CAPE of STORMS

Sharing the coast in the face of turbulent, rising seas

The Cape coastline faces into a turbulent ocean. Climate change will make this naturally stormy sea all the more formidable. Cape Town has inherited a complex space to manage: land reclaimed from the sea for forts and harbour walls; towering residential flats lined with cemented promenades; economically critical ports and railway lines; ecologically sensitive beaches, dunes and river mouths; and a legacy of dispossession of black South Africans, and privileged access for wealthy whites.

Increasingly stormy seas and higher sea levels are beginning to show up the existing fault lines in the engineered, social and institutional strata of this complex coastline. People working within the City of Cape Town (CoCT) today are making decisions about how to manage these vulnerable spaces – decisions that future generations will have to live and work with.

Short-term, piece-meal, opportunistic responses to the threat of stormier seas will only increase how vulnerable the built city, its inhabitants, economic activities, and the natural environment are. The City, lead by its Environmental Resource Management Department, is developing a rigorous coastal policy and management framework that will enable politicians, managers and residents to respond consistently and appropriately as they are confronted with an uncertain, dynamic, climate-altered future.

This booklet presents research done by the University of Cape Town's African Centre for Cities, the Stockholm Environment Institute and partner institutions, working closely with the City of Cape Town, to explore ways to manage changing coastal risks.

INTRODUCTION

A city by numbers

- 307 km of coastline, containing many different ecological, recreational, economic and living needs.
- 25 km^2 of land already vulnerable to rising tide and storm surges.
- R5 billion's worth of built environment within the 2.5 metre contour at risk of rising seas.
- 23 'hotspots' that are particularly vulnerable to coastal storm surges.

ONE DYNAMIC SPACE, THREE CONVERGING FORCES

Nature

The Cape coast is in a natural state of flux: pounding storms; waves and wind perpetually sweeping sand back and forth; the steady melting away of dunes to erosion, and the rebuilding of them elsewhere. These are the natural sculpting processes of a healthy, functioning coastline, especially one as 'energetic' as Cape Town's.

These forces have reshaped river mouths, redrawn beaches, inundated the flats with water and seen it recede again. Sometimes this change happens over a single season, sometimes over decades, sometimes over thousands of years.

Building up the city

People have used the Cape Peninsula and surrounds for hundreds of thousands of years. More recently, as increasing numbers of people have settled here permanently, we've tried to lock down the forces of movement for our convenience, safety or protection. We've thrown down concrete slabs, put up massive buildings, pushed back the tide to claim the seabed for development, rolled out kilometres of tar roads and rail lines.

Development often restricts nature's inbuilt movement, trapping the city into highly engineered spaces that have lost their resilience in the face of nature's constant change. The spreading urban edge has undermined nature's buffers which help absorb the damaging impacts of storm surges and violent seas.

Climate change

Changing ocean behaviour in response to rising global temperatures caused by human activities on the planet will make these natural ocean and wind forces much stronger and faster, causing them to act with greater power on our coastline. This puts coastal dwellings and developments at additional risk.

We are learning that it is better to work *with* nature's forces, rather than *against* them. This is particularly true as human impacts on Earth's atmosphere have knock-on effects on our oceans, which in turn put our settled coastlines at risk.

A coastline is a valuable thing, and everyone wants their piece of it.

In Cape Town the coast is the gateway to historic fishing grounds. It is where fynbos-clad mountain slopes meet some of the most beautiful beaches and tidal pools in the world.

VYING FOR A PIECE OF THE PIE

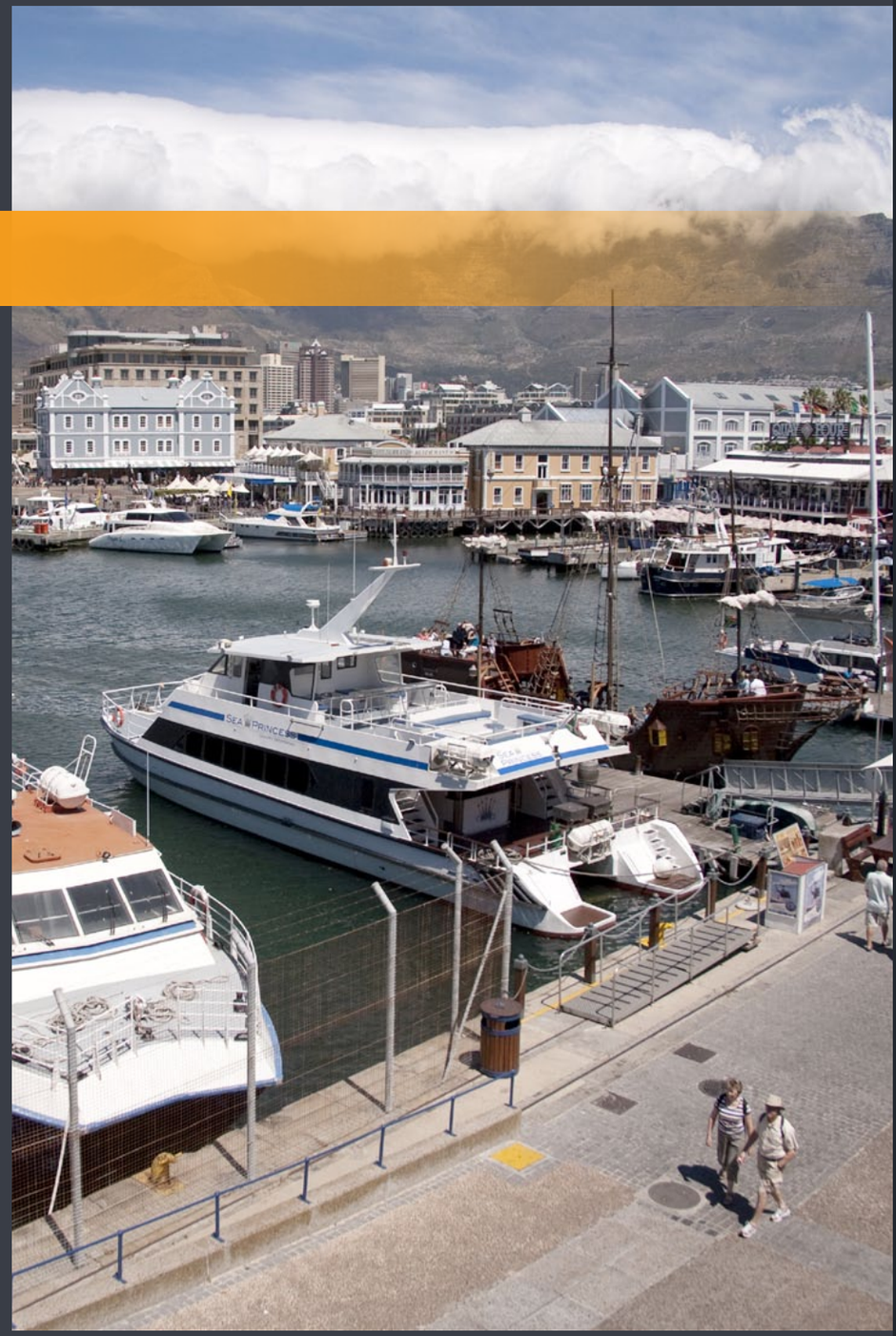
The city's arteries run close to the surface here – economically critical railways, roads and harbours connect with the region's economic engine room in the city centre. Private residential development sits alongside 'coastal public property' which is owned or managed by the state. There are ecologically fragile river mouths and dune fields, some of which are set aside for conservation, while others are mined for sand or locked down with cement or alien vegetation in an attempt to stabilise them for further development.

Commercial opportunities for property developers, and individual demand for coastal homes, make demand competitive. Property values are usually higher along the coast, which pushes up the rates, making it a significant potential source of revenue for the City, so granting development rights is an attractive proposition.

Balancing emerging risks with historical legacies: who gets to use the coast?

The economic, recreational and natural value of the coast is huge. With this comes many vested interests. Balancing the management of the coast – in terms of development, access and conservation of natural systems – is no simple task.

Historically, black, coloured and Indian South Africans were excluded from using certain beaches and pools, or even from owning property on many stretches of this coastline, while whites have enjoyed this privilege and financial gain. This only compounds the complexity of any decisions about who gets to use which sections of the coastlines now, and how much should be kept undisturbed or set aside for conservation.



THE RISING, STORMY SEAS

As human actions over the past 300 years have caused global air and sea temperatures to rise, and changed the world's climate, our oceans have become a greater potential risk for three reasons:

1. As the ocean warms, it swells, making the sea level rise.
2. As ice over land masses in places like Greenland and Antarctica melt, it adds more water to the ocean, which causes the sea level to rise further.
3. As storms become fiercer, the coastline takes a greater pounding. This is particularly severe when intense storms coincide with 'spring' tides, when the natural high tide peaks. One short storm surge can leave devastation in its wake.

Bracing for an uncertain future

The science is clear: change is already taking place and more is coming, even if we drastically reduce greenhouse gas emissions globally. But what makes preparing for that change so difficult, is the uncertainty. Sea levels don't rise evenly. Though stormier seas are a certainty, when they will come and where they will strike is hard to predict.

Sea level rise is the 'super tanker' of climate change: even if we stopped atmospheric warming immediately, the oceans would continue to heat and expand for more than a hundred years.

Expanding oceans are difficult to reverse in the medium term and are going to be a feature of life in coastal cities over the next century and beyond.

How safe is 'safe enough'?

This is a critical question: what level of risk is acceptable, and to whom?

How society grapples with these issues, often comes down to who will have to pay for the damages incurred by a rising or stormier sea.

Similarly we must consider what advantages are gained by being positioned in a particular area, relative to being somewhere else that may be safer.

What the impacts of climate change and sea level rise will be for the coastal zone depends on many things: how much of the natural space is still intact and ecologically healthy; how much development has taken place and how exposed it is; how 'valuable' that space is in terms of its natural function or the development opportunities it provides to a community. The consequences will be measured in many ways.

TAKING A POUNDING

Financial: Existing buildings and infrastructure will need constant repairs and reinforcing against the pounding they will take; insurance payouts may result in increased premiums or insurance companies may refuse to insure high-risk buildings; hidden, indirect costs of disrupted transport, decreases in tourism, loss of real estate values and reduced fishing opportunities from small harbours.

Recreational: The loss of amenities that attract people to Cape Town, and the need to create new recreational spaces.

Infrastructure: Key transport infrastructure is at risk from flooding and damage, including the False Bay railway line, the peninsula's ports and small harbours, roads, bus and cycle lanes, and parking facilities, particularly in Milnerton and Strand, for instance.

Heritage: Traditionally, communities use the sea for fishing, religious ceremonies, and recreation on beaches and at river mouths.

Biological: Shifting fish habitats and changing ocean temperatures and acidity will alter marine populations, favouring some species and proving catastrophic for others.

The 'hot spots'

Each stretch of coast is exposed to the risks of a more aggressive sea for different reasons. Researchers and the City have identified 23 'hot spots', including: Milnerton Beach, Saltriver, Green Point, Sea Point, Bakoven Cottages, Camps Bay, Kalk Bay, Strandfontein Road, and Strand. The Atlantic seaboard is at risk due to big wave events from the south-west while False Bay's beaches and dunes are likely to face heavy erosion.

STEERING A NEW COURSE

Sea behaviour will change, and our decision-making relating to coastal management needs to adjust accordingly. Society needs to be fleet of foot if we are to respond cleverly in this shape-shifting world.

We have three options when tackling sea level rise in this context:

The engineering fix: Traditionally, municipalities have gone for the hard-surfaced, technological fix to the problem of an encroaching sea. This includes building or installing sea walls, rock armour, dolosse and gabions, artificial reefs and the likes.

The nature conservation fix: Working with natural systems by protecting and rehabilitating dune cordons, estuaries, wetlands, and kelp beds to buffer a coastline against stormy seas.

The social and institutional fix: Mapping the vulnerability of the city's coastline, creating buffer zones, communicating risk, applying legislation such as the Coastal Development Guidelines or the Integrated Coastal Management Act, limiting sand mining or filling in of wetlands, research and monitoring, and insurance market correction.

A 'no regrets' approach

Even if the ocean wasn't changing its behaviour because of climate change, a different approach to managing coastal spaces is sometimes called for. Now even more so, as the sea becomes fiercer. The City is calling for a proactive, 'no regrets' approach to managing coastal risks:

- No additional reclamation of land from the sea.
- Protection of wetlands, estuaries and dune cordons from artificial change by limiting new property and infrastructure development along the coast.
- Avoiding over-investment in maintaining and protecting existing coastal developments and infrastructures that are built in high risk areas; rather, planning for relocation.
- Maintenance of drains and stormwater systems so that they work properly to channel away excess water.
- Uplifting poor communities to reduce exposure to risk.

Most of the risk brought on by a higher, stormier sea is because of historical planning decisions that, with hindsight, are inappropriate because of high exposure to coastal processes or because of the extent to which they undermine the natural buffering capacity of dunes and wetlands, for instance. In Cape Town, housing and infrastructure are central to coastal risk.

What does society do, in the face of this certain change in ocean behaviour?

Building up a defence: Often, the first thing cities do in the face of an encroaching tide, is to throw up a wall of sorts. 'Hard' engineered solutions like sea walls, dolosse or gabions are technically complex, costly to build and maintain, are irreversible, and may not work. They create a false sense of security, often encouraging risky development behind them which, if they're breached by a storm surge, can cause extensive and costly damage.

RISKY BUSINESS

Engineering solutions should be the last line of defence. They should only be used when all other options have been exhausted, or when infrastructure, especially that which serves the public interest, is too valuable to 'let go'.

Good governance: A city like this needs a new way of thinking, in terms of how it manages its coastlines, particularly as its politicians and bureaucrats balance the need for development and economic growth with keeping the coast ecologically healthy and functioning.

Bringing in the insurers: The insurance industry understands the cost implications of climate change, considering the big payouts already linked with extreme weather events. Insurance companies can take a 'carrot or stick' approach to encouraging climate-wise development and management of high risk areas.

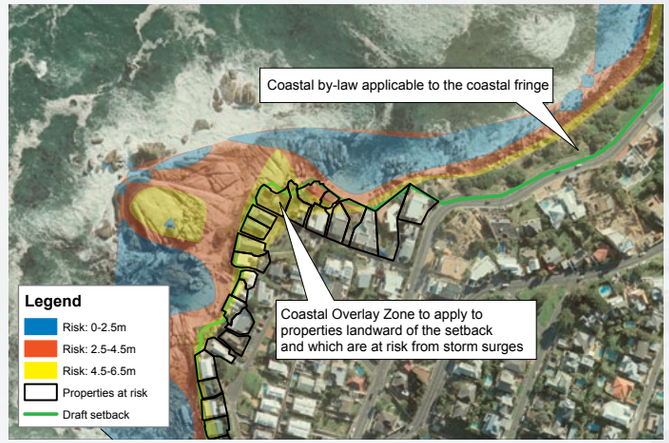
Development isn't the problem in coastal management, but rather how that development is allowed to happen. Ill-advised building and construction upsets the coast's equilibrium, increasing the risk both to the economy, to people, and to the environment. Protecting such developments often calls for expensive, engineered 'fixes'.

A better approach, most global experts now agree, is one that involves solutions at a social and institutional level. Instead of throwing up a wall of concrete in the face of an encroaching tide, one way to respond is, where possible, to take a step back from it.

A setback line is a 'soft', precautionary approach which is robust and flexible. However it needs deliberate and careful implementation, as is currently underway in the City of Cape Town.

Map: City of Cape Town

Defining a setback in Cape Town has required a delicate balance between achieving socio-economic interests whilst simultaneously avoiding risk from coastal processes. In this instance the setback has been used to define a nodal growth area to promote development whilst also demarcating hazard areas due to coastal processes and sea-level rise.



Map: City of Cape Town

A spatial representation of the various planning mechanisms and how they fit together along the City's coastline.

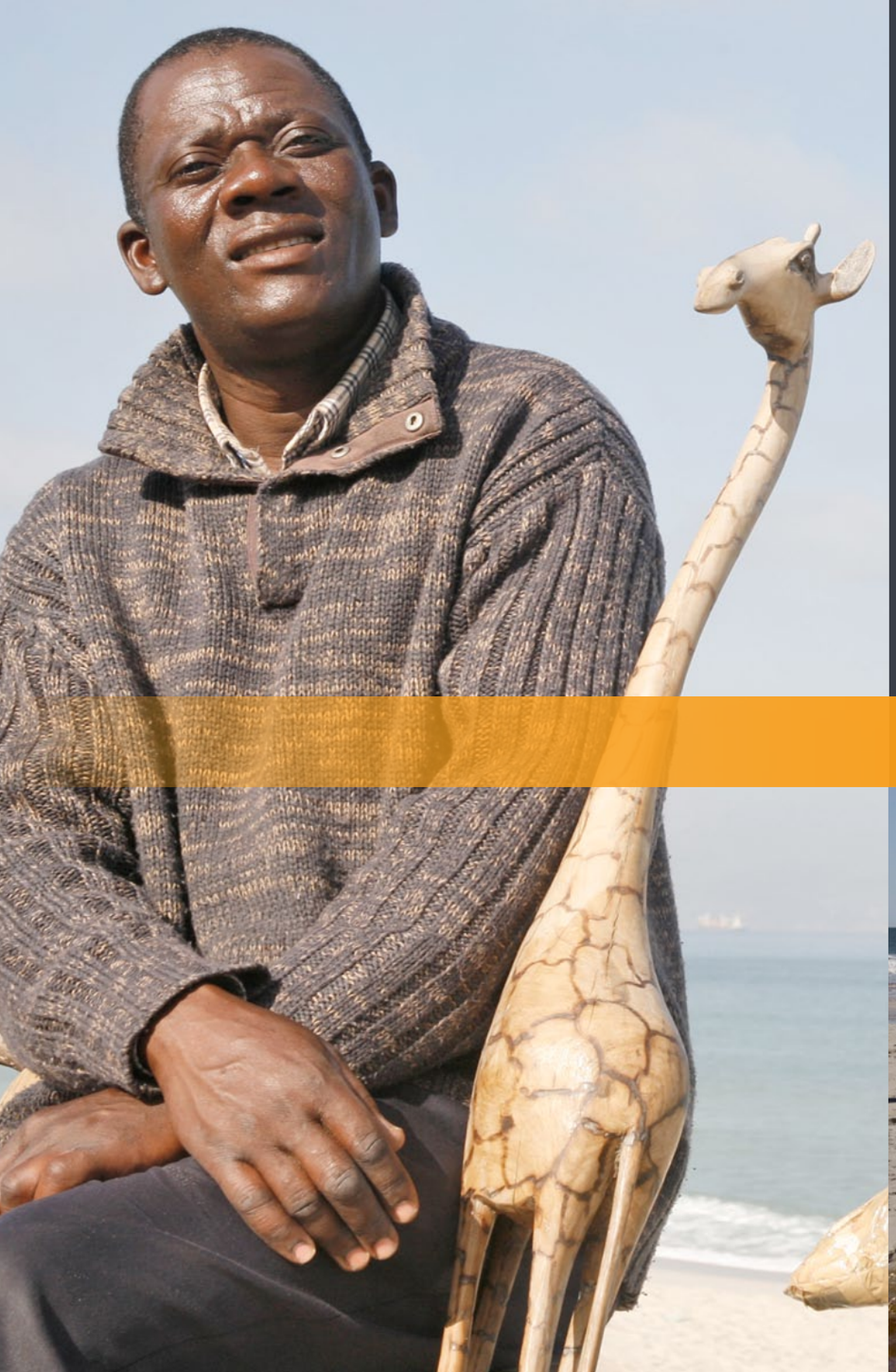
STEPPING BACK FROM A RISING TIDE

What it is: A setback line comes from global best practice, and is a demarcated line drawn along the coast, based on a range of factors, including risk from storm surges and sea level rise. It creates a protective 'buffer zone' in which development is either forbidden, or is strictly controlled, and allows for ecosystems to be restored and protected in that buffer zone, so they can offer additional defence against an aggressive sea.

Overlay zones: These spatial planning tools can be used as regulatory mechanisms to support setbacks, which can't work in isolation. Overlay zones are applied to areas inland and seaward of the setback line, designating specific development criteria and restrictions based on the varying risk profiles in each area.

Robust policy: A measure like this must to be clearly mapped out, decreed and enforced through policy and planning regulation.

Photo: Daryl Colenbrander City of Cape Town



There are political, bureaucratic, legal and historic reasons why a setback line is difficult to implement:

A contested space: Many different groups are vying for access to the coast, such as tourists, businesses, fishermen and other recreational users, conservationists, private developers, and the municipality which can get good rates from allowing prime development on such land.

The excluded majority: Historically, black, Indian and coloured South Africans were denied access to the most valuable stretches of coastline. Addressing the resulting socio-economic inequality continues to challenge a shared vision for managing coastal development.

Multiple state structures: Various government departments, at local, provincial and national levels, have overlapping roles, and have different approaches to managing the coast, interpreting associated laws, and defining a setback line. Beaches are 'coastal public property' falling under the jurisdiction of national government, but immediately next to these could be property governed by different national departments, agencies and local authorities. Meanwhile private land owners still depend on the City for service delivery, as well as planning permission relating to any buildings and development.

Near-sighted solutions: Short-term gains over-shadow long-term coastal planning and the necessary enforcement of regulations to steer the City in terms of managing coastal development or erosion and storm damage.

The City of Cape Town is actively rethinking how it navigates this new and changing jurisdiction. It is working between communities and other spheres of government to encourage shared notions of what is at risk, how much land to set aside as an appropriate buffer, and how this land will be acquired, managed and financed.

MAKING THE SETBACK LINE WORK

Photo: Darryl Colenbrander City of Cape Town

WEIGHING UP THE OPTIONS

Managing a coastline, in the context of sea level rise, needs a flexible, holistic approach, beyond that offered by the usual cost-benefit analysis, which relies on a narrow 'actuarial' or insurance industry measure of the value of a piece of land.

'Multi-criteria' approach to risk assessment

Development decisions need to be made on a case by case basis. While a 'multi-criteria' approach is a subjective assessment process, it allows for City managers to learn, adapt and respond appropriately to the changing context of the coast, and to sea behaviour. Some key criteria when deciding on how to manage coastal development applications and adaptive interventions include:

- How much does it increase or reduce risk?
- Is it easy to implement?
- Are there any additional benefits that are not linked to sea level rise risk management or climate change adaptation?
- Are there any unintended negative consequences?
- What is the cost, relative to reducing the impact per unit of investment?
- What are the greenhouse gas emissions (eg, large volumes of concrete, or energy used to pump water) associated with the choice?
- Given the unpredictable nature of a climate-altered future, is the development reversible and flexible to respond as our knowledge grows?
- Complementary options are better than single solution approaches.
- An intervention must not transfer risk onto poor communities, since these are already less able to absorb environmental shocks than affluent communities.

Being inclusive

Responsible coastal management allows for more than just building development.

Nature heals itself: Careful dune management, natural sand replenishment, wetland restoration, and so forth.

This is our heritage: Recognising the social and cultural heritage value of our coasts, which is difficult to quantify or give a monetary value. Coastlines must be accessible to more than just those with economic or political power, and they must be protected beyond the needs of the current generation.

Win some, lose some: There will be winners and losers, no matter what decisions are made, but these contests need to consider issues of equity and power differences within society. There will often be conflict between public and private interests.

Some within the City understand the need for 'climate compatible' or 'climate resilient' development, and that robust and clearly articulated, integrated policy and responsible governance are key to reducing risk.

Establishing and implementing a setback line along the coast is one such policy initiative. It aims to provide a consistent and transparent decision-making and regulatory framework within which the City and its communities can sustainably make use of the economic, social and environmental opportunities of Cape Town's remarkable coastline.

Towards a best practice setback line

Mapping the risk: The City's Environmental Resource Management Department (ERMD) has worked with researchers to map areas most at risk from sea rise and storm surge damage. This is built on robust, evidence-based research at a scale that considers localised nuances in coastal dynamics.

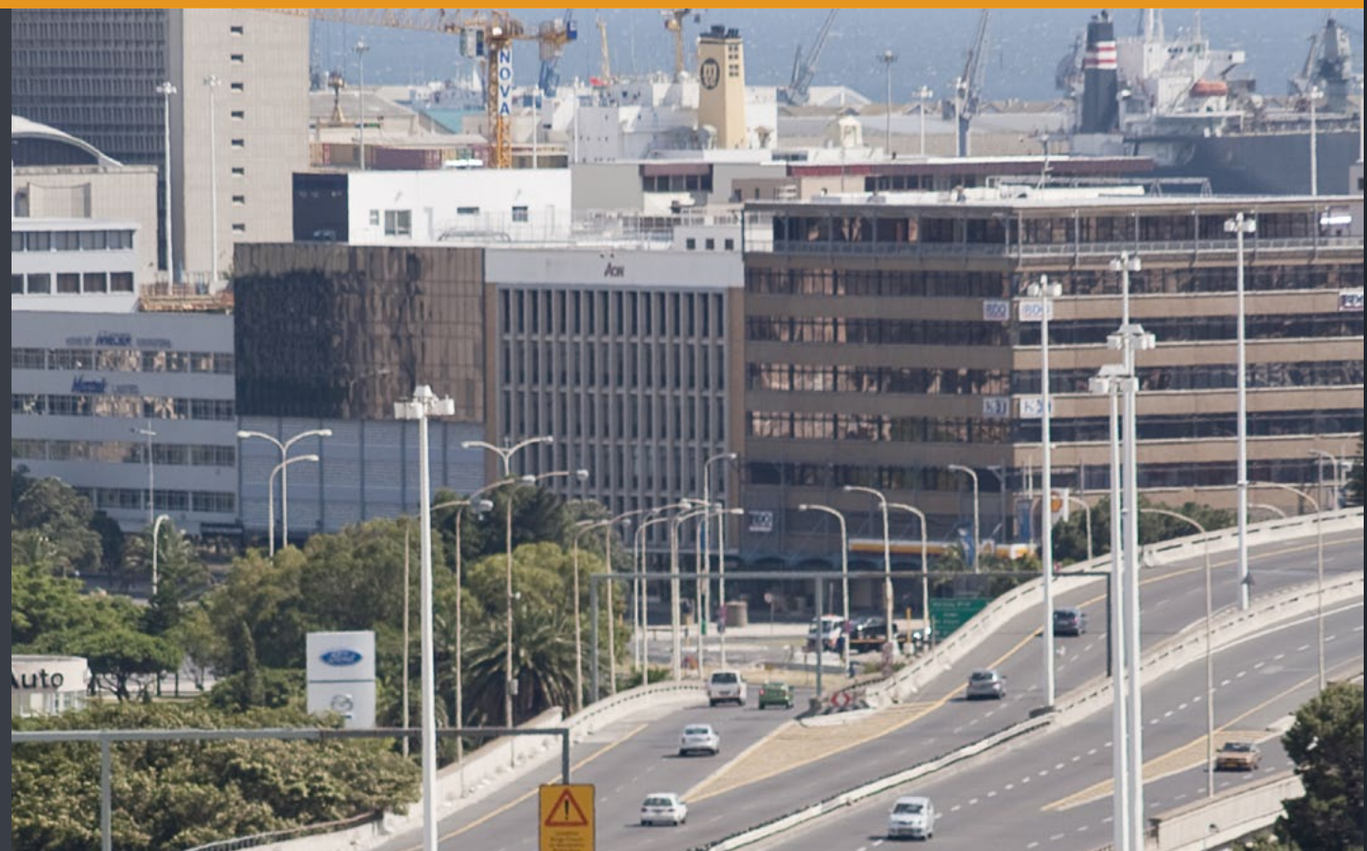
THE CITY GOES TO WORK

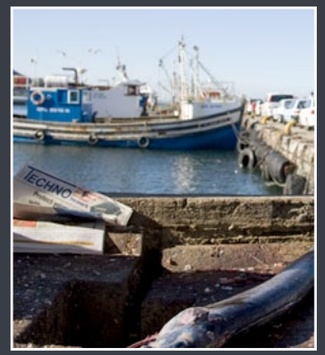
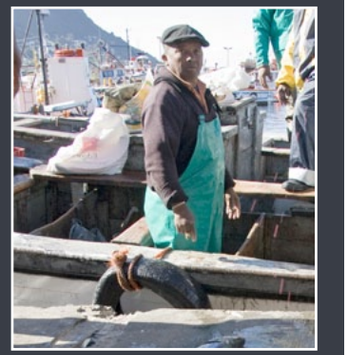
Drafting the policy: A coastal urban edge – a draft setback line – has been incorporated into the City's Spatial Development Framework. Municipal structures are working with provincial authorities to formalise this in terms of the Integrated Coastal Management Act. A 'unified' line that consolidates and represents multi-departmental interests and minimises the scope for confusion in managing the coast as an already complex space.

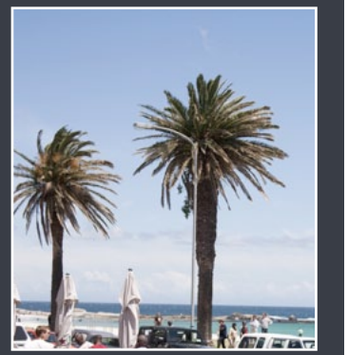
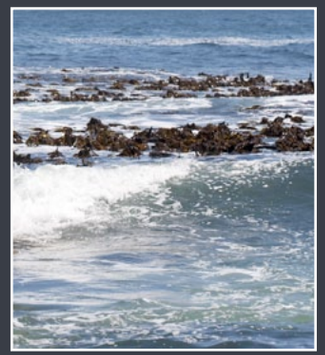
Overcoming the bureaucratic 'silo' effect: Many different national, provincial and municipal government departments need to coordinate their responses, requiring considerable investment in regular meetings and workshops to gradually align perspectives, priorities, approaches and tools for planning, management and regulation.

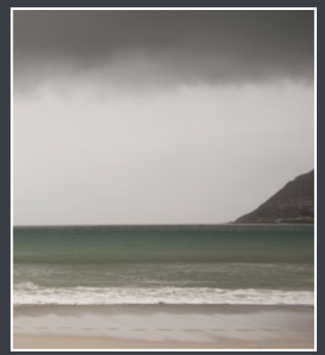
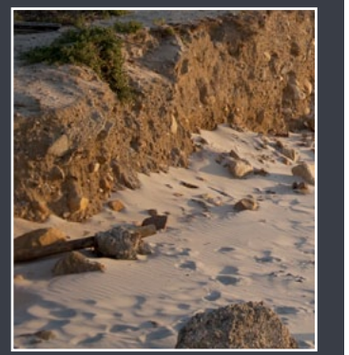
Policy like this provides a consistent approach for early action to manage the risk of rising sea levels and extreme storms associated with climate change, in a way that will reduce the cost and the hazard to the coastline, the people using it, and its natural ecosystems.

Once this policy becomes legally robust, effective implementation will be the next step. Political, public and business sector support is key to making this a reality.



With thanks to our colleagues and partners
for their contributions to this important work:
African Centre for Cities and Department of Environmental &
Geographical Science at the University of Cape Town (UCT)
Environmental Resource Management Department,
City of Cape Town (CoCT)
Stockholm Environment Institute (SEI)

This research was funded by the International Development
Research Centre and the United Kingdom Department
for International Development, as part of the
Climate Change Adaptation in Africa programme.

Edited and adapted by Leonie Joubert, from original research
by Anton Cartwright, Gregg Oelofse, Darryl Colenbrander,
Anna Taylor, Lucinda Fairhurst and Geoff Brundrit.

Photographs by Sean Wilson ©

Design by Ink Design

First published by the African Centre for Cities,
University of Cape Town, in 2013

African Centre for Cities
Room 2.11, Environmental and Geographical Science Building
Upper Campus, University of Cape Town
Private Bag X3
Rondebosch
7701
South Africa
Tel: +27 21 650-5903
Fax: +27 21 650-2032
Web: www.africancentreforcities.net