within a local economy. The NMBM thus have significant power to initiate and drive the shift towards a green economy within Nelson Mandela Bay and surrounding region to influence businesses to manage their use of natural resources and to take responsibility for product lifecycle costs (the environmental, social, and economic cost of a product's design, manufacture, operation, and disposal) i.e. sustainable / green procurement.


NELSON MANDELA BAY MUNICIPALITY

GREEN PROCUREMENT IMPLEMENTATION STRATEGY
(Current version)

PUBLIC HEALTH DIRECTORATE
ENVIRONMENTAL MANAGEMENT SUB-DIRECTORATE
NOVEMBER 2011

nelson mandela bay MUNICIPALITY

4.4 We've started the journey

The NMBM recognizes the need to manage natural resources more effectively and responsibly in order to ensure positive effects on quality of life and the growth and health of the local economy. In 2011 the Nelson Mandela Bay Council approved the Green Procurement Implementation Strategy (NMBM, 2011d), which provides guidance in terms of the transitioning to a green economy. Since its adoption, the NMBM has actively promoted green procurement through interactions with procurement departments, participation at supplier awareness events and internal education sessions with municipal officials.

The adoption of green procurement requirements by the NMBM is a critical step towards a green economy within Nelson Mandela Bay.

5 The Climate Change & Green Economy Action Plan at a Glance

One of the implications of the green-economy shift is to realise the difference between stocks and flows, and capital and income. Stocks represent the accumulation of capital assets over time whereas flows or income refer to the periodic (usually annual) proceeds emanating from using and/or liquidating the assets. Green economic thinking is much more about 'capital-thinking' than 'income-thinking'. If the Nelson Mandela Bay community takes care of its capital base, the capital base will take care of the income.

Therefore, within the context of a green economy, adaptation to climate change impacts would equate to interventions that protect the different forms of 'capital' – natural, social, economic and manufactured capital. These capitals represent the fundamental economic units from which returns or profits are derived. Should they be depleted over time, then the municipality would progressively lose its ability to generate socio-economic value and increase the requirement for artificial maintenance of these capitals. By way of example, if the natural capital is eroded, less recreational space (socio-economic value) would be available, and more direct intervention (hard infrastructure and its maintenance) would be required to handle storm water.

The Climate Change & Green Economy Action Plan consequently speaks to the ultimate goal of ensuring a **climate resilient Nelson Mandela Bay** through the achievement of eight **objectives** and **targets** that correspond to the four overarching **capitals**, as depicted in Figure 5-1. The objectives and targets are to be achieved through a range of specific **intervention programmes** that each correspond to a set of specific tasks.

The targets set for each high level objective or outcome are to be used as a 'dashboard' to show how NMBM is doing in terms of the overall goal of becoming more resilient, but also to flash warning signals when one of the dimensions of resilience is being neglected or not fully realised as intended. Table 5-1 below offers a description of each of the targets or indicators to explain how they relate to the Action Plan.

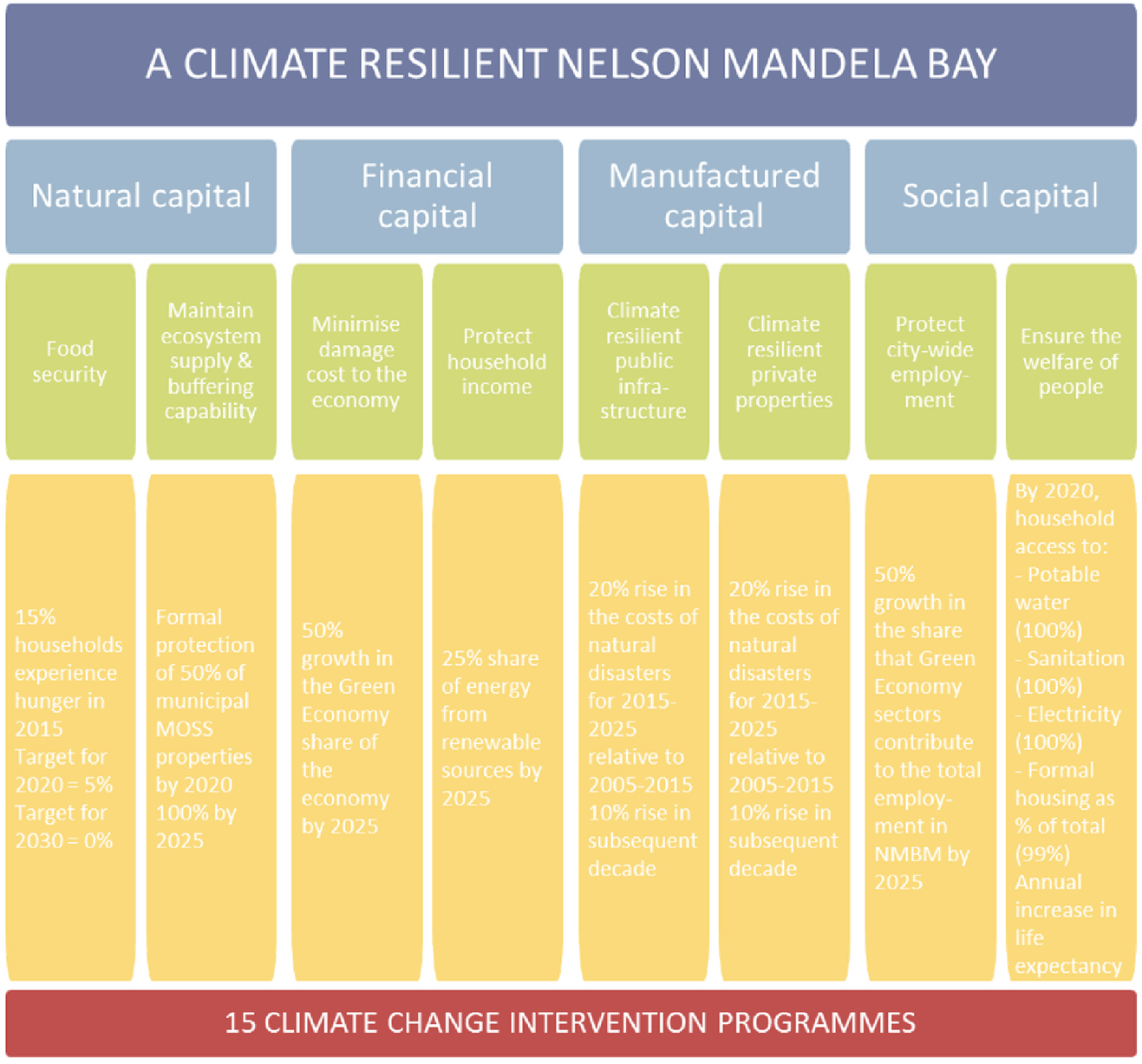


Figure 5-1: Structure of the Climate Change and Green Economy Action Plan

Table 5-1: Description of the indicators of climate change resilience in Nelson Mandela Bay Municipality

Capital threatened	Objective	Metric	Outcome Target	Description of target
Natural capital	Food security	Proportion of population who report experiencing hunger in a reference period	Target for 2015 = 15% Target for 2020 = 5% Target for 2030 = 0%	Deterioration of ecological functioning would threaten agricultural production in the region around NMBM. Monitoring the prevalence of hunger would show how expensive foodstuff are, which is indicative of the natural productivity of the local agricultural areas, as well as indirectly measure the access that low income households have to productive land and water for subsistence farming. Household food security is reported on by the national General Household Surveys. The UN Sustainable Development Target for 2030 is to eradicate hunger, as opposed to the Millennium Development Goal of reducing the percentage of the population that experience hunger to 15% by 2015.
	Maintain ecosystem supply and buffering capability	Spatial extent of the loss/protection of natural habitat	Formal protection of 50% of the municipal-owned open space considered as part of the MOSS by 2020, and 100% by 2025. Restore ecological functioning to 20% of the Krom and Kouga catchments by 2025	The municipal open space system should form the backbone of an intact and functional ecological system. The priority is to secure formal protection of all municipal properties that have been identified as part of the planned MOSS, although this can be supplemented through conservation/stewardship agreements with private landowners. Facilitating catchment management in the NMBM water supply areas by other government agencies, such as DWS and Gamtoos Irrigation Board, is a key action for NMBM to undertake.
Financial capital	Minimise damage cost to economy	Growth in the Green Economy	By 2025, a 50% growth in the share that Green Economy business has of the NMBM economy.	Growth in prioritised Green Economy sectors is an indicator of diversification and adjustment to a changing economic context and global shift to sustainable and responsible economic activities. This is a crucial adaptation requirement for NMBM which is heavily dependent on long distance transport and the automotive industry. Green Economy sectors include: • Resource conservation and management; • Sustainable waste management practices; • Water management; • Environmental sustainability: greening & legacy; • Major events & tourism, research, skills, financing and investments; • Green buildings and the built environment; • Sustainable transport and infrastructure; • Clean energy and energy efficiency; • Agriculture, food production and forestry; and • Sustainable consumption and production
	Protect household income	Proportion of energy needs supplied by renewable sources	25% share of energy from renewable sources by 2025	A large-scale shift to renewable energy will assist households to reduce their dependence on costly grid-supplied electricity (and reducing 'energy poverty'), and the municipal economy as a whole to adjust to demands for reliable clean energy to sustain business and industrial activities.
Manufactured capital	Climate resilient public infrastructure	Damage cost to public infrastructure as a result of natural disasters (inflation corrected)	A 20% rise in the costs of natural disasters for 2015-2025 relative to 2005-2015 A 10% rise in the subsequent decade	A progressive containment and eventual reduction in the rise of the costs of natural disasters would be indicative of the NMBM successfully adapting to the threats of climate change. Currently, the costs of natural disasters rise by 20% per decade, which implies that the ideal would be to firstly not allow the escalation in costs to increase (despite the further concentration of people and economic activity in the municipality) and then to reduce the overall escalation of costs over time – effectively lowering the cost escalation trajectory.
	Climate resilient private properties	Damage cost to private property as a result of natural disasters (inflation corrected)	A 20% rise in the costs of natural disasters for 2015-2025 relative to 2005-2015 A 10% rise in the subsequent decade	As with the considerations for the costs of damage to public infrastructure, the target is to slow the rise of damage costs over time.
Social capital	Protect city-wide employment	Employment in the Green Economy	By 2025, a 50% growth in the share that Green Economy sectors contribute to the total employment in NMBM	The growth of employment opportunities in Green Economy sectors would be indicative of the general success of the investment in these sectors, but specifically of the benefit that this growth holds for household level welfare.
	Ensure the welfare of people	Access to basic services, adequate housing and healthy living conditions	By 2020, household access to: • Potable water (100%) • Sanitation (100%) • Electricity (100%) • Formal housing as percentage of total (99%) Annual increase in life expectancy	Core household welfare indicators are indicative of the overall state of governance and the ability of the municipality to adjust to the progressive onset of climatic shifts. According to the Presidential Development Indicators, all households should have access to basic services, whilst the basic right to adequate housing implies that living in a formal structure would complete the picture. Lastly, life expectancy is used as an overall indicator of human health.

6 Prioritisation of intervention programmes

The eight objectives will be achieved through the implementation of 15 intervention programmes or clusters of responses required to counter the impacts that each of the primary climate change threats will have on the different capitals. These interventions were identified by the project team and confirmed by NMBM officials as necessary responses to the priority climate change threats and their relevance to the different capitals. Where possible, projects and responses already in existence, or planned for, were included in the programmes. The interventions encompass 48 specific actions and can be formulated into five broad response areas, as shown in Figure 6-1.

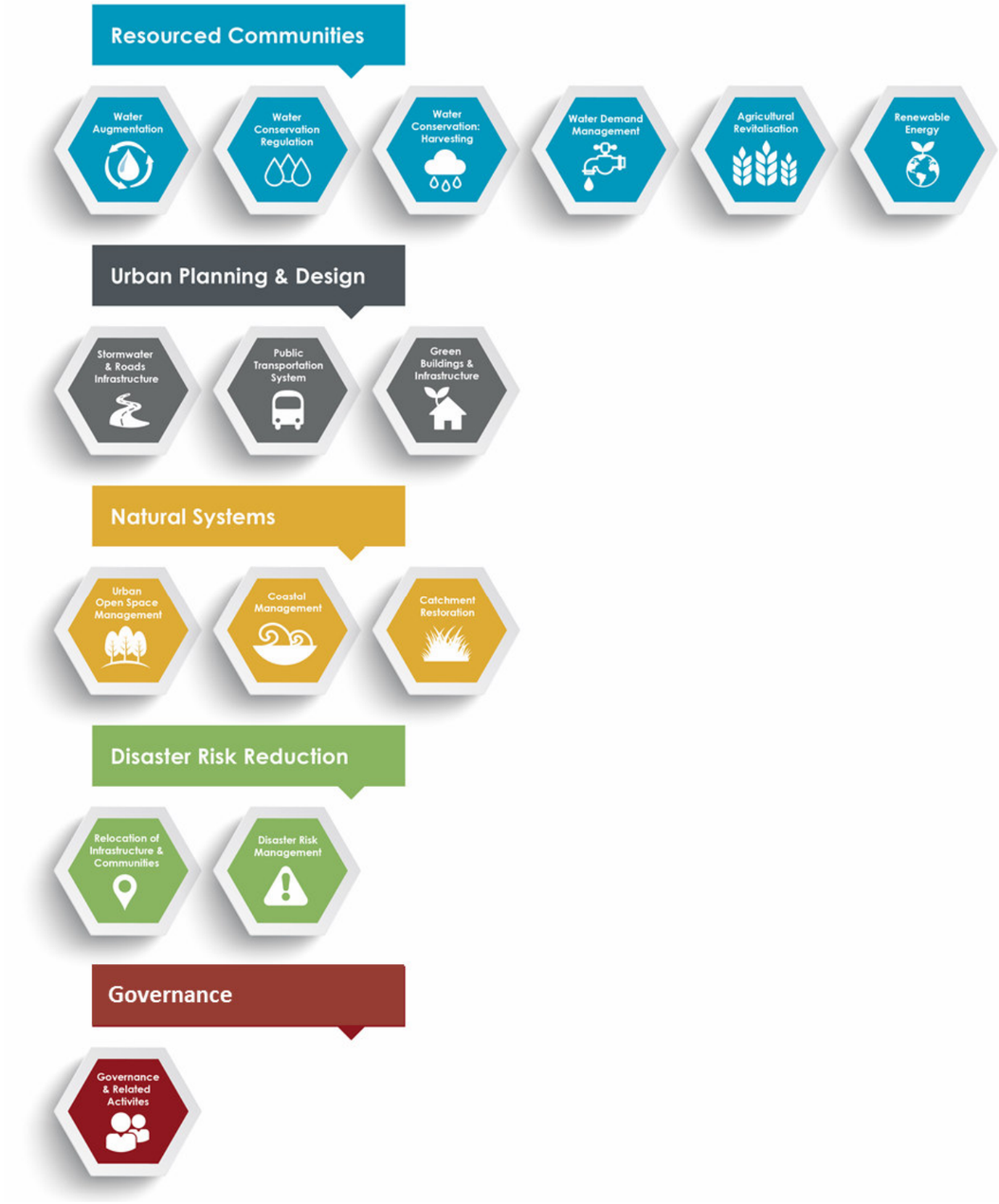


Figure 6-1: Climate Change Adaptation Programmes

Further detail on the intervention programmes and departmental responsibilities is provided in Section 7. However, it is important to realise that each intervention programme relates directly to the eight overall objectives of climate change response in Nelson Mandela Bay. These relationships are shown graphically in Figure 6-2. Evident in the figure are the interrelationships between the different intervention actions. Improving Governance activities would, for example, lead to positive responses in most objectives, thereby creating resilience within both the local economy and households. As a consequence, the burden placed on other intervention actions becomes lighter.

Implementing the various interventions requires a focussed, concerted and integrated effort by all directorates. Due to the nature of the interventions different interventions will be more relevant to some directorates than others. For that reason Table 6-1 provides a breakdown of the different responsibilities of the main departmental units in the municipality. For each programme a Lead Department is identified, along with the other Departments that will play a role in the implementation of the interventions.

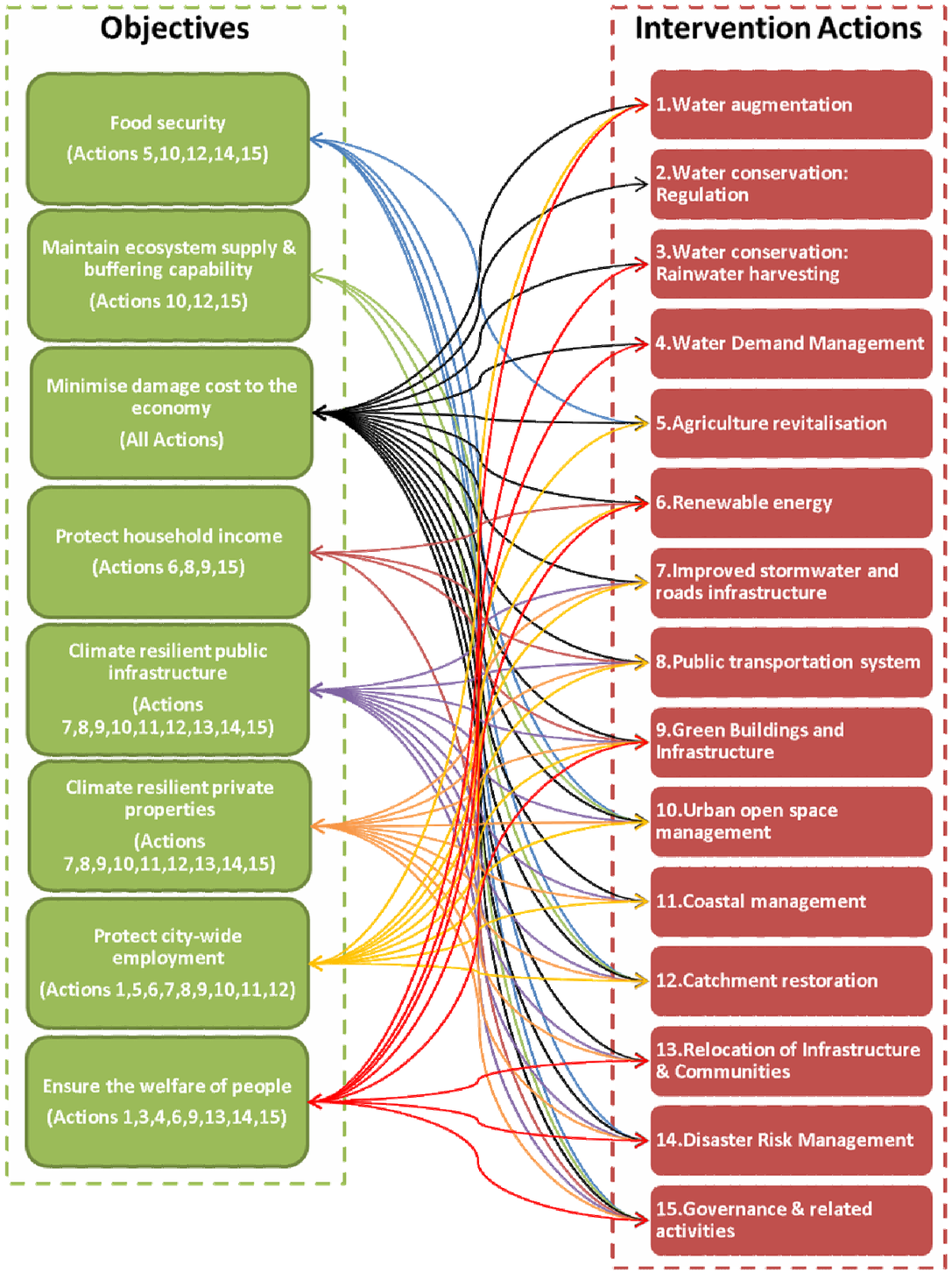


Figure 6-2: The 15 intervention programmes and related climate change response objectives

Table 6-1: Departmental responsibilities look-up table

Intervention Programme	Chief Financial Officer	Chief Operating Officer	Corporate Services	Economic Development, Tourism & Agriculture	Sports, Recreation, Arts & Culture	Electricity & Energy	Human Settlements	Infrastructure & Engineering	Public Health	Safety & Security
Water augmentation	X							LEAD		
Water conservation: Regulation	X	X						LEAD		
Water conservation: Rainwater harvesting	X		X				LEAD	X	X	X
Water Demand Management	X	X	X					LEAD		
Agriculture revitalisation				LEAD			X	X		
Renewable energy	X	X	X	X		LEAD	X	X	X	
Improved stormwater and roads infrastructure	X	X						LEAD	X	X
Public transportation system	X	X	X	X			X	LEAD	X	
Green Buildings and Infrastructure	X	X	X	X	X	X	LEAD	X	X	
Urban open space management		X		X	X		X	X	LEAD	
Coastal management					X		X	X	LEAD	
Catchment restoration		X						X	LEAD	
Relocation of Infrastructure & Communities					X		X	X	LEAD	
Disaster Risk Management	X	X			X		X	X	X	LEAD
Governance & related activities		LEAD	X				X		X	X

Prioritising where and how NMBM will concentrate financial and human investment in climate change responses is essential, given that many response programmes are financial capital intensive and dependent on long-term commitment. This action plan consequently expanded on the multi-criteria decision making tool used to compare the different climate change risks to compare the different response programmes in terms of both overall cost-benefit and relative effectiveness.

It is important to note that the approach taken has certain limitations simply due to the nature of scenario-based analysis and the specific cost-focussed approach. In particular:

1. It does not indicate by how much the climate change impact risk is reduced by implementing the interventions – to do that one would have to map the threats to the occurrence and intensity of actual disasters and see how those would be mitigated by the proposed actions.
2. It does not compare the results to the cost of not doing anything – i.e. the cost of non-adaption.
3. It does not calculate the cost savings (as opposed to the costs) of implementing the interventions.

The current work also does not compare the different interventions against a specific stated objective regarding risk or cost avoidance. To do so would require a clear objective function and a position taken on the occurrence and frequency of disasters. Instead, it compares intervention programmes on a general benefit level, thereby informing the NMBM where the potential best returns for its adaptation investments are, given limited resources.

This comparative assessment makes it is possible to outline results for two broad climate change response scenarios:

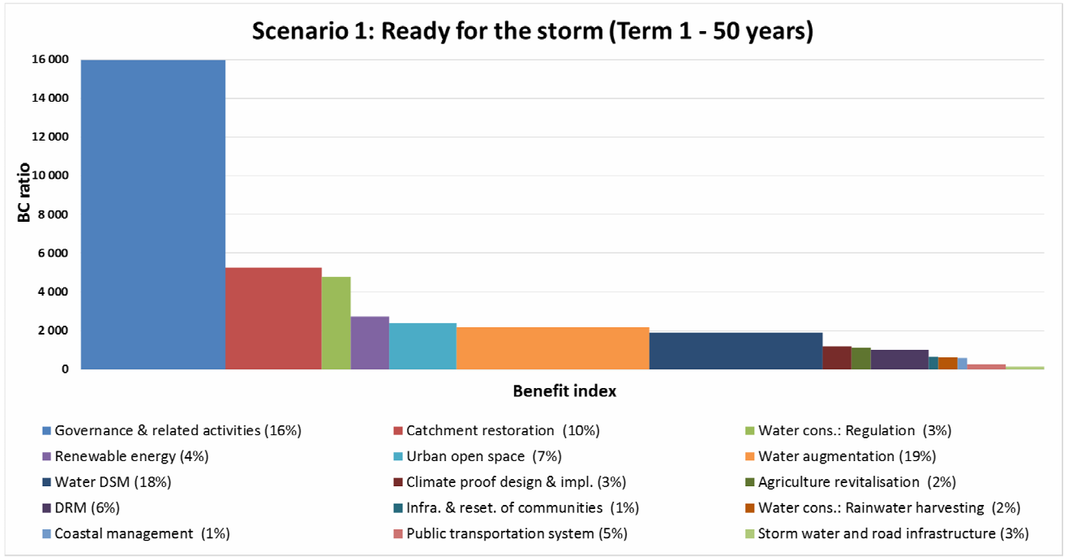
- **Scenario 1: Ready for the Storm –** A long term (50 years) outcome involving effective governance
- **Scenario 2: Stormy Sea, Leaky Boat –** A long term outcome with ineffective governance

The results of the analysis are diagrammatically illustrated in Figure 6-3 - the vertical axis indicates a relative benefit-cost ratio, and the horizontal axis a relative benefit index *(see side note)*. The difference in the scale between the two scenarios is import to note.

Benefit index
The wider the column the more the benefits are relative to another intervention option

Benefit-cost ratio (BC ratio)
The higher the column the more units of benefit per rand spent

Two aspects are immediately obvious. Firstly, as governance becomes more effective and pro-active (Scenario 1) so the benefits from interventions increases. Secondly, although significant benefits can be gained from better water management, the greatest or most cost-effective gains in both scenarios are achieved through improved governance and related activities.



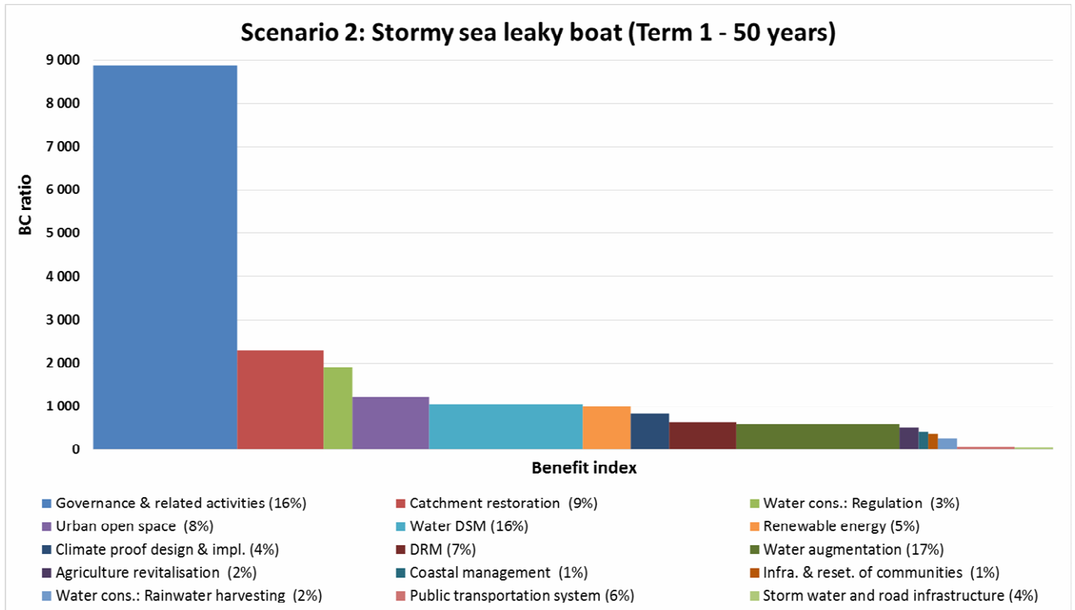


Figure 6-3: Cost-benefit comparisons for adaptation interventions under different scenarios

For further reference, Table 6-2 again shows the list of identified climate change response interventions, but also indicates the size of the population likely to benefit from the interventions, as well as the capital expenditure, implementation term and operational expenditure of each.

Table 6-2: List of priority climate change adaptation programmes for NMBM

ADAPTATION PROGRAMME	POPULATION BENEFITED	CAPITAL (Rmil)	IMPLEMENTATION TERM (years)	OPERATIONAL EXPENDITURE (Rmil/annum)
Water augmentation	1 152 115	580	4	32
Water conservation: Regulation	345 635	15	3	3
Water conservation: Rainwater harvesting	345 635	243	10	12
Water Demand Management	1 152 115	-	-	50
Agriculture revitalisation	345 635	40	3	8
Renewable energy	1 152 115	350	20	-
Improved stormwater and roads infrastructure	1 152 115	4 800	20	3
Public transportation system	806 481	3 600	10	5
Green Buildings and Infrastructure	576 058	5	2	15
Urban open space management	1 152 115	90	10	12
Coastal management	345 635	100	50	5
Catchment restoration	120 000	50	10	5
Relocation of Infrastructure & Communities	1 152 115	252	30	4
Disaster Risk Management	1 152 115	-	-	30
Governance & related activities	1 152 115	-	-	5

7 Intervention Programmes



7.1 Water Augmentation

RESPONSE	Resourced communities
INTERVENTION 1:	Water Augmentation

GENERAL DESCRIPTION

Forming part of the present Nooitgedagt water supply scheme, the Lower Sundays River Return Flows project will utilise return flows from irrigation in the Lower Sundays River to supply some 50-60 Mℓ/day potable water to the NMBM. The scheme will consist of a raw water abstraction pump station in the vicinity of Barkly Bridge pumping raw water to an off-channel balancing dam, as well as a low pressure desalination plant which will use micro filtration/ultra-filtration to remove suspended solids as a pre-treatment to reverse osmosis. Chemical treatment necessary to manage scale formation will generate high operating costs. A further pump station will pump the water to the Olifantskop reservoir site, where it will be blended with Orange River water supplied from Nooitgedagt WTW or alternatively supplied to the Coega IDZ as an industrial water supply. The brine and ultra-filtration backwash streams will be discharged with a gravity pipeline system over a distance of some 21km to the mouth of the Sundays River.

ESTIMATED PROGRAMME BUDGET: R 580m

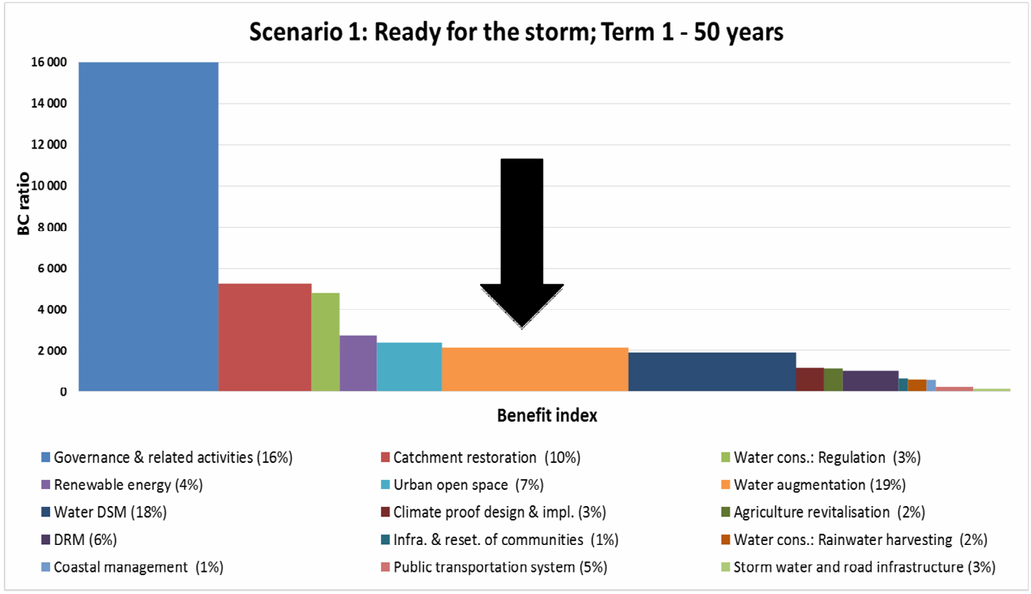
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	Medium term (2016/17, next 5-year IDP budget)	Long term (2021/22 <)	
To supply some 50-60 Mℓ/day potable water to the NMBM.	Build a reverse osmosis plant, with associated balance dams, abstraction pumps, distribution pumps, and a brine discharge pipeline, with all necessary governance processes.	Complete and commission the works		I&E: Water & Sanitation • CFO: Budget & Financial Control • CFO: Treasury & Financial Support • EDTA: Trade & Investment

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
The re-use of irrigation returns flows and the employment of green infrastructure or ecological processes to support partial purification of polluted water support the development of a green economy, as less 'new' water has to be sourced. As a new field/practice within Nelson Mandela Bay it will require the development of specific skills and support services around water treatment. It paves the way for the recycling of water from other sources, including, but not limited to wastewater from treatment works.	• **Changes to rainfall patterns** • **Changes to drought patterns** • **Changes to flood patterns**	**KPA 1:** Basic Service Delivery & Infrastructure Development **KPA 3:** Local Economic Development	**GOVERNMENT/PARASTATAL** • National Department of Water and Sanitation • Coega Development Corporation **PRIVATE SECTOR/NGO'S** • Buyers of partially treated water • Business Chambers	NMBM Water Master Plan (2011) Feasibility Study into the re-use of Lower Sundays River Waste Flows (2013) Algoa Reconciliation Strategy (2011) Built Environment Performance Plan (2014)

PRIORITY

Medium (cost-effectiveness

High (societal benefit)



7.2 Water Conservation: Regulation

RESPONSE	**Resourced communities**
INTERVENTION 2:	**Water conservation: regulation**
GENERAL DESCRIPTION The investigation of several policy options and the implementation thereof to affect improved water conservation among all water users within the municipal boundaries to reduce water losses, incentivise water efficiency, and to mainstream water conservation as an ongoing priority activity. The intervention aims to initiate processes, such as research activities and stakeholder engagement processes, that will lead to policy and by-law changes in the areas of water tariffs, surface runoff, water re-use, water recycling, water use efficiency and non-metered water losses. Regulations changes should both act as incentives to motivate change and punitive in the event of compliance failure.	
ESTIMATED PROGRAMME BUDGET: R R15m initially, R 3m thereafter	

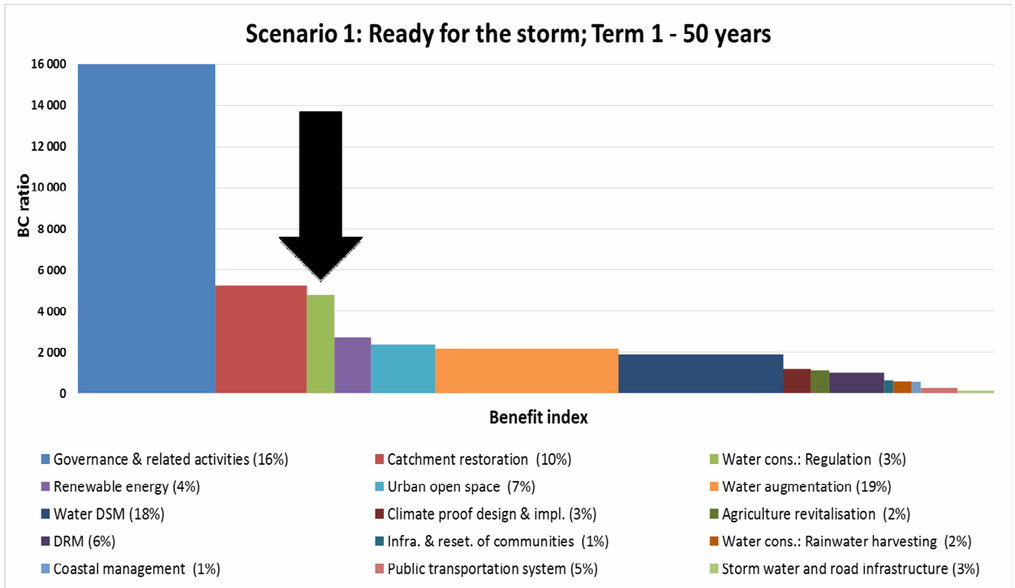
TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Revision of the water tariff structure Achieve a reduction in water run-off from hard surfaces Reduce on-site water use from the water supply infrastructure Water use efficiency improvements Reduce non-metered water losses and consumption		Develop an innovative water tariff structure that will incentivise water use efficiency Develop policy and by-law that will incentivise the reduction of water use from the water supply infrastructure through the re-use and recycling of water i) harvested and ii) used on site Develop policy and by-law that will incentivise the development and use of innovative technology changes that will improve water use efficiency Develop and monitor incentive schemes to reduce non-metered water losses and consumption	Develop policy and by-law that will incentivise the reduction of water run-off from hard surfaces from both existing as well as newly build areas	I&E: Water & Sanitation • CFO: Revenue Management & Customer Care • COO: Legal Services

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
The intervention will contribute to the following Green Economic opportunities: • The development of a more sustainable basis for economic growth in a water constrained area (i.e. improved manufacturing processes); • The development of technologies that will be water efficient; • The development of infrastructure, or the remodelling of existing infrastructure, that will be more resilient to both floods and droughts.	• **Changes in droughts patterns** • **Changes in rainfall patterns** • **Changes in temperature patterns** • **Changes in flood patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 3: Local Economic Development KPA 4: Municipal Transformation & Organisation Development KPA 5: Good Governance & Public Participation KPA 6: Financial Sustainability & Viability	**GOVERNMENT/PARASTATAL** • National Treasury • National Department of Water Affairs **PRIVATE SECTOR/NGO'S** • Large water users • Rate payers • Business Chambers	NMBM Water Master Plan (2011) Built Environment Performance Plan (2014)

PRIORITY

High (cost-effectiveness

Medium (societal benefit)



7.3 Water Conservation: Rainwater Harvesting

RESPONSE	**Resourced communities**
INTERVENTION 3:	**Water conservation: rainwater harvesting**
GENERAL DESCRIPTION The conservation of water: rain water harvesting programme aims to install 35,000 x 5,000 litre rain water harvesting tanks at low income households	
ESTIMATED PROGRAMME BUDGET: R R243m over 10 years; 5% annual maintenance cost	

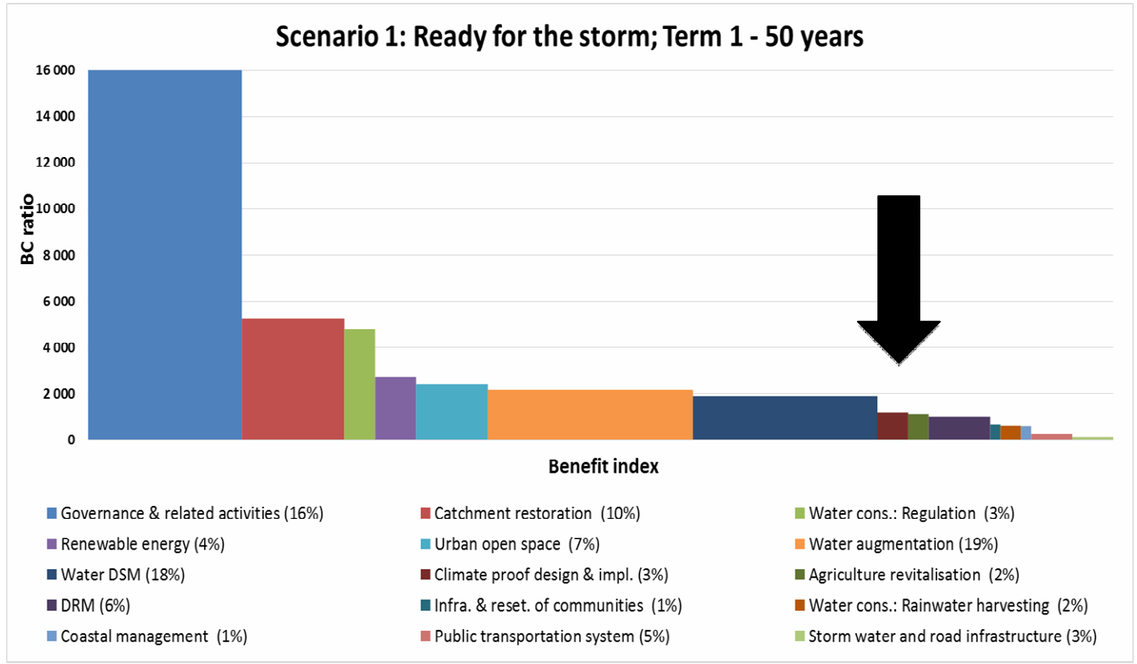
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Installation of rain water harvesting tanks	Project approved at Council level	Install 35 000 x 5,000 litre tanks at low income houses Complete a study to measure the impact of household rainwater tanks on water use efficiency	Expand project further if proven to be successful	Human Settlements: Housing Delivery • COO: Budget & Financial Control • I&E: Water & Sanitation • Public Health: Environmental Management • Corporate Service: Constituency Services • Safety & Security: Disaster Management • Human Settlements: Land Planning & Development

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
• The development of a rain water harvesting industry, with large scale job creation. • Sustainable water supply among low income households, with the potential to promote market gardening and urban agriculture.	• **Changes in drought patterns** • **Changes in rainfall patterns** • **Changes in temperature patterns** • **Changes in fire patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 3: Local Economic Development	**GOVERNMENT/PARASTATAL** • National Treasury • National Department of Human Settlements • National Department of Water and Sanitation **PRIVATE SECTOR/NGO'S** • NMB low income residents • NMB Civil Society Coalition • Philanthropic organisations • NGO's active in the health, water and environment sector	NMBM Water Master Plan (2011) Informal Settlements Upgrading Plan (2008) NMBM Human Settlements Strategic Framework 2030 (2012) High-level Housing Strategy (2012)

PRIORITY

Low (cost-effectiveness

Low (societal benefit)



Text Box: Some ideas as to how to use your rain water harvesting tank

Decide on a water use protocol or management regime.

- Is this water for daily use or is it for emergency use only?

If the water is for daily use, then the yield of the tank should be maximised, that means, the user should try to capture as much water as possible during the rainy season. How do I do that?

- If the tank remains full during the rainy season, then the water will spill over when it indeed does rain and it will therefore not be captured. If, on the other hand, the tank was near empty, then it will be filled again.
- The more times the tank is filled during a rainy season, the higher the tank's yield, even though it's capacity to hold water remained constant, e.g. 5,000litres.
- The tank will only be filled if it was used, and therefore not full, before the rain.

If the water is for emergency use only, then seek to store the water and make use of alternative – existing – sources of water for daily consumption.

7.4 Water Demand Management

RESPONSE	**Resourced communities**
INTERVENTION 4:	**Water demand management**

GENERAL DESCRIPTION

A water demand management (WDM) programme includes bulk zone meter installations, universal metering of consumers, water balances, meter replacement programmes, leak repairs on bulk and distribution pipelines, school ablution and leak repairs, etc. It also includes an awareness and education program for all. It is a continuous programme required to save and thus make available some 60-90 Mℓ/day which is presently lost from the water system. Some WDM actions have been taking place over recent years, but funding and skills shortages has not allow this programme to be fully implemented yet.

The more efficient use and reduced waste of available water will make a large scale positive impact on climate change resilience. The programme has a strong institutional capacity building component which will allow households, the municipality and business to respond to climate change threats independently. Furthermore, as water demand management will reduce the loss of water already captured, distributed and purified (in other words, water which has already cost a significant sum of money), it will also result in a significant financial savings to NMBM.

ESTIMATED PROGRAMME BUDGET: R 50m

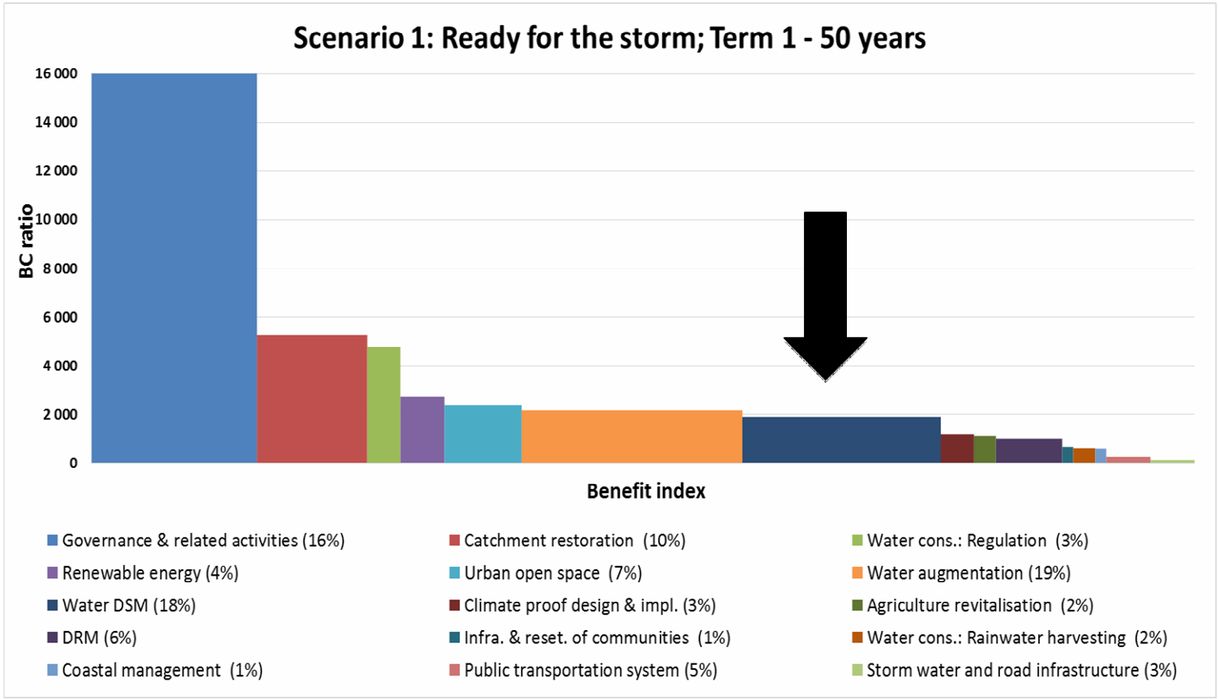
TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
WDM unit establishment Residential metering Industrial and commercial metering Maintenance infrastructure Sectorisation and zone management Pressure management	Complete an assessment of different WDM interventions	An autonomous Water Demand Management unit established and operational. An annual water awareness campaign. Implement regular monitoring of residential water meters. Meters older than 10 years must be replaced. Implement regular monitoring of industrial and commercial water meters. Wet industry must be equipped with battery driven magnetic flow meters. Preventative and regular maintenance program is established and adhered to. Reduce system leakages to 20% through an asset replacement program (network pipelines) with funding in place (1,5% of the total value of the network per annum) and a capacitated (financial and human) maintenance programme. 100% coverage by pressure monitoring system as well as regular maintenance, data logging and evaluation of consumption trends.	Daily remote monitoring of consumption in districts/ zones/ sectors, along with analysis of patterns and events and reporting through official and public channels	I&E: Water & Sanitation • Corporate Services: Constituency Services • CFO: Revenue Management & Customer Care • COO: Communications

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
A water demand management programme actively supports the development of a green economy due to: • Making more efficient use of existing water, thereby growing the economy without the need to find more water. • Encouraging and supporting individual households and businesses to develop their own efficiency strategies, and supports a market based approach to saving water. • Encourages innovation and develops business opportunities to turn water adversity into market opportunities. • The actions of retrofitting, leakage management, preventative maintenance and water metering are labour intensive. For example, an 'army of plumbers' could be continuously employed to mend leaks and save the same amount of water that a new dam could supply (which would only create jobs for a few years during the dam construction phase).	• **Change in rainfall and drought patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 3: Local Economic Development	**GOVERNMENT/PARASTATAL** • National Department of Water and Sanitation • National Department of Cooperative Governance & Traditional Affairs • Eastern Cape Department of Education **PRIVATE SECTOR/NGO'S** • Business chambers • NMB Civil Society Coalition • Civil society organisations will need to be engaged in this process	NMBM Water Master Plan (2011) Infrastructure Maintenance Backlog Assessment (2011) Integrated Water Resources Management Plan (2009)

PRIORITY

Medium (cost-effectiveness

High (societal benefit)



7.5 Agricultural revitalisation

RESPONSE	**Resourced communities**
INTERVENTION 5:	**Agricultural revitalisation**
GENERAL DESCRIPTION The development of commercial community food gardens on 200ha of transformed and un/under-utilised public land. The agriculture revitalisation programme aims to reduce the city's vulnerability with respect to food insecurity, create jobs, productively use un/under-utilised land and reduce the exposure to malnutrition.	
ESTIMATED PROGRAMME BUDGET: R 40m over three years; R 8m/annum thereafter	

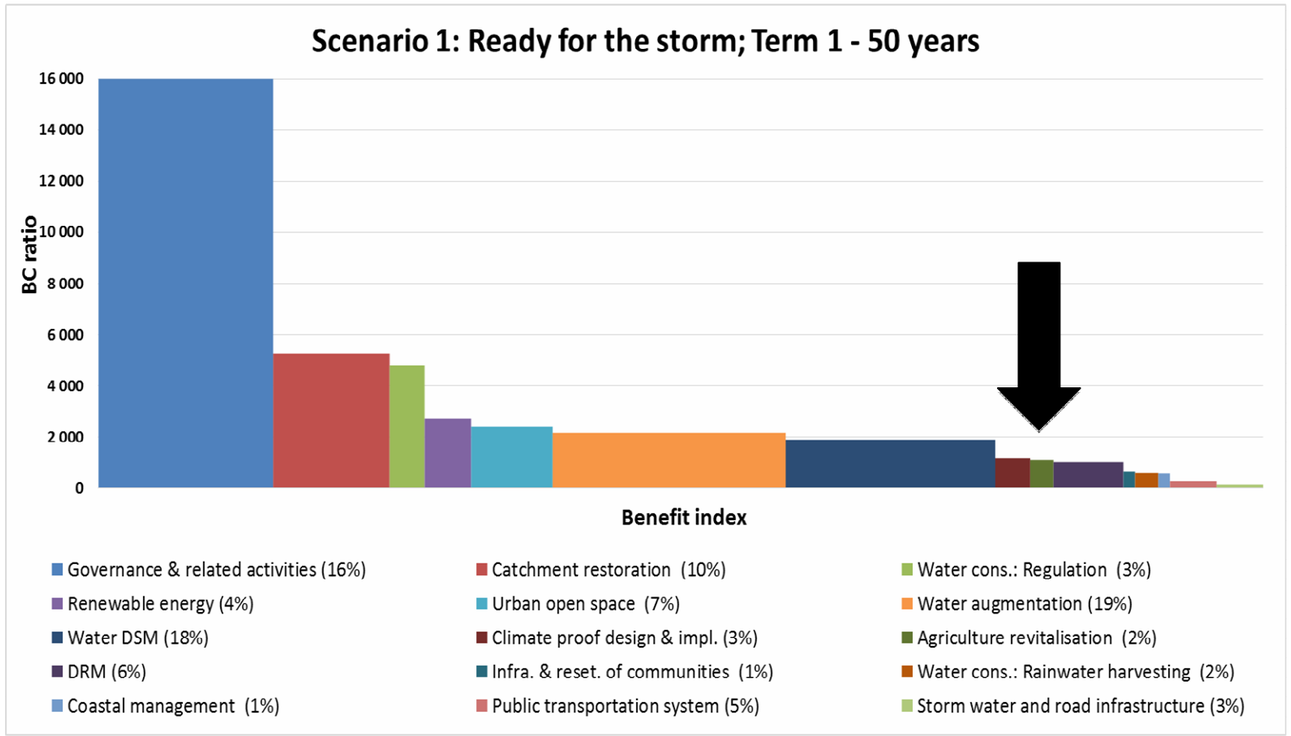
TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Commercial community food gardens	Project plan and budget approved at Council level	Launch agricultural revitalisation project – 200ha of small farmer market garden development area with composting and rainwater harvesting.		EDTA: Urban Agriculture • I&E: Water& Sanitation • Human Settlements: Land Planning & Development

Green Economy Opportunities	**Threats addressed**	**IDP Linkages**	**Other Role Players**	**Reference documents**
• Job creation through labour intensive cultivation • Avoiding transport costs for a portion of the food consumed, incentivising increased local production and reducing the carbon footprint of food consumption • Healthy food production • Rise in agricultural support services (e.g. agricultural co-operatives)	• **Changes in drought patterns** • **Changes in rainfall patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework KPA 3: Local Economic Development	**GOVERNMENT/PARASTATAL** • National Department of Agriculture, Forestry and Fisheries • National Department of Water & Sanitation • Provincial Department of Rural Development & Agrarian Reform • Agricultural Research Council **PRIVATE SECTOR/NGO'S** • Nurseries • Farmers • Food and health sector-specific NGO's	Economic Development Strategy (2009) Nelson Mandela Bay Industrial Development Strategy (2012)

PRIORITY

Medium (cost-effectiveness

Low (societal benefit)



7.6 Renewable energy

RESPONSE	**Resourced communities**
INTERVENTION 6:	**Renewable energy**

GENERAL DESCRIPTION

NMBM recognises the threat that the current electricity crisis poses. This includes the loss of revenue due to distributed generation projects, and the obligation on government to mitigate greenhouse gas emissions. It therefore needs to progressively grow the NMB investment in renewable energy over the next 20 years to reduce its reliance on costly and unreliable fossil fuel-based grid power and offset revenue losses.

Solar power solutions across a range of scales will form part of this suite of investments –solar lighting for informal housing or domestic solar water heating, to commercial scale solar PV installations with grid tie-in. Operational costs of renewable energy projects is assumed to be low, but long term. The benefits will accrue to all residents via direct cost savings and improved municipal operations.

ESTIMATED PROGRAMME BUDGET: R 350m/annum

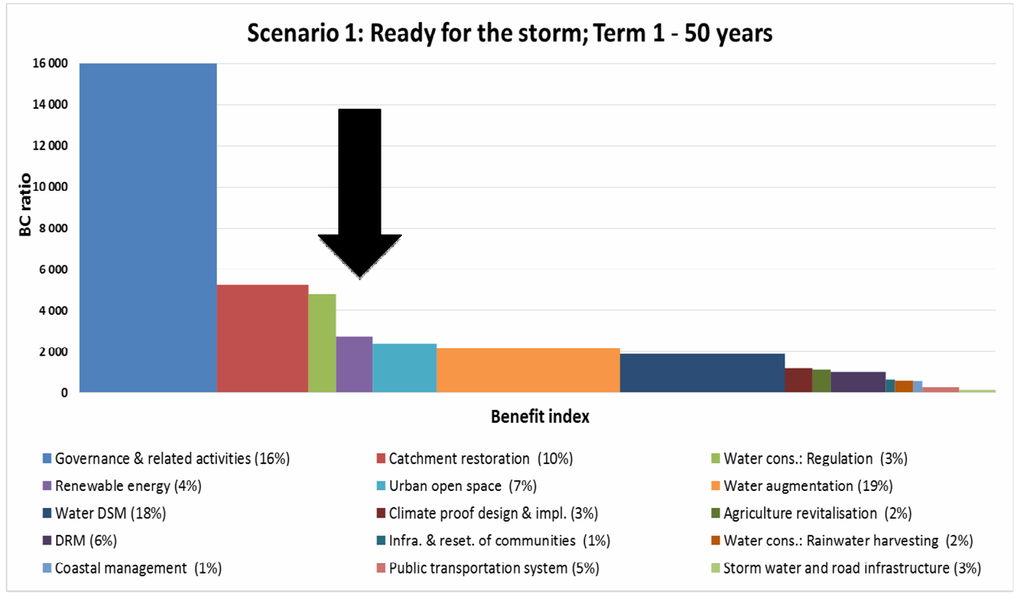
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Subsidies for household level interventions Investment in commercial scale facilities Red tape reduction for IPP's		Project plans and budgets approved at Council level Subsidies made available for household level interventions Red tape reduction for IPP's	Annual targets reached for investment in commercial scale renewable energy generation	<u>E&E: Projects</u> • E&E: Retail and Commercial Management • CFO: Legal Services, Supply Chain Management, Treasury and Financial Support • COO: Integrated Development Plan, Legal Services, Policy, Strategy and Research • Corporate Services: Facilities Management • EDTA: Trade and Investment • Public Health: Environmental Management • I&E: Design and Implementation • Human Settlements: Housing Delivery

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
Government as a whole has committed itself to the Green Economy Accord, which includes the procurement of renewable energy and the promotion of a local manufacturing capacity for renewable energy facilities components. This implies opportunities for local industrial development, facilitation of private investment in local energy generation projects, development of local technology, skills development, and direct employment through installation and retrofitting of renewable energy equipment.	• **Change in temperature patterns** • **Change in rainfall patterns** • **Change in drought patterns** • **Change in wind patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 3: Local Economic Development KPA 6: Financial Sustainability & Viability	**GOVERNMENT/PARASTATAL** • Department of Economic Development, Environmental Affairs and Tourism • Department of Roads and Public Works • Department of Human Settlements • Department of Health • National Department of Energy • National Energy Regulator of South Africa **PRIVATE SECTOR/NGO'S** • Independent Power Producers • High energy users • NMB Civil Society Coalition • Business chambers	NMBM Integrated Energy Plan (2010) NMBM Greenhouse Gas Inventory (2014)

PRIORITY

High (cost-effectiveness

Medium (societal benefit)



7.7 Improved Stormwater & Roads Infrastructure

RESPONSE	**Climate resilient urban planning & design**
INTERVENTION 7:	**Improved stormwater & roads infrastructure**

GENERAL DESCRIPTION

Projections of climate change indicate that an increased incidence of flooding and a generally warmer temperature regime can be expected. By adjusting the specification levels for roads and stormwater management infrastructure to accommodate the changing conditions, NMBM will experience less damage to infrastructure during extreme events, less incidental wear-and-tear resulting in lower maintenance costs, better management of future surface runoff volumes and improved availability of roads infrastructure during extreme weather events. Construction of new, and maintenance of existing infrastructure should consequently be done at specification levels adjusted to accommodate changing climatic conditions.

ESTIMATED PROGRAMME BUDGET: R 7,4m initial, thereafter R 3m/yr

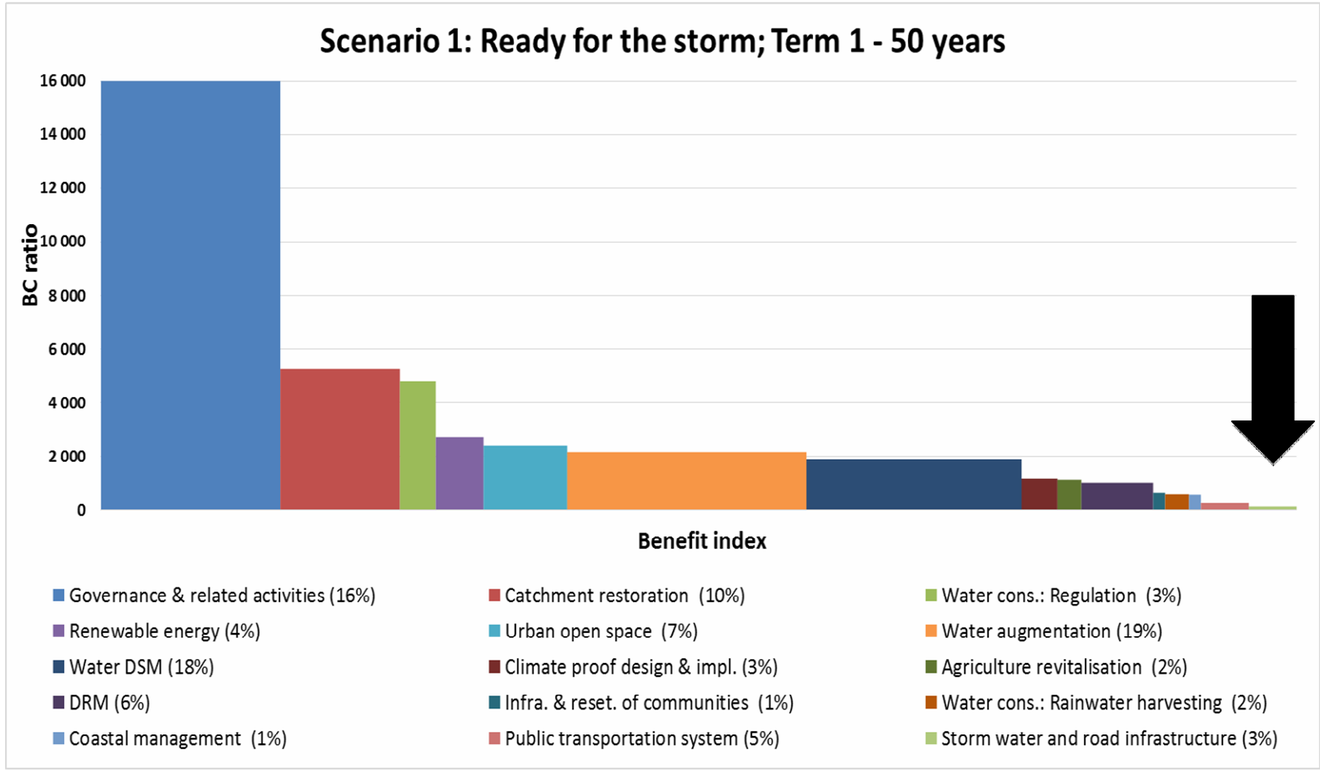
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Chatty River Flood Risk Improvements Climate change proof upgrading and maintenance of roads and stormwater infrastructure Revise specifications for infrastructure provision – e.g. bridge heights, culvert sizes, use of open space elements	Complete the Chatty River improvements	Complete a risk assessment to identify vulnerable infrastructure Adopt revised infrastructure specifications that comply with worst case climate change projections		I&E: Roads, Stormwater & Transportation • CFO: Supply Chain Management: green procurement • CFO: Treasury and Financial Support • CFO: Budget & Financial Control • COO: Expanded Public Works Programme • Public Health: Environmental Management, Parks • Safety and Security: Disaster Risk Management

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
• Transport infrastructure is central to the functioning of the economy, the added guarantees of a climate change-proof transportation system thus adds value to the overall economic attractiveness of NMB • Investment into the development of climate proof designs for roads and storm water infrastructure • Local sourcing of materials and supplies • Recycling of construction materials • Additional construction projects related to modal shifts in transportation	• **Change in temperature patterns** • **Change in rainfall patterns** • **Change in flood patterns** • **Change in storm surge patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework KPA 3: Local Economic Development KPA 6: Financial Sustainability & Viability	Government / Parastatals • SANRAL • PRASA • Transnet • Department of Roads and Public Works	NMBM Stormwater Master Plan Infrastructure Maintenance Backlog Assessment (2011)

PRIORITY

Low (cost effectiveness)

Medium (societal benefit)



7.8 Public Transportation

RESPONSE	**Climate resilient urban planning & design**
INTERVENTION 8:	**Public transportation**

GENERAL DESCRIPTION

The provision of affordable, efficient mass (public) transport will make people financially resilient and the city more efficient in terms of energy, land take and access to community services. Urban transport also has the potential to improve resilience to climate change related risks on all levels since functioning, affordable and efficient mass transport will lower the cost of living, improve access to economic opportunities, increase access to social services and facilities, and reduce the need for transformation of open space areas for transportation infrastructure. The programme therefore encompasses all components of the Comprehensive Integrated Transportation Plan that relates to Integrated Public Transport Systems or the Bus Rapid Transit system.

ESTIMATED PROGRAMME BUDGET: R 3,6bn (the scheme will not be funded solely by the municipality - funding is to be sourced from a range of Provincial and National grant and funding schemes. Nevertheless, significant shortfalls are expected and need to be planned for)

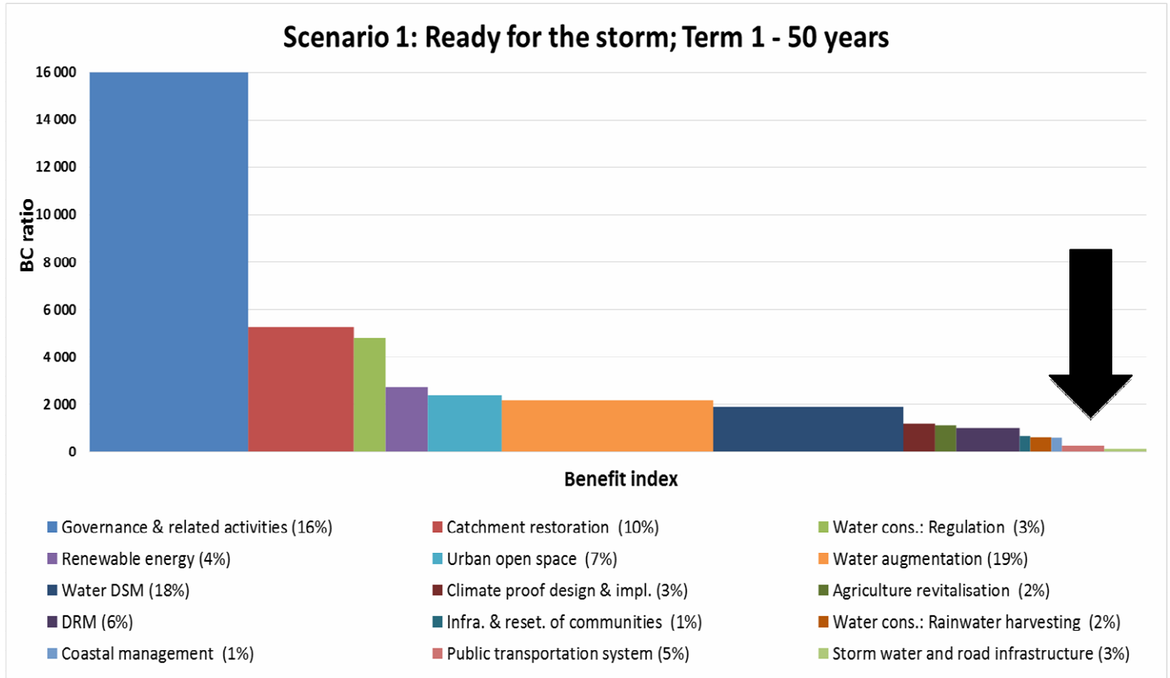
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
IPTS master plan implementation	As per IPTS	As per IPTS	As per IPTS	I&E: Roads, Stormwater & Transportation • Human Settlements: Land Planning and Management • COO: Treasury and Financial Support • COO: Integrated Development Plan, Policy, Strategy and Research • Corporate services: Asset Management, Facilities Management, and Municipal Information Systems • EDTA: Trade and Investment • Public Health: Environmental Management

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
An effective transport system is acknowledged as being a key driver of economic growth and social development. Continued demand for transportation system expansion is therefore inevitable and the requirement for a shift towards modes of transport with less carbon emissions means that on-going investment will necessarily be in the public transport and rail systems. Coming off a low base, this means that opportunities for economic activity and employment creation abound – construction of infrastructure, local manufacturing, development of facilities for increased freight rail traffic etc. The outcome will benefit the economy in general, but also indirectly individuals who get opportunities for reskilling or employment in the renewed transport sector.	• **Change in temperature patterns** • **Change in rainfall patterns** • **Change in flood patterns** • **Change in wind patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework KPA 3: Local Economic Development	**GOVERNMENT/PARASTATAL** • Department of Finance, Economic Development, Environmental Affairs and Tourism • Department of Roads and Public Works • Department of Human Settlements • Department of Transport • Transnet **PRIVATE SECTOR/NGO'S** • Algoa Bus • Private bus operators • Taxi associations	Comprehensive Integrated Transport Plan 2011/12 (2011)

PRIORITY

Low (cost-effectiveness)

Medium (societal benefit)



7.9 Green Buildings & Infrastructure

RESPONSE	**Climate resilient urban planning & design**
INTERVENTION 9:	**Green Buildings & Infrastructure**

GENERAL DESCRIPTION

The application of sustainable or 'green' standards for all components of the built environment can make structures perform better in increasingly adverse climatic conditions – interventions can be applied to the entire built environment, including to the overall spatial and development planning, transportation systems and actual buildings ranging from low cost houses to large buildings. This will improve the resilience of individuals and the city as a whole through operational cost savings and more efficient resource use.

ESTIMATED PROGRAMME BUDGET: R 5m, then R15 million per annum

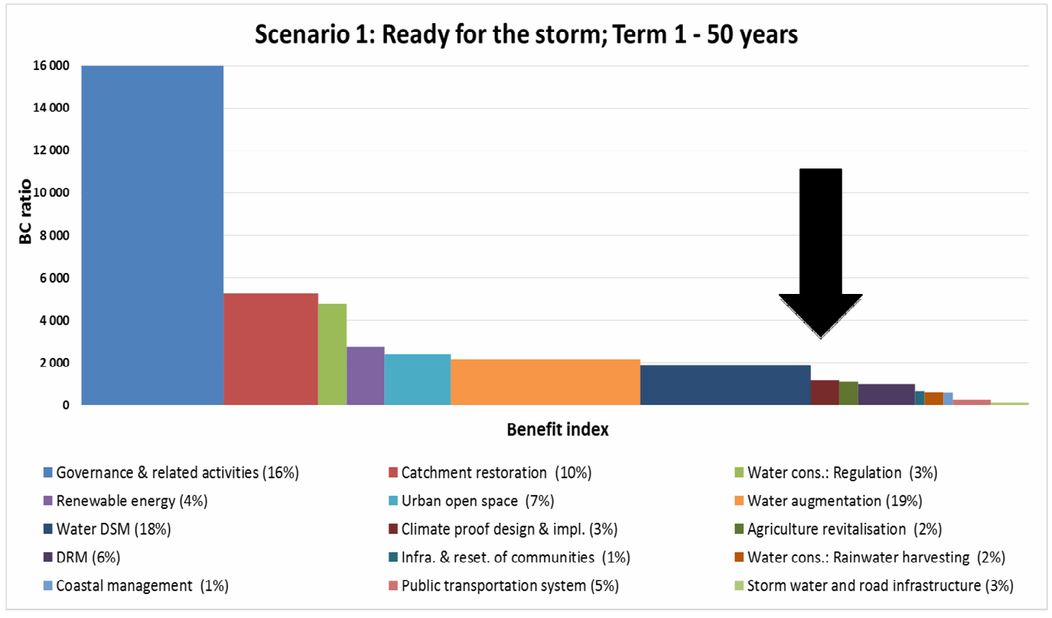
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Revision of procurement standards Revision of specifications for building development and maintenance Retrofitting of public buildings and facilities	Draft revised procurement specifications for the built environment that comply with worst case climate change projections Draft revised (green) procurement specifications for the built environment that support GHG mitigation targets and local socio-economic targets	Adopt revised procurement specifications for the built environment that comply with worst case climate change projections Adopt revised (green) procurement specifications for the built environment that support GHG mitigation targets and local socio-economic targets All scheduled retrofits/ refurbishments of council buildings to address climate change projections and GHG mitigation targets All new municipal buildings to obtain at least a 4-star Green Star SA design rating where a relevant category exists	All new municipal buildings to obtain at least a 4-star Green Star SA 'as built' rating where a relevant category exists	<u>Human Settlements: Land Planning & Development</u> • Corporate services: Facilities Management • Public Health: Environmental Management • CFO: Supply Chain Management • COO: Legal Services • COO: Integrated Development Plan • COO: Policy, Strategy & Research • COO: Expanded Public Works Programme • EDTA: Fresh Produce Market and Urban Agriculture, Trade and Investment • SRAC: Beaches, Resorts and Support Services • E&E: Technical Services, Projects, Retail and Commercial Management • Human Settlements: Development and Support, Social Development • I&E: Design and Implementation, Roads, Storm water and Transportation, Water and Sanitation • Public Health: Environmental Management • Public Health: Waste Management

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
The shift towards sustainable urban development is a central part of the shift towards a green economy, as it includes: • Development and installation of local renewable power generation facilities • Waste to energy projects • Employment and resource recovery from waste streams • Employment and skills development related to green technology in buildings • A demand for energy efficient equipment and retrofitting • Attractive investment options in Green Building developments	• Change in temperature patterns • Change in rainfall patterns • Change in drought patterns • Change in flood patterns • Change in wind patterns	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework KPA 3: Local Economic Development KPA 6: Financial Sustainability & Viability	**GOVERNMENT/PARASTATAL** • Department of Economic Development, Environmental Affairs and Tourism • Department of Roads and Public Works • Department of Human Settlements • Department of Health **PRIVATE SECTOR/NGO'S** • Property developers or managing agents for properties • Master Builders Association • Green Building Council South Africa • SABS • National Building Council • Professional registration bodies for the built environment sector • Community development organisations	NMBM Building Regulations Sustainable Communities Planning Guide (2007) Built Environment Performance Plan (2014) Draft Urban Network Strategy (2014) Spatial Development Framework (2009) High-level Housing Strategy (2012) Green Procurement Implementation Strategy (2011)

PRIORITY

Medium (cost-effectiveness)

Low (societal benefit)



7.10 Urban Open Space Management

RESPONSE	**Healthy natural ecosystems**
INTERVENTION 10:	**Urban open space management**

GENERAL DESCRIPTION

Provision of open space plays an important role in improving the quality of human life through both direct benefits, such as offering recreational space and beautifying the city, and indirect benefits in the form of ecosystem goods and services. These indirect benefits include microclimatic amelioration, wind and dust suppression, hydrological functions including groundwater recharge, flood mitigation, water purification and acting as storm water conduit, as well as habitat for beneficial plants and animals. The full implementation of the Metropolitan Open Space System as recommended by the biodiversity planning exercise therefore needs to guarantee the persistence of ecosystem goods and services in NMB.

ESTIMATED PROGRAMME BUDGET: R 90m over 10 years; R 12m per annum

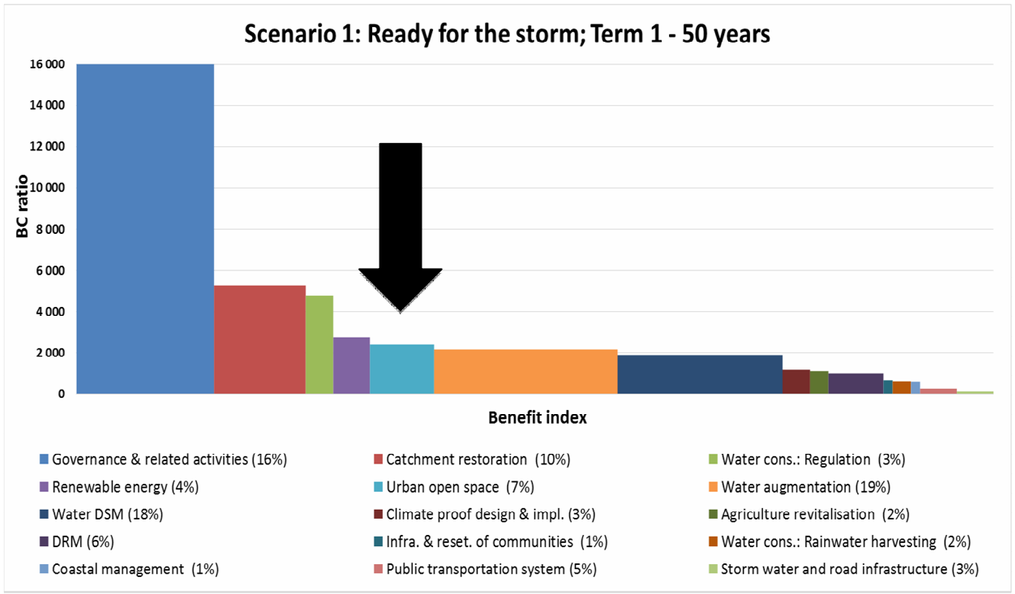
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Incorporation of the MOSS in the SDF and IDP Ground-truthing of MOSS properties and boundaries Ensure formal protected status of protected areas Facilities and infrastructure to improve access Maintenance of open space areas	All MOSS areas recognised in the SDF mapping and IDP planning	Approved MOSS formalisation plan Secure initial sites with formal protection Development of basic visitor facilities such as access control, information kiosks, signage, park furniture and bird hides at regional parks to encourage use of the open space On-going maintenance of open spaces included in the MOSS, including invasive alien plant management, trail maintenance and rehabilitation of disturbed areas	Secure remaining sites with formal protection	<u>Public Health: Environmental Management</u> • COO: Integrated Development Plan, Policy, Expanded Public Works Programme • EDTA: Fresh Produce Market and Urban Agriculture, Special Projects • SRAC: Beaches, Resorts and Support Services, Sports and Recreation • Human Settlements: Land Planning & Development, Development and Support, Social Development • I&E: Roads, Storm water and Transportation • Public Health: Waste Management

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
Open space maintenance is generally a labour intensive process, and has strong links with the Expanded Public Works Programme. The organic matter generated through weeding, tree maintenance, grass cutting, alien control etc. can be used in various applications such as composting or biogas generation. A well-located open space area provides for recreational and tourism activities based on the attraction of natural features. An investment in open space or green infrastructure generates numerous ecosystem goods and services which add value to urban society, providing opportunities for new economic growth, and in reducing recurring costs, such as low level flooding. Importantly, a shift to actively utilising green assets in managing urban ills is a fundamental aspect of a green economy.	• **Change in temperature patterns** • **Change in rainfall patterns** • **Change in drought patterns** • **Change in flood patterns** • **Change in fire patterns** • **Change in wind patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework	**GOVERNMENT / PARASTATALS** • Department of Finance, Economic Development, Environmental Affairs and Tourism • Department of Rural Development and Land Reform • Department of Human Settlements • South African National Biodiversity Institute • Eastern Cape Parks Board • South African National Parks • Nelson Mandela Bay Tourism **PRIVATE SECTOR / NGO'S** • Corporate sponsors • Property developers or managing agents for properties adjoining open space areas • Environmental education and awareness agencies • Conservation bodies	NMB Conservation Assessment and Plan (2009) Sustainable Communities Planning Guide (2007) Spatial Development Framework (2009)

PRIORITY

High (cost effectiveness)

High (societal benefit)



7.11 Coastal Management

RESPONSE	**Healthy natural ecosystems**
INTERVENTION 11:	**Coastal management**
GENERAL DESCRIPTION The coastal management programme aims to manage the coastal zone in a manner that builds resilience to the impacts of climate change, especially to sea level rise and the potential of greater intensity of storm surges.	
ESTIMATED PROGRAMME BUDGET: R 7m per annum	

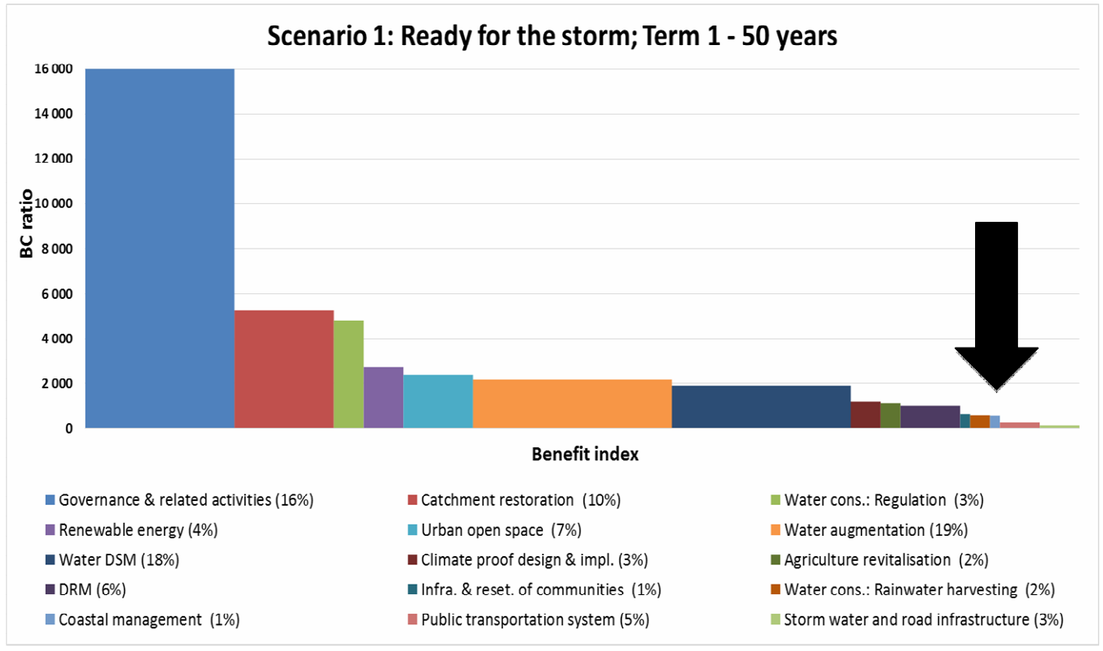
TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Implementation of the Integrated Coastal Management Plan (ICMP) Application of the Nelson Mandela Bay Coastal Setback Line Incorporation of coastal & aquatic processes in planning / zoning, spatial development planning etc. Understanding sand movement processes along the coastline Coastal Ecosystem Management (incl. sediment management, beach nourishment, erosion protection, dune management)	Adoption of ICMP Adoption of Coastal Management Line Incorporation of Coastal Management Line and other ICMP prescriptions in planning maps Identification of interventions for inclusion in next IDP period	Actions as per ICMP Complete coastal defence works at vulnerable locations Review the ICMP Conduct a study of the coastal sand movement processes and factor into coastal management planning	Actions as per ICMP Implement and complete a coastal retreat plan	Public Health: Environmental Management • Public Health: Parks • I&E: Roads, Storm water & Transportation • Human Settlements: Land Planning & Development • SRAC: Beaches, Resorts & Support Services • COO: Legal Services

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
• While planning actions will contribute little to the green economy, coastal ecosystems management provides opportunities for maintenance jobs • A more resilient coastal system facilitates tourism	• **Change in sea level** • **Changes in extreme storm surge patters** • **Change in wind patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework KPA 3: Local Economic Development KPA 6: Financial Sustainability & Viability	**GOVERNMENT/PARASTATAL** • Eastern Cape Department of Economic Development, Environmental Affairs & Tourism (DEDEAT) • Department of Water Affairs (DWA) • Department of Agriculture, Fisheries & Forestry (DAFF) • Coega Development Corporation (CDC) **PRIVATE SECTOR/NGO'S** • Transnet • Mandela Bay Development Agency (MBDA) • Nelson Mandela Metropolitan University (NMMU) • WESSA • Swartkops Trust • Cape Recife Conservancy • Blue Horizon Bay Conservancy	Coastal Management Program (2015)

PRIORITY

Low (cost-effectiveness)

Low (societal benefit)



7.12 Catchment Restoration

RESPONSE	**Healthy natural ecosystems**
INTERVENTION 12:	**Catchment restoration**

GENERAL DESCRIPTION

Although outside the NMBM boundary, the Krom and Kouga catchments house natural assets providing high value ecosystem services. These assets are, however, impacted by excessive consumption of ecosystem goods and neglect which leads to regional flood damage and water shortages. These effects will be exacerbated by climate change. A large scale catchment management programme is required, which includes alien plant clearing, the restoration of degraded areas and fire management. Importantly, the NMBM would need to facilitate this process yet not necessarily implement the entire programme itself. Catchment management could generate an additional 37million m^3 per annum in base flows, with a 200 000 m^3 reduction in sediment deposition in dams, and with large scale carbon sequestration. It will also increase catchment storage in the system by slowing run-off and increasing infiltration, thereby elevating soil water storage and increasing dry season flows. The reduced run-off will also reduce sediment yields and increase the life-span of water storage infrastructure. The elevated infiltration will reduce storm flow and thereby reduce the impacts of climate induced flooding events, whilst the catchment restoration would reduce the severity of more frequent fires likely to result from climate change.

ESTIMATED PROGRAMME BUDGET: R 252m over 30 years (national government would be the key source of funds for this activity, with support from the water consumers. Carbon offsets may also finance some of this restoration); R4 million operating costs per annum

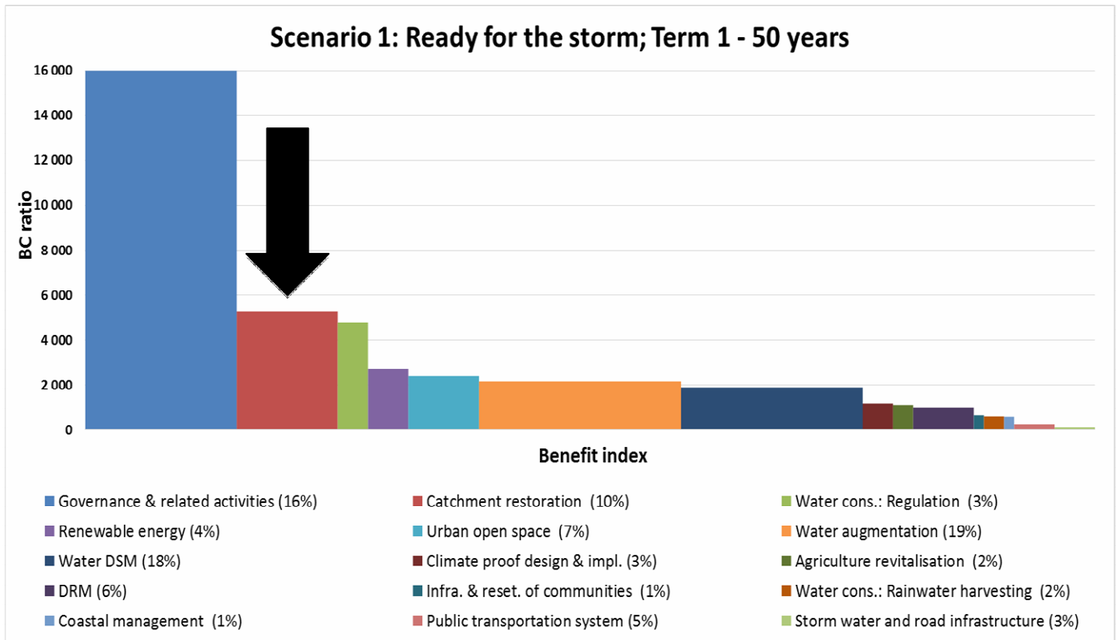
TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Alien plant clearing in riparian areas and across the landscape, with subsequent follow up clearing. Restoration of indigenous vegetation in degraded localities. Management of restored and cleared areas.	Continue with existing EPWP works in Krom and Kouga catchments	Krom catchment – 418ha cleared of alien plants per year, and 580 ha is restored per year. Kouga catchment – 1 514 ha cleared of alien plants per year and 1 014 ha is restored per year.	Cleared and restored areas are managed, with 3 000 ha added to the management process every year for 30 years. Thereafter the total catchment will be managed at low level.	Public Health: Environmental Management • Public Health: Parks • COO: Expanded Public Works Programme • I&E: Water & Sanitation

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
• Large-scale carbon sequestration benefits that could be tied to NMBM industry offsets, making local industry more attractive. • Elevated tourism opportunities in the district, with greater tourism growth for NMBM. • Greater assurance of water supply. • Reduced flooding. • Large scale job creation, with the potential to create some 15 000 long term jobs in the catchment.	• **Change in rainfall patterns** • **Change in drought patterns** • **Change in flood patterns** • **Change in fire patterns**	KPA 1. Basic Service Delivery & Infrastructure Development KPA 3. Local Economic Development	**GOVERNMENT/PARASTATAL** • National Department of Water and Sanitation • Department of Environmental Affairs – Natural Resources Management Programme • Gamtoos Irrigation Board • Eastern Cape Parks and Tourism Agency • National Department of Agriculture, Forestry and Fisheries **PRIVATE SECTOR/NGO'S** • All businesses that are large water users and which may be concerned with reducing their carbon footprint • Farmers associations and local conservancies • Catchment management structures	

PRIORITY

High (cost-effectiveness

High (societal benefit)



7.13 Relocation of Infrastructure & Communities

RESPONSE	**Disaster risk reduction**
INTERVENTION 13:	**Relocation of infrastructure & communities**

GENERAL DESCRIPTION

The Integrated Coastal Management Plan contains various recommendations with regards to the relocation or demolition of municipal infrastructure that is highly vulnerable to the impacts of sea level rise and the probability of greater intensity storm surges due to its current location on the seaward side of the coastal setback/management line. The proper location of infrastructure is the most successful form of adaptation with the greatest potential to avert risk and to save on high, on-going costs associated with maintaining infrastructure affected by natural coastal systems like mobile sand-dunes.

Similarly, there are currently several communities (mostly informal) that are highly vulnerable to especially the impact of flooding owing to their location within floodlines. The NMBM has an informal settlement upgrade and relocation plan, which, if implemented, will be a key adaptation measure in terms of diverting the risk away from these highly vulnerable communities.

ESTIMATED PROGRAMME BUDGET: R 50m over 10 years

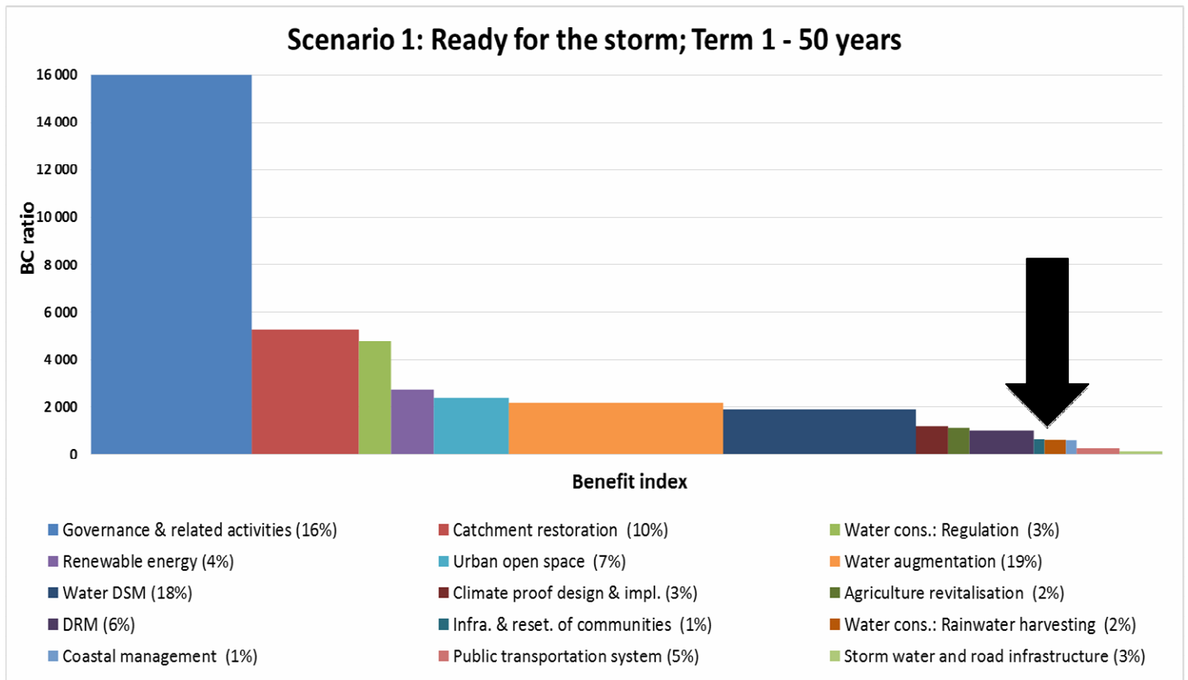
TARGET	TASKS & IMPLEMENTATION TERM			NMBM ROLE PLAYERS
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Relocate/ demolish inappropriately placed infrastructure.	Complete a risk areas and vulnerable infrastructure assessment Incorporate the information into planning maps	Obtain approval for relocation projects Complete relocation projects as per plan	Complete relocation projects as per plan	Public Health: Environmental Management • Public Health: Parks • I&E: Design & Implementation • I&E: Roads, Stormwater & Transportation • Human Settlements Directorate • SRAC: Beaches, Resorts & Support Services

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
Housing programmes provide an opportunity for communities to partake in the development of their neighbourhoods, contributing to local economic development and a sense of ownership in doing so. This should include more flexible tenure schemes to facilitate socio-economic migration.	• **Changes in sea level** • **Changes in storm surge patterns** • **Changes in wind patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 2: Spatial Development Framework KPA 6: Financial Sustainability & Viability	**GOVERNMENT/PARASTATAL** • National Department of Human Settlements • Eastern Cape Department of Human Settlements • Department of Economic Development, Environmental Affairs & Tourism (DEDEAT) **PRIVATE SECTOR/NGO'S** • None	Coastal Management Program (2015) Informal Settlements Upgrading Plan (2008) Spatial Development Framework (2009) High-level Housing Strategy (2012)

PRIORITY

Low (cost-effectiveness)

Low (societal benefit)



7.14 Disaster Risk Management

RESPONSE	**Disaster risk reduction**
INTERVENTION 14:	**Disaster risk management**
GENERAL DESCRIPTION Disaster Risk Management includes the full range of disaster planning and response actions – including fires, flooding, disease, damage to infrastructure etc. The NMBM DRM programme includes the proactive planning for, and response to, climate related disasters or incidences of disasters that are exacerbated by climate change. This consequently includes DRM systems, up to date information on risk profiles of the municipality and its communities, awareness and preparedness training and communication, disaster mitigation strategies, disaster planning as well as disaster relief, recovery and rehabilitation.	
ESTIMATED PROGRAMME BUDGET: R 30m per annum	

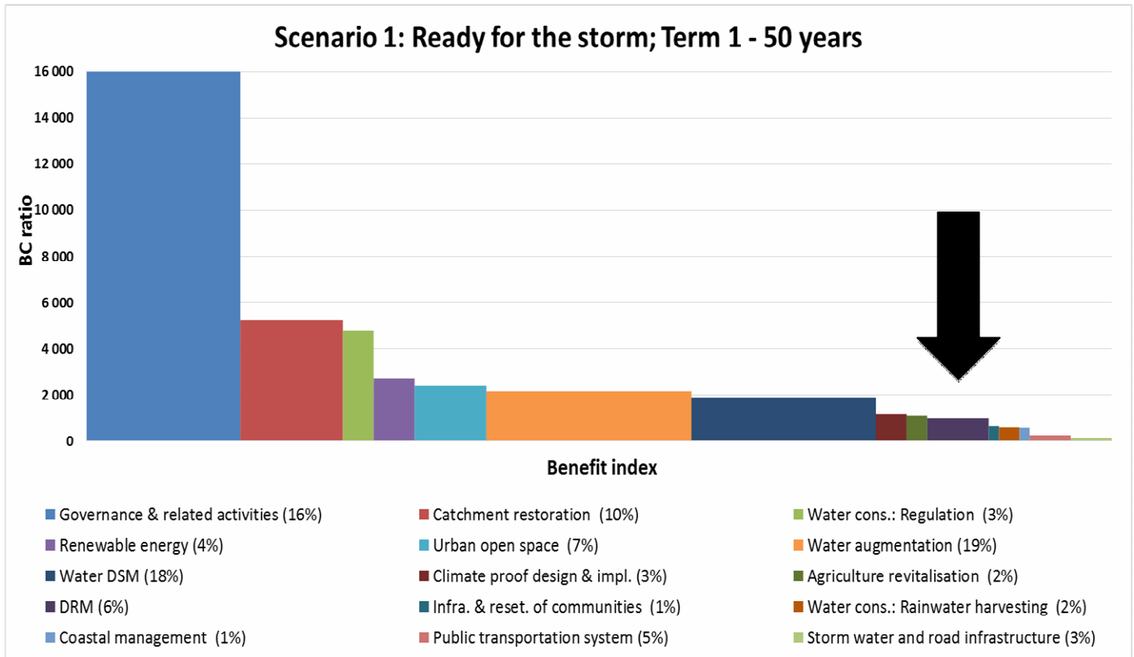
TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
DRM office Continuation of Disaster Management Forum	Hold Disaster Management Forum engagements DRM unit's project plans and budgets approved at Council level	DRM unit's project plans and budgets approved at Council level		<u>Safety & Security: Disaster Management</u> • CFO: Budget & Financial Control • COO: Policy, Strategy and Research • COO: Risk Management • COO: Communications • Safety & Security: Fire & Emergency Services • SRAC: Beaches, Resorts and Support Services • Human Settlements: Land Planning and Management • I&E: Design and Implementation • I&E: Roads, Stormwater and Transportation • I&E: Water and Sanitation • Public Health: Environmental Management

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
• Forecasting and early warning systems • Better disaster preparedness also offers opportunities for investment and growth in areas like transportation, energy, mobile health, technology, financial services and agriculture. • Links to labour and construction benefits as infrastructure gets upgraded through public works schemes	• **Change in temperature patterns** • **Change in rainfall patterns** • **Change in drought patterns** • **Change in flood patterns** • **Change in fire patterns** • **Change in storm surge patterns** • **Change in wind patterns**	KPA 1: Basic Service Delivery & Infrastructure Development KPA 4: Municipal Transformation & Organisation Development KPA 5: Good Governance & Public Participation	**GOVERNMENT/PARASTATAL** • National Department of Cooperative Governance & Traditional Affairs • Department of Safety and Liaison • Department of Finance, Economic Development, Environmental Affairs and Tourism • Department of Health • South African Weather Services **PRIVATE SECTOR/NGO'S** • Nurseries • Farmers • Food and health sector-specific NGO's	Disaster Management Plan (2010)

PRIORITY

Medium (cost-effectiveness

Medium (societal benefit)



7.15 Governance & Related Activities

RESPONSE	**Good city governance**
INTERVENTION 15:	**Governance & related activities**
GENERAL DESCRIPTION Good governance and effective institutions are foundational to adaptive capacity and hence city resilience. Good governance is participatory, consensus orientated, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows the rule of law. The governance programme aims to strengthen inter-departmental relationships within the NMBM, the relationship with external role-players including the academic and business sectors, other government departments as well as civil society, as well as existing institutional structures and processes that contribute to building climate resilience. It also needs to establish new structures and processes.	
ESTIMATED PROGRAMME BUDGET: R 5m/annum	

TARGET	**TASKS & IMPLEMENTATION TERM**			**NMBM ROLE PLAYERS**
	Short term (2015/16, existing funding)	**Medium term (2016/17, next 5-year IDP budget)**	**Long term (2021/22 <)**	
Focus GO Green campaign on creating community awareness of climate resilience Strengthening of ward committee system Coordination between departments regarding sector specific community liaison and communication Establish Climate Change Unit within NMBM Formally commit to achieving national climate change standards and international standards and actions Establish bi-laterals to deal with key sectorial issues e.g. water, infrastructure (where necessary) (e.g. existing NMBM-DEDEAT bi-lateral) Establish a city wide climate resilience forum with key role players to provide a platform for sharing information and mobilising action Utilise Corporate GIS as the central point for all NMBM spatial data & have it accessible to the public to enable informed decision-making within Nelson Mandela Bay Utilise the Municipal Planning Tribunal as platform for integrating climate and resilience-related issues into land management Utilise the Integrated Land Information System (ILIS) as the central point of coordination for all land related processes Develop information and data repository to assist with	Distribute information document outlining the roles of all directorates as related to climate change actions Monthly Ward Committee meetings and effective communication channels Set up coordination forum(s) – e.g. community liaison technical team, high level or senior decision-making planning committees, bi-laterals with relevant provincial and national departments, city wide climate resilience forum Hold climate change coordination engagements Regular updating of the Emissions Inventory for Nelson Mandela Bay	Establish a dedicated unit responsible for climate change coordination within the NMBM Adopt monitoring, reporting and evaluation plan for climate change actions Quarterly, annual and 5-yearly performance reports submitted to Council Monthly Ward Committee meetings and effective communication channels Hold climate change coordination engagements Re-branding/thinking of the GO Green campaign to focus on climate resilience and develop implementation/ roll-out plan Formalise the relationship between Corporate GIS and the GIS functions within individual directorates/ sub-directorates GIS data to be accessible for use by the public Utilise the Integrated Land Information System (ILIS) as the central point of coordination for all land related processes through a formalised relationship between the ILIS Manager and the associated process managers within individual directorates / sub-directorates	Hold climate change coordination engagements Quarterly, annual and 5-yearly performance reports submitted to Council Monthly Ward Committee meetings and effective communication channels	Office of the Chief Operating Officer • Public Health: Environmental Management • Corporate Service: Constituency Services • Safety & Security: Disaster Management • Human Settlements: Land Planning & Development

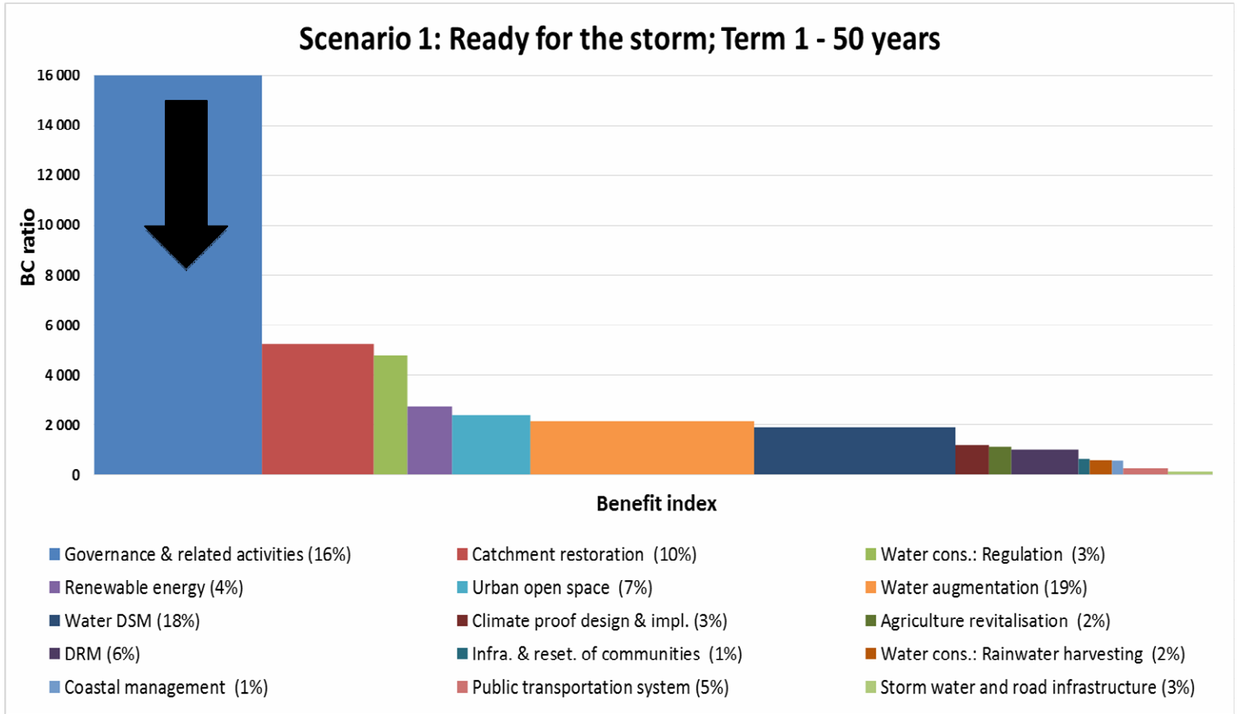
retaining institutional knowledge				

Green Economy Opportunities	Threats addressed	IDP Linkages	Other Role Players	Reference documents
A significant number of green economy initiatives require high levels of cross-sectorial cooperation and elevated levels of public-private sector cooperation. Consequently, high levels of governance will promote greater cooperation and a more rapid growth of the green economy.	• **Change in temperature patterns** • **Change in rainfall patterns** • **Change in drought patterns** • **Change in flood patterns** • **Change in fire patterns** • **Change in storm surge patterns** • **Change in wind patterns**	KPA 4: Municipal Transformation & Organisational Development KPA 5: Good Governance & Public Participation	**GOVERNMENT/PARASTATAL** • National Department of Cooperative Governance & Traditional Affairs • Provincial Department of Local Government & Traditional Affairs **PRIVATE SECTOR/NGO'S** • NMB Civil Society Coalition • Nelson Mandela Metropolitan University (NMMU)	Integrated Development Plan (2014) Local Government Turnaround Strategy (2010) Integrated Environmental Policy (2012)

PRIORITY

High (cost-effectiveness)

High (societal benefit)



8 Measurement, Reporting and Verification Plan

8.1 Measurement, Reporting and Verification (MRV)

As non-Annex I party to the United Nations Framework Convention on Climate Change (UNFCCC), South Africa is required to measure and report on efforts to address climate change and the actual impacts of these efforts. This includes measurement of GHG emissions and the reduction thereof, the effects of specific mitigation actions, as well as the support received and still required. The responsibility for setting up the necessary monitoring and reporting systems resides with the National Department of Environmental Affairs, but the actual parties responsible for the intervention actions, whether related to mitigation or adaptation, would be required to collect and report the actual data and information.

This implies that the intervention actions proposed in the Nelson Mandela Bay Climate Change and Green Economy Action Plan should be made subject to a structured performance monitoring process that will facilitate reporting on implementation process in future. This, however, also provides a golden opportunity to establish foundations for a monitoring and reporting system that will not only serve as performance measurement system for the identified key adaptation actions, but that can accommodate both adaptation and mitigation efforts in due course.

The objectives and targets of the Climate Change & Green Economy Action Plan are to be achieved through a set of 8 overall objectives and 15 specific intervention programmes that each correspond of a set of specific tasks. The MRV Plan is aimed at tracking the eight overall objectives of the NMBM Action Plan within the context of broader reporting on mitigation and adaptation responses.

8.2 Monitoring mitigation actions

In the absence of specific devolved responsibility to report on GHG emissions, the current GHG emissions tracking in the NMBM should be maintained and continued in the future. This implies regularly updated emissions inventory that is aligned with international standards. In parallel, related processes such as the production of a State of Energy report should continue but be aligned in a way that makes data sharing between the reporting processes seamless.

Current reporting – the 2012 Greenhouse Gas Inventory (ICLEI, 2012) – focusses on providing GHG emissions data in accordance with international accounting protocols. Superficial data analysis is included, and the Inventory recommends that the information be used when developing and outlining objectives and actions in respect of development with a lower emission footprint.

Strong recommendations are also made in respect of the progressive improvement of data collection and reporting processes. In particular, it is recommended that reporting be handled in-house by a designated official, who can then coordinate data collection, reporting and communication. A significant effort would be required to improve the data collection process, as a range of internal and external data custodians are involved.

Specific incremental improvements that will add value to the reporting and that would balance the reporting with more qualitative information include reporting against specified emissions targets, a description of progress made in terms of the implementation of specific mitigation actions, as well as a report on support received and given. In addition, the mitigation reporting needs to show how emissions reduction actions overlap with adaptation needs and actions, and how any co-benefits are being realised.

Given the recent release of the GHG Inventory, actions need to shift towards identifying GHG emissions reduction opportunities, their implementation, as well as setting up of a centralised data collection and reporting function within the NMBM. The GHG Inventory contains a number of recommendations in terms of mitigation measurement, reporting and verification (Table 8-1). It also makes suggestions in terms of where best interventions can be targeted to reduce the overall GHG emissions of the city (ICLEI, 2012).

Table 8-1: Mitigation measurement, reporting and verification actions (ICLEI, 2012)

Energy data collection and analysis	Continued measuring, monitoring and reporting
• Assign responsibility to a competent municipal staff member to undertake this specific data management task and score performance under key performance areas (KPA). • Repeat data collection and analysis on an annual basis. • Store data readily available on a central data base system. • Installation of an internal energy management system. • Disseminate and publically display GHG findings within the municipality to respective sectors and to external stakeholders (newspaper, website, and posters). • Annually report energy data and climate action to the HEAT+ and carbon*n* Climate Registry (cCR). • Lobby the Department of Energy to ensure consistency of the SAPIA data, as liquid fuels represent a large contribution to the energy consumption within the municipality, and the inventory depends on being able to source reliable and consistent data.	• Put systems in place to measure electricity consumed by individual local government operations (buildings, water and sanitation facilities, street and traffic lighting). • Continuously report on individual consumption patterns and report to respective municipal platforms. • Report and record to a central data base any projects relating to energy savings that will have an impact on electricity consumption from local government operations – publically disseminate information to the public.

8.3 Monitoring and reporting of adaptation actions

Central to monitoring and reporting of climate change responses is the tracking of general progress towards achieving the high level targets set as part of the Climate Change and Green Economy Action Plan. These targets relate to the eight overall objectives identified as representative of a climate resilient Nelson Mandela Bay.

This progress reporting will consequently report against the targets specified in Table 5-1 on page 7. The reporting needs to specify quantitative or qualitative data on the progress made towards the stated goals/objectives, as well as a description of the methodologies used or assumptions made in collecting and analysing data.

An important step towards monitoring and reporting on the 15 key adaptation actions identified in the Climate Change and Green Economy Action Plan is the identification of Intended Outcomes, Performance Indicators linked to temporal scale, Evidence of performance, a Responsible Agency and a Monitoring Agency/ Mechanism for each of the actions prior to collecting and reporting on progress:

Intended outcomes:	To be defined in terms of the eight objectives stated in the Climate Change Adaptation Plan: o Food security o Ecosystem supply & buffering capability o Minimised cost to the economy o Protect household income o Climate resilient public infrastructure o Climate resilient private properties o Protect city-wide employment o Human welfare
Performance indicators linked to temporal scale:	A final project outcome as well as key procedural steps. For example: o Council go-ahead o Budget approved o Project phases o Final outcome(s) - Short term (2015/16, existing funding) - Medium term (2016/17, next 5-year IDP budget) - Long term (2021/22<)
Evidence	Documented evidence of performance according to above performance indicators
Responsible agency:	The lead agent
Monitoring agency/ mechanism	The entity/entities responsible for collecting the information as well as the structure within which to report

The refinement of performance indicators at programme level, not task level, as required for performance management on a detail project level and for individuals or directorates within the NMBM structure, is the responsibility of NMBM and should form part of the institutionalised performance management system.

The actual progress reporting can then provide quantitative or qualitative information on the following against the adaptation interventions:

- A description of the **coverage** of the response action
- A description of **action steps** taken or still envisaged
- **Support** needed, received or rendered
- Quantitative or qualitative **data on the progress made** towards the stated goals/objectives
- A description of the **methodologies** used or **assumptions** made
- Evidence of **maladaptation or unintended consequences**
- Recommended **corrective action or adjustments** to the monitoring and reporting process

8.4 Central Coordination, Future Development and Refinement

The MRV component of the Nelson Mandela Bay's Climate Change and Green Economy Action Plan is part and parcel of an important first step towards a pro-active change in the development trajectory in order to make the city more sustainable and resilient. The generation and central collection of information will provide a benchmark against which developmental actions and decisions, and future monitoring results, can be measured. The sooner the information collection commences, the better.

It is crucially important to realize that the responsibility for the data collection as outlined in this plan does not reside with a single administrative entity or division within the Municipal structure. Rather, it will be a distributed effort, with many different divisions providing information and data on their actions and activities. It is, however, necessary to designate one entity that will take responsibility for the central collection, analysis and dissemination of reporting products.

It should be noted though that despite the MRV plan suggesting that a range of new interventions and tasks be tracked, it need not result in new structures being created or more onerous reporting requirements being imposed. Instead, the existing monitoring and evaluation arrangements in place in NMBM should be used as far as possible. This will not only give more credibility to the reporting systems, but also avoid unnecessary duplication. A range of existing relevant reporting mechanisms identified for possible relevance to the Climate Change and Green Economy MRV Plan include:

- The Monitoring and Evaluation unit within the office of the COO, which tracks service delivery related planning and performance
- Annual IDP planning that builds on on-going monitoring results
- Linkages with Key Performance Indicators and targets for Directorates, specifically how the monitoring is integrated with internal performance measurement for individuals and directorates
- The Built Environment Performance Plan which monitors the use of grant funding
- Existing external reporting systems specifically aimed at tracking climate change response related data such as the carbon*n*® Climate Registry and SACN
- Data collection and reporting by StatsSA – such as the Community Surveys and census programme
- The South African Air Quality Information System
- A National Climate Change M&E System (anticipating alignment with the carbon*n*® Climate Registry) which is under development

Further build-out of the scope of the monitoring and evaluation plan can take place in ensuing years by following the approach described in this guideline. Aspects to consider during such refinement of the plan for adaptation include:

- Global adaptation performance targets for the municipality as a whole
- Differential or shared responsibilities that could leave the municipality as secondary partner to intervention actions

- Adaptation responses that require cross-sector participation
- The overlap between mitigation and adaptation actions
- Reporting cycles vs. climate change or response effect manifestation timeframes

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