



# CLIMATE CHANGE ADAPTATION HUMAN SETTLEMENTS

Adaptation Scenarios Factsheet Series, Factsheet 4 of 7

## THE LONG-TERM ADAPTATION SCENARIOS FLAGSHIP RESEARCH PROGRAMME (LTAS) FOR SOUTH AFRICA

The LTAS (April 2012 – June 2014) aims to respond to the South African National Climate Change Response White Paper (2011) by undertaking climate change adaptation research and scenario planning for South Africa and the Southern African sub-region.

The **Adaptation Scenarios Factsheet Series** has been developed to communicate key messages emerging from LTAS Phase 2 (June 2013 – June 2014) to policy- and decision-makers, researchers, practitioners and civil society. The Factsheet Series complements the LTAS Phase 2 technical reports. For further details on this factsheet, see the LTAS Phase 2 full technical report entitled *Climate Change Adaptation: Perspectives on Urban, Rural and Coastal Human Settlements in South Africa*.

## 1. Introduction

South Africa is a diverse country, not just in terms of populations and biodiversity, but also in terms of its human settlements. These settlements face severe challenges, even before climate change is taken into account. The implications of the compounding impacts of climate change will be profound, and human settlements therefore represent a crucial part of national adaptation strategies. The overarching strategic framework for the development of human settlements is described in the National Development Plan (NDP) and, more specifically in relation to the implications for climate change, in the National Climate Change Response (NCCR). However, to develop appropriate adaptation responses a more nuanced understanding of the challenges and options for human settlements is required, building on the insights of the NCCR. This understanding needs to take into account the unusually diverse urban forms of human settlement in the South African context, and the importance of ecological infrastructure in supporting service delivery and building resilient communities.

## 2. Climate change impacts on human settlements

The consequences of warming, extreme weather and sea-level rise to human settlements in general are summarised in the table.

Climate change phenomenon	Consequences for human settlements
General warming – more frequent and intense hot days and nights, fewer and less intense cold days and nights	<ul style="list-style-type: none"> <li>• Intensified heat island effect.</li> <li>• Increased energy demand for cooling.</li> <li>• Declining air quality in cities.</li> <li>• Reduced energy demand for heating.</li> </ul>
Extreme weather – heat waves and drought	<ul style="list-style-type: none"> <li>• Increased water demand.</li> <li>• Water quality problems.</li> <li>• Increased risk of heat-related mortality, especially for the elderly, chronically sick, very young and poor.</li> <li>• Reduction in quality of life for people without appropriate housing.</li> </ul>
Extreme weather – intense precipitation events and severe storms	<ul style="list-style-type: none"> <li>• Adverse effects on quality of surface and groundwater, contamination of water supply.</li> <li>• Increased risk of death, injury, loss of property, and disease (infectious, respiratory, skin, water- and food-borne).</li> <li>• Displacement of people and distress migration to urban areas.</li> <li>• Pressures on urban and rural infrastructure, resulting in power outages, disruption of public water supplies and transport.</li> </ul>
Sea-level rise and storm surges	<ul style="list-style-type: none"> <li>• Decreased freshwater availability due to salt-water intrusion.</li> <li>• Increased risk of death and injury by drowning and migration-related health effects.</li> <li>• Loss of property and livelihoods and withdrawal of risk coverage in vulnerable areas by private insurers.</li> <li>• Permanent erosion and submersion of land.</li> </ul>

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Urban, rural and coastal human settlements face particular environmental and social challenges in relation to climate change. The projected impacts of climate change on urban settlements are complex and diverse, and both direct and indirect. Historical practices and spatial planning have, to some degree, shaped urban settlements in South Africa in maladaptive ways. This has resulted in a concentration of informal settlements on the urban periphery far from economic opportunities, compounding the climate change risks faced in the urban centres themselves. Impacts that are specific to human settlements in urban areas are listed in Box 1.

Rural economies are primarily dependent on agriculture, herding and tourism, all of which are directly or indirectly vulnerable to climate change. It must be recognised that the situation with respect to rural land rights and traditional authorities is complex and uniform solutions are unlikely to be appropriate in all situations, particularly when exacerbated by climate change. Many other drivers of social vulnerability identified in the context of urban settlements are particularly prevalent in rural communities. Impacts that are more specific to human settlements in rural areas are listed in Box 2.

Certain coastal settlements are vulnerable primarily through the effects of climate change on sea-level rise, storm surges and coastal flooding, and the impact of climate change on the marine environment and estuaries. Impacts that are specific to coastal settlements are listed in Box 3.

#### BOX 1: CLIMATE CHANGE IMPACTS ON URBAN SETTLEMENTS

- Increased costs of water, liquid fuels and electricity as industrial inputs.
- Increased costs of labour linked to food, energy, water and transport costs.
- Direct impacts of weather on construction, electricity generation and other industries, resulting in loss of productivity.
- Increased risk of lack of water delivery as a result of increased demand because of higher temperatures and drying conditions.
- Increased population size in urban and peri-urban areas, leading to increased pressure on service delivery and competition for resources, as a result of migration from rural areas affected by climate change.
- Increased disruptions to transport infrastructure (roads, rails, bridges, airports, tunnels) as a result of extreme weather events.
- Increased threat to human health through, for example, increased spread of malaria.
- Increased risk of extreme weather events to already vulnerable informal settlements, that are often unplanned, and without extensive service or infrastructure.

#### BOX 2: CLIMATE CHANGE IMPACTS ON RURAL SETTLEMENTS

- Reduced productivity of subsistence farmlands as a result of rising temperatures, unreliable rainfall, water scarcity and bush encroachment.
- Reduced productivity of rangelands as a result of drought, bush encroachment, malnutrition and disease.
- Increased vulnerability to water shortages because of increased evaporation, changes in rainfall, damage to infrastructure from floods and storm surges, and reduction in groundwater recharge.
- Reduced availability of natural resources on which many rural communities depend, because of diminished biodiversity in already degraded ecosystems.
- Physical isolation of rural communities as a result poor rural roads and increased flooding and erosion.
- Reduced food security, particularly of subsistence farmers, and resultant increase in malnutrition.
- Increased migration from rural settlements to urban and peri-urban settlements.



### **BOX 3: CLIMATE CHANGE IMPACTS ON COASTAL SETTLEMENTS**

- Increased impacts on marine diversity from ocean acidification, higher sea temperatures and changes to oceans currents, resulting in a reduction in the value of fisheries, affecting dependent livelihoods.
- Increased loss of property and damage to infrastructure (including coastal roads and railways, small fishing ports and harbours, and critical infrastructure such as Koeberg nuclear power station) as a result of rising sea-levels and storm surges.
- Increased disruptions to basic services as increasing groundwater salinity accelerates leeching of toxins from landfills threatening drinking water, and rising seas and storm surges result in “backwash” through sewage and wastewater systems causing damage and hazardous pollution.
- Increased groundwater salinity threatening smallholders and families who depend on vulnerable aquifers for irrigation of coastal farmlands.
- Reduced income from tourism as a result of reduced marine recreational opportunities and increased impact on tourism-supporting infrastructure, such as beach access roads.

### **BOX 4: CLIMATE CHANGE IMPACTS ON HUMAN MIGRATION AND CONFLICT**

South Africa is a highly migrant society, with large flows of people both from rural areas to urban, and between urban (or peri-urban) areas. Migration is an existing adaptation strategy, both to vulnerability from joblessness and from lack of access to basic services. Climate change is likely to disproportionately affect socially vulnerable populations already inclined to migrate, thereby increasing rates of migration. Specifically, climate-related food insecurity, service incapacity, extreme weather events and water security could lead to increased migration. Migration is likely to be experienced both internationally (from neighbouring countries) and domestically. In both cases, it is likely that climate change will accentuate the existing trend towards urbanization due to the negative impacts of climate change on rural livelihoods. Changes to settlement patterns may not be restricted to the socially vulnerable. For instance, the value of beachfront properties in some areas may drop as a consequence of their vulnerability to sea-level rise, forcing people to migrate to unaffected areas. Large population movements caused by deteriorating environmental conditions may lead to conflict through competition for resources in the receiving area, or by exacerbating existing ethnic, nationalistic or class divisions. Climate change could also contribute to failures of infrastructure and service provision, exacerbating the existing phenomenon in South Africa of service delivery protests.

## **3. Climate change adaptation responses**

There can be no ‘one-size-fits-all’ adaptation strategy for human settlements. Adaptation needs vary not only with the particular climate vulnerability experienced by an area or settlement, but with the economic, institutional and socio-economic context as well.

Climate change adaptation has to happen at the local level; however, national government can play a critical enabling and supporting role. National (and provincial) government is capable of planning for climate change adaptation on scales and along time-scales that simply are not possible on lower levels, and can also create an enabling environment, through resources and policy to support effective adaptation. A strong policy framework at national level should guide local adaptation strategies, including establishing standards of best practice. This is particularly relevant with regards to water and food security, service delivery, planning processes, land use decisions and population migration in South Africa. Institutional capacity is an essential component of building adaptive capacity. This is a major challenge for South African adaptation as municipalities are, with exceptions, under-resourced and under-staffed. The required capacity building should therefore be a priority.

Adaptation to climate change needs to be viewed as an integral part of the broader developmental challenges facing South Africa’s human settlements, in that effective adaptation can closely resemble non-climate related development. Addressing existing deficits in the provision for water, sanitation, drainage, electricity, tenure, healthcare, emergency services, schools and public transport backlogs is fundamental to building climate resilience in vulnerable human settlements. With well-designed institutional arrangements and mandates, development and adaptation objectives can be combined along with the resources necessary for each. Adaptation could be thus be ‘mainstreamed’ into economic, spatial and infrastructure policy implementation.

### **BOX 5: ADAPTATION RESPONSES FOR URBAN, RURAL AND COASTAL SETTLEMENTS**

- In terms of specific urban adaptation responses, water services will require better planning, management and long-term monitoring. Demand will have to be progressively managed and reduced by means of usage restrictions, higher tariffs, leak reduction, pressure management to reduce losses from leaks, awareness campaigns, and incentives and regulations to promote efficiency. To protect urban residents from extreme weather events, monitoring and warning systems should be upgraded and extended to areas they do not currently cover. Infrastructure for resilience (such as stormwater drains) should be improved; and all infrastructure should be made more resilient to accelerated weathering and deterioration.



- Adaptation responses for rural areas include improved ecological management (such as restoration of wetlands and river corridors that limit water runoff, provide grazing fodder, and increase potable water), farm support and land reform. Farm support in the form of subsidies and provision of equipment also increases adaptive capacity, but it is critical that this is accompanied by agricultural extensions services that are used to promote climate smart agriculture. The adaptive capacity of rural areas could be greatly increased with effective land reform that promotes smallholding, provides adequate support (financial, material and training) for recipient farmers, and does not disrupt traditional farming practices.
- Coastal settlements, particularly cities, need to actively manage their shorelines. This includes careful regulation of seashore development including buffer zones and more stringent set-back lines. Particular care should be taken with wetlands, estuaries and dunes, which play an important role in preventing sea encroachment. Other no regret adaptation measures include incorporating sea-level rise into future planning processes, infrastructure design and disaster management strategies.

#### 4. Policy and research recommendations

The implementation of existing policies and programmes relevant to human settlements, such the NDP, National Water Resource Strategy and Strategic Infrastructure Programmes, needs to be guided by the environmental constraints created by climate change. This will avoid maladaptive development potentially leading to costly investments in stranded assets and unsustainable land use decisions.

There are a number of national adaptation responses that are appropriate in all climate scenarios, and that deliver ancillary social benefits, such as creating livelihoods and promoting social equality. They can and should be prioritised and in many cases are aligned with existing government policies and programmes. They include:

- Community-based adaptation in building climate resilient human settlements, particularly with regard to informal settlement upgrades, rural housing subsidies and tenure reform.
- Ecosystem-based adaptation to build resilience, alleviate poverty and create jobs.
- Urban densification and social housing to enhance access to economic opportunities, contribute to cost-effective roll-out of infrastructure and services to the urban poor, and manage environmental impact of urban settlements.
- Development and access to basic services, as delivery of water, electricity and waste collection represent a significant contribution to improving the resilience of settlements.
- Disaster risk management that links with planning of human settlements, particularly around low cost housing and informal settlement upgrades.

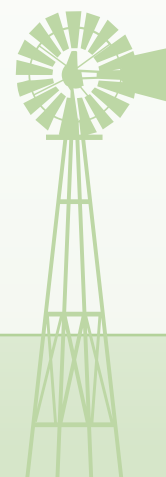
From a research perspective, downscaling of climate change projections to the local scale is an important aspect of disaster risk reduction and management that links with planning of human settlements, but this needs to be contextualised through field work in informal settlements involving participatory research models. Additionally, further research is needed to understand and demonstrate where effective ecosystem-based approaches are being used. Lastly, further investigation into behaviour change and social cohesion is required, as these are critical to community-based adaptation at all levels of society.

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SANBI, DEA and GIZ in consultations with relevant sector stakeholders

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