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POLICY BRIEF

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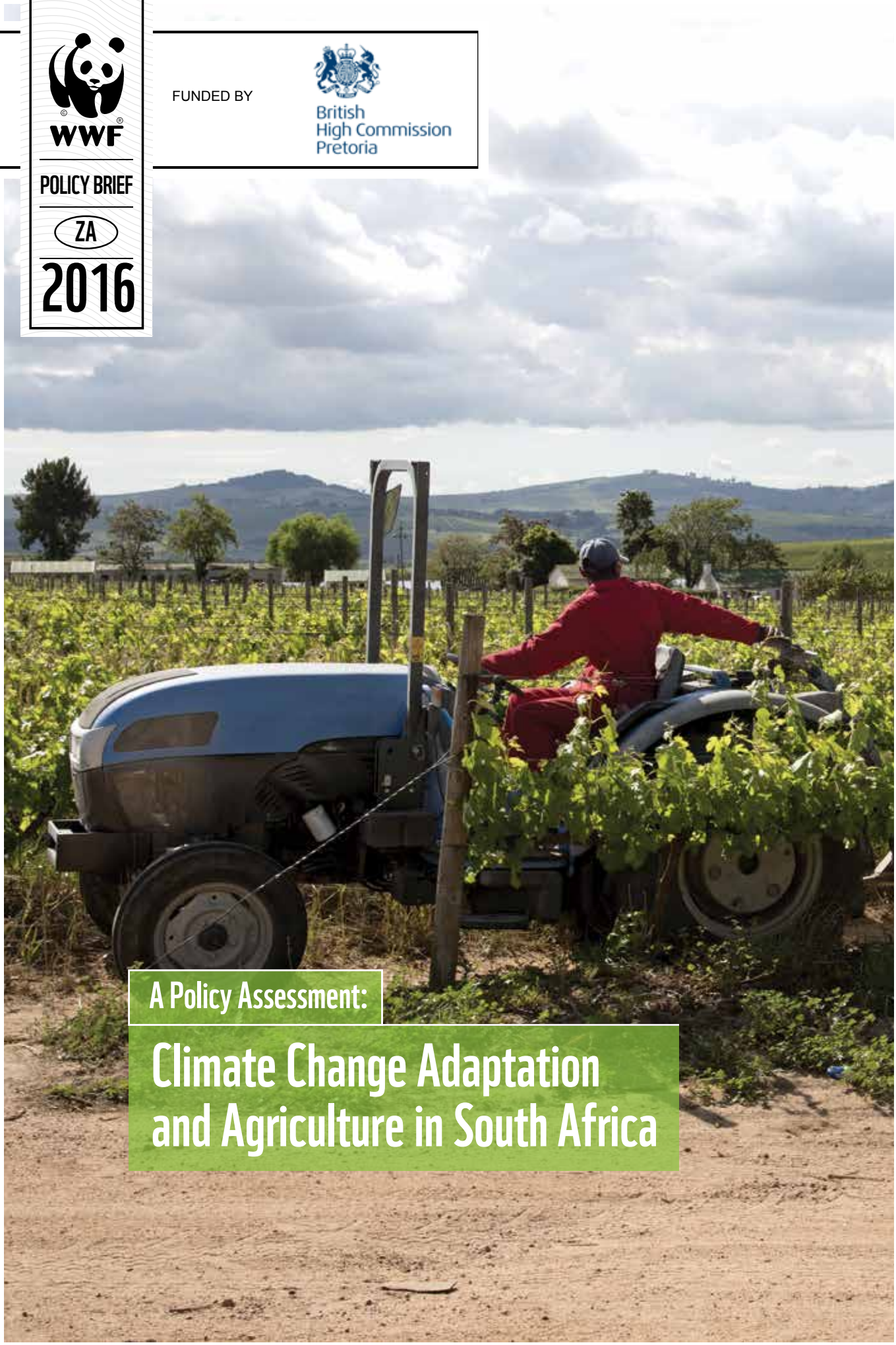

A Policy Assessment:

Climate Change Adaptation and Agriculture in South Africa

AUTHORS

Meshack Zwane
Gaylor Montmasson-Clair
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ABOUT THIS STUDY

WWF received funding from the British High Commission to establish a programme to provide the South African agri-food value chain with tools and information to understand and proactively respond to climate risks in the value chain thereby supporting on-going productivity in South Africa and continued local and international market access for South African supply farms.

ABOUT WWF

The World Wide Fund for Nature is one of the World's largest and most respected independent conservation organisations, with almost five million supporters and a global network active in over 100 countries. WWF's mission is to stop the degradation of the Earth's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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For further information please contact:
Tatjana von Bormann at **tvbormann@wwf.org.za** or Alexis Scholtz at **ascholtz@wwf.org.za**

CONTENTS

1. KEY FINDINGS

- Notable absence of a national political agenda around climate change adapation.
- No guidelines for local government to translate the national climate change action plan into local plans.
- Policies fail to recognise that changes in the availability of water supplies may limit the potential for irrigation expansion in some areas.
- The South African government has not indicated potential sources of financing for adaptation measures in the agricultural sector.
- Currently no financial or regulatory incentives for local governments to include mitigation and adaptation projects within planning.
- Policies shy away from the nexus of research and development translating into market-ready technologies and products.
- Little attention given to the need to capacitate extension services and to strengthen weather and climate forecasting and risk management tools.
- No understanding of the linkages between climate change, trade and industrial development.
- Lack of an integrated, strategic framework for spatial planning and land use management.

2. INTRODUCTION

Agriculture is one of the two sectors (along with mining) at the core of economic development. Underpinning food systems, agricultural activities constitute an indispensable pillar of sustainable development. This is especially true in South Africa, where the economic, social and environmental opportunities of sustainable agriculture are yet to be fully exploited. Over the last two decades, agriculture has been subject to drastic economic and social evolutions in the country. On top of that, climate change is progressively, but undeniably, changing the environmental, social and economic conditions affecting agriculture. According to the World Bank (2014), CO_2e (carbon dioxide equivalent) emissions are now 60% higher than the levels in 1990 and growing at about 2.5% per year. Without mitigation, CO_2e emissions will continue to rise driven primarily by increasing population and economic growth (IPCC, 2014). If the world continues on this trajectory, the Intergovernmental Panel on Climate Change (IPCC) projects that global mean surface temperatures are likely to increase from 3.7 °C to 4.8 °C in 2100 compared to pre-industrial levels (IPCC, 2014). Climate change poses a significant threat to South Africa's water resources, food security, health, infrastructure, ecosystem services and biodiversity. In South Africa, broadly speaking, climate change projections up to 2050 show significant warming (5-8°C) over the interior, a risk of drier conditions to the west and south of the country and a risk of wetter conditions along the eastern portion of the country (DEA, 2013). Agriculture in South Africa faces a variety of risks associated with climate change, such as changes in rain patterns, increased evaporation rates, higher temperatures, increased pests and diseases and changes in diseases and pest distribution ranges, reduced yields and spatial shift in optimum growing regions. The emergence of such risks calls for urgent, ambitious action to ensure the resilience of South Africa's agricultural sector through adaptation to climate change impacts.

Strategic public intervention is instrumental in ensuring the long-term sustainability of South Africa's agricultural sector. Market forces do not factor in social and environmental externalities of economic activities. In addition, the type, scale and duration of investments required to facilitate climate change adaptation in the agricultural sector and achieve common goals (such as food security), require the direct involvement of government. The multitude of stakeholders involved in the pursuit of sustainability also generates coordination failures, calling for government steering and oversight.

This policy brief speaks directly to the issues at stake and considers the extent to which South African policies and strategic plans adequately address climate change adaptation in the agricultural sector. Section 3 provides an

overview of the interplay between climate change and agriculture in South Africa. Section 4 unpacks an analytical framework underpinning the policy assessment. Section 5 reviews national policy documents and strategies based on the analytical framework outlined in Section 4. Section 6 idenfies key policy gaps based upon the review in Section 5. Section 7 investigates the extent to which provincial (general overview of provincial coverage) and municipal (a limited sample of municipalities) governments address climate change adaptation in the agricultural sector. Section 8 concludes with policy implications.

3. BRIEF SUMMARY OF RISKS ASSOCIATED WITH CLIMATE CHANGE

As mentioned in Section 2, the agricultural value chain in South Africa faces multiple stresses. Although these are often commodity and location specific, key issues can be identified (Table 1). A following risks were highlighted in a study of known climate science by WWF-SA:

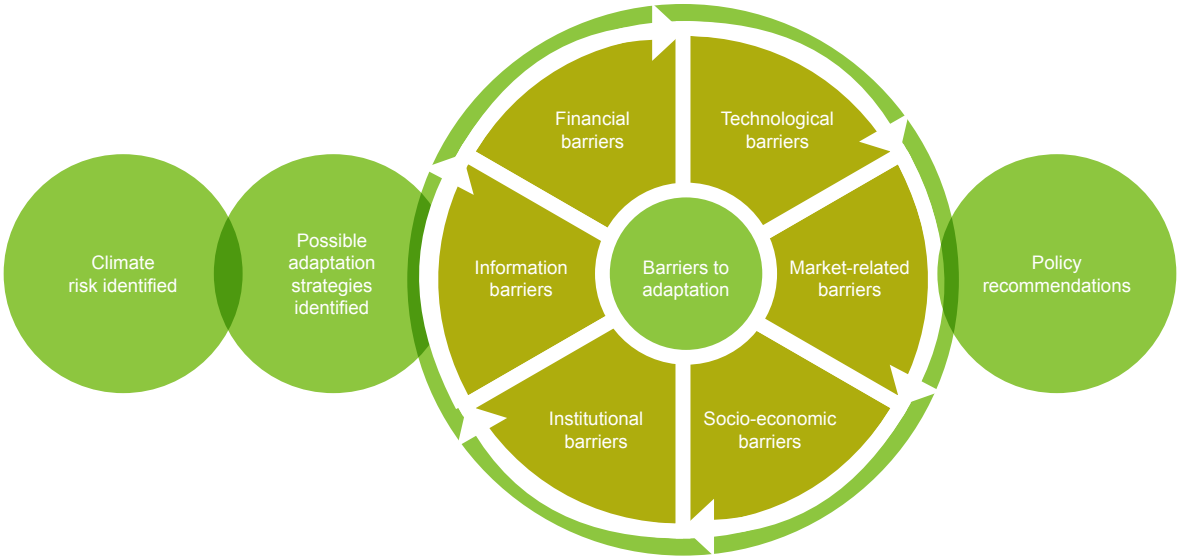
TABLE 1: STRESSES FACED BY THE AGRICULTURAL VALUE CHAIN

NATURAL RESOURCES
Lack of proactive water catchment management
Declining water availability and quality
Competition for water rights between domestic use, mining and agriculture
POLICY AND GOVERNANCE
Misalignment of government policy
Uncertainty regarding government policy (e.g. land reform)
Poor implementation of policies
Absence of effective extension services
TECHNOLOGY
Insufficient funding for research
Challenges associated with new technologies (e.g. pest intensification under nets)
Poor rail and road infrastructure
Risk of lock-in with technologies and investments
Challenge of investing in new technology in a time of uncertainty
FINANCIAL
Increasing input costs (weak rand exchange to global currencies)
Unaffordable insurance resulting in an inability to access funding
No relief/protection in the value chain for disaster

4. AN ANALYTICAL FRAMEWORK FOR ASSESSING THE POLICY COVERAGE OF CLIMATE CHANGE ADAPTATION FOR AGRICULTURE IN SOUTH AFRICA

Climate change adaptation is a relatively new area of policy development. This is particularly the case with regards to the South African agricultural sector. As policies, strategies and action plans are developed, it is necessary to ensure that they are evidence-based, coordinated and coherent. In order to do so, an analytical framework (Figure 1) was devised through combining known risks and adaptation strategies to establish a set of six complementary criteria based upon barriers to climate change adaptation. The criteria were derived from a review of domestic (WWF, 2016) and international literature (UNDP, 2004; LUANAR & UNECA, 2013; SEI, 2008; Selvaraju, 2012; Kragta, Mugeraa & Kolikowa, 2013). This framework underpins the policy review and gap analysis carried out in Sections 5 and 6 and the policy recommendations made in Section 8.

FIGURE 1: AN ANALYTICAL FRAMEWORK TO ASSESS POLICIES FOR CLIMATE CHANGE ADAPTATION IN THE AGRICULTURAL SECTOR



Source: Authors' composition

TECHNOLOGICAL BARRIERS (INCLUDING RESEARCH AND DEVELOPMENT)

This criterion scrutinises the existing policies on investments in the agricultural sector with respect to technological innovations, research and development in climate-resistant crop varieties, improved methods of irrigation and water harvesting, and the development of high-value agricultural crops and infrastructure. It looks at the policy and institutional arrangements linked to research, development, demonstration and deployment, notably the role of the Agricultural Research Council (ARC).

FINANCIAL BARRIERS

This criterion looks at the extent to which existing policies explicitly explain the funding mechanisms used to finance identified climate change adaptation strategies. It also looks at the role of insurance and whether the policies recognise the role of the agricultural insurance market as an adaptation response. Having insurance can build financial resilience as it helps farmers access credit assistance more easily, allowing them to innovate and invest in technologies that boost productivity. This barrier also examines the role of financial institutions such as development finance institutions and commercial banks in financing climate change adaptation. The main argument behind finance for climate adaptation along agro-value chains is relatively simple: improving value chain actors'

access to finance can help them build their assets and therefore reduce their vulnerability to climate and non-climate risks. If, for reasons of drought or flood, farmers produce less crops, financial assets will not directly contribute to increased climate resilience — that is to say, they will not directly protect crops from being damaged by climate hazards at the production level.

INSTITUTIONAL SUPPORT AND CAPACITY-BUILDING BARRIERS

This criterion investigates the extent to which policies tackle the role of the state in supporting information systems, both at local and national levels, to collect, process and disseminate climate change information and weather forecasts. This involves disseminating meteorological forecast to farmers, notably through extension services. Among the critical elements of the forecast are the rainfall amount and pattern (onset and cessation), length of the growing season, temperature and droughts.

INFORMATION BARRIERS (AVAILABILITY AND ACCESS TO QUALITY DATA)

This criterion looks at the extent to which policies foster awareness and knowledge of climate change impacts and risks. This is essential to make the agricultural production sector less vulnerable, to encourage the sector to adapt to climate change and adopt a soil protection ethos and conservation agriculture practices conducive to soil and water conservation, minimise greenhouse gas emissions, and carbon sequestration. This also covers the dissemination of information to farmers on various adaptation options through extension services and the dissemination of climate forecasts in accessible language, rather than in scientific terms. Climate is one of the major driving forces in agriculture. Food security is dependent on a suitable climate for crop growth and sufficient pastures to keep livestock for meat production. Therefore monitoring of the climate is important in order to facilitate informed decisions on where and when to plant which crops.

SOCIO-ECONOMIC BARRIERS (MARKET DEVELOPMENT AND ACCESS)

This criterion questions whether investments in climate-resilient infrastructure, such as irrigation systems, storage facilities and telecommunications, are adequately considered in policies. It also considers how the impacts of socio-economic dynamics (food shortages; increased food prices as agricultural productivity falters; role of strategic crops for food security; and the preservation of arable land for agricultural use) on both commercial and non-commercial farming are being understood and addressed.

MARKET-RELATED BARRIERS

This criterion investigates the extent to which policies account for the market-related barriers hindering market access, notably tariff and non-tariff barriers (such as certifications and standards).

5. AN ANALYSIS OF NATIONAL POLICY DOCUMENTS AND STRATEGIES

Building on the analytical framework proposed in Section 4, this section reviews South Africa's principal national policy documents, strategies and action plans in relation to agriculture and climate change. The following texts are reviewed in this section: the National Development Plan (NDP) (2012), the Integrated Growth and Development Plan (IGDP) (2012), Department of Agriculture Forestry and Fisheries (DAFF) Strategic Plan (2015/2016), the Agricultural Policy Action Plan (APAP) (2015), the National Climate Change Response White Paper (NCCRWP) (2011), the Green Economy Accord (GEA) (2011), the National Food and Nutrition Security Policy (NFNSP) (2014), the National Water Resources Strategy 2 (NWRS 2) (2013) and the Sectoral Disaster Risk Management Plan (2012).

TABLE 2: HOW DO SOUTH AFRICA'S NATIONAL POLICIES AND PLANS TACKLE CLIMATE CHANGE ADAPTATION BARRIERS IN THE AGRO-FOOD SECTOR?

DOCUMENT	TECHNOLOGICAL BARRIERS	FINANCIAL BARRIERS	INSTITUTIONAL BARRIERS	INFORMATION BARRIERS	SOCIO-ECONOMIC BARRIERS	MARKET-RELATED BARRIERS
NATIONAL DEVELOPMENT PLAN 2012	Recommends substantially increased investments in water resource and irrigation infrastructure. Recommends that the ARC establish a research focus on climate change and food security.	Does not show where funding would come from. Ignores access to agricultural insurance markets as an adaptation strategy.	Does not suggest any collaboration between departments, agencies and other relevant stakeholders operating at sector level. Does not acknowledge the need to capacitate extension services and strengthen weather and climate forecasting and risk management tools.	Access and availability of quality climate information is not covered in the NDP.	Does not acknowledge water scarcity, food shortage and food price fluctuations due to climate change.	Calls for becoming an early adopter of low-carbon technologies rather than holding onto obsolete fossil-fuel technologies that may be increasingly subject to trade barriers. Beyond that point, it does not take cognisance of the linkages between climate change, trade and agriculture.
NATIONAL CLIMATE CHANGE RESPONSE WHITE PAPER 2011	Calls for improvement in research into water, nutrient and soil conservation technologies and techniques, climate-resistant crops and livestock.	Proposes a fiscal mechanism to support the Department of Cooperative Governance and Traditional Affairs and the National Treasury respectively. However, the climate change agenda has been dominated mainly by energy security and efficiency linked to climate change mitigation.	Does not detail the required stakeholders for implementation.	Proposes the development and enhancement of early warning systems as well as education and awareness programmes in rural areas.	Does not address the lack of infrastructure development, such as the appropriate storage facilities for farm produce.	Mentions the need to manage the economic impacts resulting from national and international climate change response measures. While acknowledging the challenges and the vulnerability of the South African economy, it does not detail the approach which will be taken to ensure that economic risks are mitigated and opportunities seized.
GREEN ECONOMY ACCORD 2011	Does not cover agriculture-related issues at all.	Does not cover agriculture-related issues at all.	Does not cover agriculture-related issues at all.	Does not cover agriculture-related issues at all.	Does not cover agriculture-related issues at all.	Does not cover agriculture-related issues at all.

DOCUMENT	TECHNOLOGICAL BARRIERS	FINANCIAL BARRIERS	INSTITUTIONAL BARRIERS	INFORMATION BARRIERS	SOCIO-ECONOMIC BARRIERS	MARKET-RELATED BARRIERS
DAFF STRATEGIC PLAN 2015-2019	Calls for research on crop suitability and biogas production integrated with crop/livestock systems.	The proposed interventions are not supported by a corresponding budget.	The proposed interventions are not supported by a corresponding implementation framework.	Proposes climate change capacity building and awareness creation.	Silent on climate change effects on water availability and food supply.	Aims to promote economic development, trade and market access for agricultural, forestry and fisheries products and foster international relations for the sector. However, it does not recognise potential market access barriers arising from climate change response measures.
INTEGRATED GROWTH AND DEVELOPMENT PLAN 2012	Acknowledges that diversification (of crops, varieties and breeds) is a centrally important adaptation strategy. Emphasises the need for greater investment in irrigation.	Funding mechanisms are not outlined.	Does not provide details to guide the implementation of the identified interventions.	Calls for research and support of extension services to advise on crop choice and planting times, as precipitation and temperature changes have an increasingly significant effect.	Does not address the lack of ready markets, market access and farm infrastructure.	Acknowledges the role of agricultural trade in climate change. While it also stresses the need to better understand and manage international trade standards and regulations, the link between climate change and trade is not made.
AGRICULTURAL POLICY ACTION PLAN (APAP) 2014	Recommends climate-smart agricultural production systems and technologies (such as improved irrigation practices and techniques).	Does not propose a funding strategy.	Recommends the ARC as the lead institution, with support from DAFF.	Does not propose a clear capacity building programme for information disseminators (extension officers).	Does not cover the issue at all.	Covers trade and market access issues linked to international trade negotiations, but fails to make the link with climate change developments.
FOOD AND NUTRITION SECURITY POLICY 2014	The implementation plan calls for the promotion and support of water harvesting technologies.	There is no corresponding funding mechanism for the proposed adaptation strategy.	The implementation plan recommends a collaboration between DAFF, the Water Research Commission and the Department of Rural Development and Land Reform.	There is no coverage at all.	There is no coverage at all.	This point is not covered in the policy.

DOCUMENT	TECHNOLOGICAL BARRIERS	FINANCIAL BARRIERS	INSTITUTIONAL BARRIERS	INFORMATION BARRIERS	SOCIO-ECONOMIC BARRIERS	MARKET-RELATED BARRIERS
NATIONAL WATER RESOURCES STRATEGY 2 2013	Does not cover the issue at all.	Does not cover the issue at all.	Does not cover the issue at all.	Does not cover the issue at all.	Does not cover the issue at all.	Not applicable.
SECTORAL DISASTER RISK MANAGEMENT PLAN 2012	Does not propose any technological adaptation strategies.	There is no coverage at all.	Does not recognise the lack of capacity in disaster risk management at all levels.	Recommends that information dissemination at the provincial and local level needs more attention to flesh out bottlenecks that impedes the receipt of early warning information	There is no coverage at all.	Not applicable.

Source: Authors' composition

6. KEY POLICY AND STRATEGY GAPS FROM ANALYSIS

Table 2 above summarises the policy assessment, revealing the following gaps across the reviewed policies:

- **Technological barriers:** most of the policies propose irrigation technologies suitable for different agro-climatic regions. However, they fail to appreciate the context in which these schemes are to be designed and implemented. Some of the policies largely ignore the research and development of technological options for climate change adaptation, breeding climate-resilient crops and livestock varieties. The policies shy away from adressing the breakdown of transforming research and development into market-ready technologies and products.
- **Financial barriers:** there is a clear lack of prioritisation of funding to implement the proposed climate change adaptation response strategies. Given the lack of national guidelines and financing mechanisms on which municipalities might draw to address climate change locally, it is no surprise that the institutional configuration and content of the municipal climate adaptation programmes are markedly different.
- **Institutional barriers:** there is little attention given to the need to capacitate extension services and strengthen weather and climate forecasting and risk management tools. The poor recognition of the linkages between access to water, food security, climate change and land tenure implies weak institutional arrangement and planning. In addition, emphasis should be placed on the role of agricultural extension officers in encouraging farmers to adopt new technologies and improved methods of farming. A variety of methods should be used to reach farmers, such as organising study groups for farmers (especially those who do not have sophisticated information technology), farmer days, demonstrations, lectures and literature, as well as informing the media about farmers' challenges.
- **Information barrier:** the availability and dissemination of climate variability data, notably through extension services, is not adequately addressed.
- **Socio-economic barriers:** most of the policies are silent on infrastructure development, access to markets and the effects of climate change on food availability and food prices. Agriculture-related policies and plans, such as IGDP, APAP, the National Food and Nutrition Security Policy and DAFF's Strategic Plan, failed to take the shifting balance between rain-fed and irrigated agriculture in the face of climate change into account.

- **Market-related barriers:** most policies, with the notable exception of the National Climate Change Response White Paper, do not cover issues related to the interplay between climate change, trade and agriculture. When addressed, market access and trade issues are tackled purely from a trade negotiation and facilitation perspective, failing to recognise the particularity of the climate and trade nexus.

The South African government has designed several policies, strategies and plans to understand, identify and address the impacts of climate change on the economy. In addition, the analysis also sheds light on the fact that while many policies and strategic plans deal with climate change in South Africa, they are generally fragmented (sector-specific) and/or too broadly framed. As a result, they offer very limited scope for addressing the complexity of climate change adaptation. This is specifically the case for policies reviewed in this brief.

DAFF's (2015) Strategic Plan 2015/16 to 2019/20 sets out the courageous and aspiring objectives of the department. The plan acknowledges that the increasing threat of climate change, combined with inadequate investment in agricultural production, poses a serious risk to food security. As part of the implementation strategy, the plan notes that the department will implement sustainable development programmes that ensure protection of biomes and endangered species, the rehabilitation of degraded land, and climate change mitigation and adaptation strategies. However, it does not address issues related to climate change adaptation for crops and livestock. Moreover, droughts and water scarcity are mentioned once as cross-cutting issues, but the policy fails to provide clear direction on how to address them.

The Integrated Growth and Development Plan (2102) describes the current realities and challenges of the agriculture, forestry and fisheries sector and outlines the goals, objectives and interventions that need to be made to achieve the vision of "an equitable, productive, competitive and sustainable agriculture, forestry and fisheries sector, growing to the benefit of ALL South Africans" (DAFF, 2012). With regard to climate change, the plan recognises the need to develop both adaptation and mitigation strategies for the sector. The plan suggests the need for adaptive management strategies at five to ten-year intervals in order to keep up with changes in the productivity and distribution of resources. Following the initial publication of the IGDP in 2012, DAFF released a five-year strategic plan (2015–2020) in 2015, however, the adaptive management strategies proposed in the IGDP are not mentioned anywhere in the latest five-year DAFF Strategic Plan.

The Department of Environmental Affair's (DEA) National Climate Change Response White Paper (2011) describes climate response strategies for different sectors of the South African economy, including the Agriculture, Forestry and Other Land Use sector. The White Paper highlights the need to invest in and improve research on water, nutrient and soil conservation technologies and techniques; develop climate-resistant crops and livestock; and develop production, ownership, and financing models to promote the development of climate smart agriculture. Such interventions are not reflected in strategic agriculture-specific documents, such as DAFF's Strategic plan and the Agricultural Policy Action Plan.

Indeed, policies designed to tap significant mitigation and adaptation opportunities in agriculture fit uneasily within the general climate change policy framework. Components of a sound agricultural policy framework ought to contribute to mitigation and adaptation objectives, even when such objectives are not a policy priority.

The National Food and Nutrition Security Policy is relatively strong in terms of envisioning food security measures, the impact of climate change, and the creation of a centralised food security control. However, the policy is silent on climate change adaptation and disaster risk reduction interventions to ensure food security, despite the significant challenges they cause for food security. The policy only focuses on ensuring sustainable access to food and food availability, which are less likely to be achieved if issues pertaining to climate change are given a blind eye.

National policies also tend to fail in capturing the specificity and particularity of the local context. With climate change, smallholder farmers are already at risk but are bound to suffer more if they engage in specialised production. Diversification of livelihood systems among these vulnerable people is therefore an important

adaptation strategy. Examples of national policies that do not take local contexts into consideration include the APAP (DAFF, 2014), the IGDP (2012), DAFF's Strategic Plan (2015) and the National Food and Nutrition Security Policy. In addition, farming in the most vulnerable communities (former Bantustan areas) is mainly done at small-scale levels, mostly by women who lack labour and financial capacity to conduct commercial farming. The APAP lacks detail on how district-level officials should be equipped with information about climate change issues facing both commercial and small-scale farmers, such as climate impacts and adaptation measures, and how these affect specific farming districts. Their local knowledge is key in ensuring policies are adapted to various local social and cultural contexts.

The role of irrigation is another issue for which national policies fail to provide a sound, evidence-based direction. The promotion of appropriate irrigation technologies suitable for different agro-climatic regions and sensitive to ecological systems seems to appear in most of the reviewed policies. It is important to note that all the policies fail to recognise that changes in the availability of water supplies may limit the potential for irrigation expansion in some areas. In addition, most of these policies and plans do not include indicative budgets and plans for line departments (national and local). The policies under review fail to consider the high cost of technologies due to the existence of counterfeit technologies, and the inability of farmers to draw a distinction between counterfeit and genuine technologies. Policies also do not cater for small land sizes which make adoption of the technologies uneconomical, the lack of market for agricultural products and the lack of the requisite infrastructure for technology uptake.

The National Development Plan (2012) proposes the expansion of irrigated agriculture through better use of existing water resources and development of new water schemes. The plan does not, however, highlight the urgency of a comprehensive integrated socio-economic analysis of irrigation systems and other water uses for long-term sustainable socio-economic development. The Agricultural Policy Action Plan (2014) – which is a sectoral plan of the NDP developed by DAFF for the period 2014–2019 – proposes a different approach. It notes that a number of well-developed climate-smart approaches to agriculture exist and encourages the route of climate-smart agriculture generally, and conservation agriculture specifically.

In addition, the NCCR White Paper clearly advocates for the adaptation of agricultural technologies for analogue environments, and the enhancement of early warning systems with drought monitoring and seasonal forecasts. Further, it calls for a critical review of the policy and legislation relating to local government functions and powers with respect to climate change. The White Paper argues for an appraisal of the fiscal mechanisms to support local government capital and operating expenditures and the need to incentivise municipal adaptation and mitigation, to be led by the Department of Cooperative Governance and Traditional Affairs and the National Treasury respectively.

All the policies under review fail to promote the creation of weather-based insurance schemes for crop and livestock production as a climate change adaptation strategy. Given the importance of South Africa's agricultural sector for the economy and the high vulnerability of the sector to climatic shocks, it is critical to analyse existing risk management schemes, particularly insurance. Understanding the situation and constraints of the agricultural insurance market in South Africa can also lead to an expansion of the agricultural sector and better protection for farmers. Therefore, agriculture-related policies should also look at the role of development finance institutions (DFIs), such as the Land Bank, the Industrial Development Corporation (IDC) and the Development Bank of Southern Africa (DBSA), and commercial banks in strengthening climate change adaptation in the agricultural sector.

The National Planning Commission (NPC), through the NDP, proposes an expansion of irrigated agriculture. It targets a 50% increase in the area under irrigation by 2015, however, the NDP does not provide details on the corresponding budgets (for respective departments) to accomplish this target. Notably, as the core function of the initial NPC revolved around providing advisory services and developing a long-term vision and strategic plan for South Africa, the NDP could have mapped how the respective departments should expand irrigated agriculture. Importantly, the NWRS 2 pioneered by the Department of Water and Sanitation notes that there is little additional water for irrigation. Seemingly, there is a clear misalignment between agricultural planning and water planning, with agriculture seeking to increase the irrigated area substantially. The existing institutions are often not geared to address water management in a coordinated fashion, and intersectoral linkages (for example, between the water,

agriculture and industrial sectors) are typically weak. In the context of climate change and risk management and adaptation, this poses a significant concern.

The National Food and Nutrition Security Policy highlights the need for research and technology development on tolerant varieties and breeds. However, its weakness lies in the lack of tools that can ensure communities' resilience to climate change shocks and stresses. For example, it mentions the lack of food preparation, preservation and storage technologies as barriers, but falls short of stating the solution or the ways to provide such technologies. The Food and Nutrition Security Policy does not recognise the impacts of climate change on livelihoods and access to food. The policy lacks the prioritisation of livelihood groups that warrant special attention in the context of climate change, such as crop farmers that may not be sustainable under changing temperature and rainfall regimes and poor livestock keepers in drylands where changes in rainfall patterns will affect the forage availability and quality.

The expansion of irrigated agriculture is emerging as a major area of focus for national policies and strategies such as the NDP. However, the potential negative impacts of declining rainfall patterns on agricultural water needs tend to be ignored in policy formulation (such as the National Water Resource Strategy). In addition, there are no clear indications that due consideration is given to options for increasing productivity in rain-fed cropping systems. There is, consequently, policy misalignment between the NDP and the NWRS 2. The NCCR White Paper (2011) has brought about a directional change in South Africa towards the issue of climate change. It focuses both on adaptation and mitigation and aims towards inclusive development keeping climate change effects and impacts in view. However, agricultural related policies or plans such as APAP, the DAFF Strategic Plan and the National Food and Nutrition Security Policy tend to contain very broad objectives but with few specific targets and do not identify specific actions that might address some of the production challenges that climate change will exacerbate. National policies such as the Green Economy Accord are silent on climate change adaptation in the agricultural sector. Critical documents such as the DAFF Strategic Plan, Integrated Growth and Development Plan and National Food and Nutrition Security Policy do not place any emphasis on specific challenges related to rainfall variability, increasing temperatures, frequent droughts and occasional floods affecting the agricultural sector.

Beyond the reviewed policies, numerous other policy documents have an indirect impact on the sustainability of the South African agricultural sector. A high level scan of South Africa's key energy, transport and zoning policies shows that the impacts of agriculture are considered to varying degrees. South Africa's Integrated Resource Plan for Electricity 2010–2030 for example does not explicitly take into account the increased energy requirements associated with rising temperatures and climate change adaptation activities. While a number of scenarios are modelled, demand forecasts are driven by population size and economic variables, such as the expected gross domestic product growth rates, the expected growth rate in the Final Consumption Expenditure of Households (FCEH) values and relevant manufacturing and mining indexes (CSIR, 2010).

From a transport perspective, South Africa's National Transport Master Plan 2050 pays particular attention to the agricultural sector. It references the Strategic Integrated Projects (SIPs) developed by the Presidential Infrastructure Coordinating Commission, most importantly SIP 11 on agri-logistics and rural infrastructure, which aims to improve investment in agricultural and rural infrastructure that supports the expansion of production and employment, small-scale farming and rural development. On the back of increased agricultural and forestry activities, it also considers the expansion of the national N2 corridor, which links the coastal regions of KwaZulu-Natal, the Eastern Cape, the Western Cape, and the emerging Treasure[1] corridor in the North West Province. The plan takes into account the distribution of agricultural land, the ongoing and forecasted growth of agricultural activities, freight traffic regulatory measures (for the bulk movement of agricultural products) and the condition of the road networks (Department of Transport, 2015).

Spatial planning and land use management is another policy sphere which has key implications for agricultural policy. The Spatial Planning and Land Use Management Act 16 of 2013 provides for the sustainable and

[1] The N12 Treasure Route forms part of the national road network and was devised to introduce visitors to attractions in the North West province. See http://tinyurl.com/jnuhcbd

efficient use of land, where "sustainable development of land requires the integration of social, economic and environmental considerations in both forward planning and ongoing land use management to ensure that development of land serves present and future generations". The Act promotes the principle of spatial sustainability, based on which special consideration is given to the protection of prime and unique agricultural land. The Act also aims to ensure consistency of land use measures in accordance with environmental management instruments. In addition, it upholds the principle of efficiency, whereby land development optimises the use of existing resources and infrastructure, and decision-making procedures are designed to minimise negative financial, social, economic or environmental impacts. It also promotes the principle of spatial resilience, whereby flexibility in spatial plans, policies and land use management systems is accommodated to ensure sustainable livelihoods in communities most likely to suffer the impacts of economic and environmental shocks.

According to the Act, the national and provincial spheres of government and each municipality must prepare spatial development frameworks within five years from 2013 (the publication of the Act) and review them at least every five years. Spatial development frameworks must be informed by a long-term spatial development vision statement and plan, representing the integration and trade-off of all relevant sector policies and plans. It must give effect to national legislation and policies on mineral resources and sustainable utilisation and protection of agricultural resources. At municipal level, it must include a strategic assessment of the environmental pressures and opportunities within the municipal area, including the spatial location of environmental sensitivities, high-potential agricultural land and coastal access strips. While in theory the Act and supporting regulations and guidelines appear to provide a strategic and integrated framework for spatial planning and land use management, implementation remains problematic at multiple levels. The translation of the national framework, particularly for climate change adaptation, into local level intervention is not prioritised and spatial planning and land use management have had far more of a life on paper than in practice (van Niekerk, 2013).

7. AN ANALYSIS OF SUB-NATIONAL CLIMATE CHANGE ADAPTATION STRATEGIES IN SOUTH AFRICA

Climate change adaptation, particularly in the agricultural sector, is primarily a grassroots issue. Local government institutions (provincial, district and local municipalities) are in many cases highly aware of the need for action on adaptation, and have knowledge and ideas on what to do. Currently, there is a lack of connection between national policies on climate change adaptation and the local institutional situation on the ground. While analysing national policies provides a critical, overarching understanding of climate change adaptation for agriculture in South Africa, any national developments need to be effectively translated into sub-national policies and action plans. This section reviews the status of South Africa's provincial and municipal policy for climate change adaptation in the agricultural sector.

From a provincial perspective, not all regions are at the same level of advancement with regards to climate change adaptation (in general and for the agricultural sector). The Western Cape, Gauteng, Eastern Cape and KwaZulu-Natal have climate change response strategies in place. In contrast, other provinces - the North West, the Free State, Limpopo, Mpumalanga and the Northern Cape - do not have climate change adaptation plans. According to the DEA (2014), climate change response strategies for the Mpumalanga, North West and Northern Cape provinces are being developed and are currently in draft form[2].

Table 3 clearly shows that there is:

a) limited capacity to effectively implement the provisions of the National Climate Change Response White Paper and the priorities of provincial climate change response plan;

2 However, these documents are not available in the public domain at the time of writing.

b) a lack of dedicated budget for the implementation of provincial climate change response activities; and
c) no or limited provincial institutional capacity for climate change coordination and implementation.

TABLE 3: ASSESSMENT OF PROVINCES' CLIMATE CHANGE ADAPTATION STRATEGIES FOR AGRICULTURE

PROVINCES WITH CLIMATE CHANGE RESPONSE PLAN	PROVINCES WITH NO CLIMATE CHANGE RESPONSE PLAN	BUDGET ALLOCATED	DEDICATED INSTITUTIONAL ARRANGEMENTS
✓ Western Cape climate change response framework for the agricultural sector ✓ Gauteng climate change response strategy ✓ Eastern Cape climate change response strategy ✓ KZN climate adaptation plan ✓ Limpopo Green Economy Plan	✓ Free State ✓ North West ✓ Mpumalanga ✓ Northern Cape	✓ Western Cape (minimal dedicated budget) ✓ KwaZulu-Natal (minimal dedicated budget)	✓ Western Cape ✓ KwaZulu-Natal

Source: Authors' composition

Policy development for climate change adaptation is also extremely unresolved at the municipal level. As it is not possible to review all municipalities responses to climate change in the agricultural sector in a high level briefing paper, a limited sample of municipal case studies is used in this brief as an illustration of the issues around policy coherence. Three municipalities were selected due to their focus on the agricultural economy: two are municipalities with a climate change response strategy/plan, namely the Mbombela (Box 2) and Mogale City (Box 3) local municipalities, and one municipality with no climate change adaptation plan, namely the Theewaterskloof Local Municipality (Box 1).

It is worth noting that nationwide climate change adaptation has thus far not been adequately mainstreamed or integrated in specific plans and strategies for the agricultural sector at the provincial level. The Western Cape Government (WCG) has recognised the important role of the agricultural sector in the provincial economy and its growth potential, in job creation, and in the socio-economic development needs of the rural areas. At the same time, it has also identified the agricultural sector as being particularly vulnerable to a changing climate. In 2014, the WCG developed a stand-alone plan named the Western Cape Climate Change Response Framework for the Agricultural Sector (WCCCARF). The framework builds on the Western Cape Climate Change Response Strategy (WCCCRS), specifically the food security focus area which promotes climate-smart agriculture. It also aligns closely with the current five-year Provincial Strategic Plan and the national DAFF's Strategic Goals. For example, the Response Framework positions the sustainable utilisation of water and land resources as a priority to increase climate-smart agricultural production. This kind of systematic alignment of policies and strategic plans is not observed in the other provinces. In addition, the WCCCRS addresses the critical role that partnerships between government stakeholders, the private sector, research bodies, academia and civil society can play in implementing the strategy, stressing that every stakeholder needs to play a part in achieving the climate change response. However, the framework lacks details on financing mechanisms to address the specific needs of smallholder agriculture, including the need for investment capital and risk management/transfer. It is widely acknowledged that climate change imposes additional costs on municipal budgets. For example, climate change adaptation measures have not found their way into the Theewaterskloof Municipality budgetary framework. It is critical to devise sustainable funding mechanisms for climate change adaptation.

BOX 1: CLIMATE CHANGE ADAPTATION FOR THE AGRICULTURAL SECTOR IN THE THEEWATERSKLOOF LOCAL MUNICIPALITY, WESTERN CAPE

The Theewaterskloof Local Municipality is located in the Western Cape. Theewaterskloof is situated within a critical water catchment area for the City of Cape Town and is a major agricultural contributor to the fruit and wine industry. The Theewaterskloof economy is largely dependent on the agricultural sector and, in line with the topographical diversity, accommodates both intensive irrigated and extensive dryland agriculture. The municipality faces challenges in respect of water shortages and increased competition for water between economic sectors. Given the dominance of agriculture in the Theewaterskloof area, water is likely to become the largest constraint to growth and will need to be proactively managed (Theewaterskloof Vision 2030, 2011). Despite strong agricultural exports from the area, Theewaterskloof has no stand-alone climate change adaptation strategy. However, the area has pursued some climate change programmes around integrated water management involving the Groenland Water Users Association, sustainable farming and integrated pest management through the Sustainable Fruit Initiative and the Sustainable Wine Initiative, biodiversity conservation, especially within the UNESCO designated Kogelberg Biosphere Reserve, and also on farms through the Wine and Biodiversity Initiative under the Theewaterskloof Vision 2030 (2011). The Vision 2030 does not go any further in describing the detailed adaptation strategies and the corresponding funding mechanisms. Of all the irrigated crops, apples are probably the most sensitive. However, the vision is silent on opportunities to introduce cultivars more resistant to high temperatures that don't have the same chilling requirements as some of the older cultivars.

Source: Authors' analysis, based on Theewaterskloof Vision 2030 and Integrated Development Plan 2015

Over the years, there have been climate change impacts in Mpumalanga such as fire outbreaks, floods, excessive temperatures and rainfall (Mandleni, 2011). To date, Mpumalanga province does not have a climate change adaptation plan in place.

BOX 2: CLIMATE CHANGE ADAPTATION FOR THE AGRICULTURAL SECTOR IN THE MBOMBELA LOCAL MUNICIPALITY, MPUMALANGA

The Mbombela Local Municipality (MLM) is located in Mpumalanga province. Agriculture plays a key role in the municipality with local manufacturing also largely depending on the agriculture sector for inputs. In 2015, the MLM developed a climate change adaptation response policy. Primarily, the rationale for the response policy is to assist the municipality in aligning its activities to meet international commitments, and national and provincial climate change related policies and legal requirements. The policy notes that key economic activities that drive the MLM economy are at risk from the effects of climate change, including agriculture, tourism, forestry, industry, transportation and commerce. The MLM is ideally positioned to expand its agriculture sector. New developments, such as the National Fresh Produce Market, provide opportunity for local farmers to have better access to markets. However, climate change adaptation in the agricultural sector is not addressed at all by local strategies. The MLM Climate Change Response Strategy is mainly focussed on aligning its activities with international and national climate change initiatives. The policy largely ignores potential barriers to the implementation of an adaptation plan, such as local human capacity, limited financial resources and the limited knowledge and understanding of climate issues at the farm and municipal level.

Source: Authors' analysis, based on Mbombela Integrated Development Plan 2015 and Mbombela Climate Adaptation Plan 2015.

According to the Kwazulu-Natal Climate Change Adaptation Plan (2014), agricultural production in the province will change in the coming years and decades. Production areas will shift and productivity will be altered. Agricultural opportunities will be gained in some areas while other areas will become agricultural 'losers'. The plan also acknowledges that food insecurity in the coastal and northern parts of the province (such as the Zululand, Umkhanyakude, Ugu and uMgungundlovu district municipalities) may be worsened by climate change impacts. The plan proposes a number of solutions to address food security threats, including expanded rainwater harvesting, water storage and conservation techniques, water reuse, desalination, water-use and irrigation efficiency. The plan

also recommends a shift in crop calendars, the switching of crops and a switch to more resilient livestock production systems. With respect to institutional arrangements, the provincial Department of Water Affairs and Department of Agriculture were identified as institutions to champion the opted climate change adaptation solutions in the agricultural sector. However, little attention has been given to how farmers access information on climate change. Moreover, the role of extension officers in disseminating quality climate change information to farmers is largely ignored. Extension officers are supposed to be intermediaries between research and farmers. They operate as facilitators and communicators, helping farmers in their decision-making and ensuring that appropriate knowledge is implemented to obtain the best results. This gap has limited farmers' understanding of climate change and how to cope with it.

The Draft Eastern Cape Climate Change Response Strategy has the objective to promote adaptation and mitigation technologies and interventions to minimise future adverse effects of climate change on agricultural production and rural livelihoods. While the policy is still in draft form, the issues of climate change should have been tackled in each thematic area to address adaptation issues for each theme. The strategy supports the use of drip irrigation. However, there is no corresponding funding mechanism on the proposed adaptation strategy. The strategy is also silent on policy instruments (such as access to quality climate information, the role of agricultural insurance and investment in technology development, research and development) for adaptation in the agriculture sector.

In 2013, the Gauteng Province launched a climate change response strategy. The strategy reported that evaporation of water from dams and soil in Gauteng was expected to increase by five to ten% by the 2050s; and 15 to 25% by the 2090s. In response to water scarcity, farmers were encouraged to conserve water by using grey water technology, which is the reuse of water used for domestic activities such as laundry, dishwashing and bathing.

BOX 3: CLIMATE CHANGE ADAPTATION FOR THE AGRICULTURAL SECTOR IN THE MOGALE LOCAL MUNICIPALITY, GAUTENG

The Mogale City Local Municipality (MCLM) falls within Gauteng Province and is one of four local municipalities under the West Rand District Municipality (WRDM). The agricultural sector in Mogale City mainly incorporates floriculture, pig and chicken farming as well as the production of vegetables. In addition, agricultural activities in MCLM are extensive and relatively diverse with a third of the total land surface under some form of agricultural production (Gauteng Agricultural Potential Atlas 3). In 2014, the MCLM developed a climate change framework and an operational plan which aim to assist the municipality in putting measures in place to adapt to climate change impacts and to reduce the municipality's greenhouse gas emissions. The framework acknowledges that climate change in the agricultural sector will cause increased water demand for irrigation, an increase in the spread of pests and pathogens, increased discomfort levels and heat stress for livestock, increased discomfort levels and reduced productivity of the labour force, a rise in winter temperatures and a decrease in the number of chill units in a year and an increase in extreme precipitation events which can cause crop damage. With regards to climate change adaptation, the framework proposes to improve early warning systems, preserve agricultural land, promote the use of food gardens in residential areas, improve crop management and yields by using appropriate crops and species, the promotion of sustainable farming, and the improvement of livestock farm management. These measures are in tandem with the Gauteng Climate Change Response Strategy. It is important to mention that the framework and its climate change adaptation and mitigation actions are not incorporated into the 2015 Mogale City Integrated Development Plan, drastically constraining its impact. Indeed, the framework failed to detail budgetary provisions to finance the proposed adaptation strategies.

Source: Authors' analysis, based on Mogale Integrated Development Plan 2014 and Mogale Climate Change Response Strategy 2014

The Limpopo province incorporated climate change into its Green Economy Plan. Agriculture and food production are among the key focus areas of Limpopo's Green Economy Plan. The plan recommends a proper awareness raising strategy and the training of extension services workers on raising awareness on the green economy. The Limpopo Department of Agriculture Strategic Plan 2015-2020 acknowledges the acute shortage of extension officers with the necessary skills and resources to support previously disadvantaged farmers and

enable them to cope in a technologically advanced and globalised sector. The plan proposes to recruit extension officers to support previously disadvantaged farmers and land reform projects. However, the proposed awareness raising strategy on the green economy is not documented in the current Limpopo strategic plan. The Green Economy Plan largely ignores the training and retraining of extension staff to acquire new capacity in climate change management. The plan also lacks detail on climate change adaptation strategies for the agricultural sector.

The National Climate Change Response Policy (NCCRP) provides the country's commitments and plans to address climate change challenges and outlines what is required by all provinces and municipalities (as of October 2015). It is assumed that provincial climate change adaptation policy will likely prescribe municipal recommendations.

In summary, the integration of policies at different levels, in line with the realities of the local contexts, remains a critical challenge. The 2011 census shows the highest proportion of agricultural households within provinces was recorded in the Eastern Cape, Limpopo, Kwazulu-Natal and Mpumalanga. However, except Kwazulu-Natal, these provinces do not have a stand-alone climate change adaptation policy or plan. This might affect the implementation of municipality climate change response plans. For instance, the Mbombela Climate Change Adaptation Policy omitted provincial plans or commitments on climate change adaptation due to the unavailability of a provincial adaptation policy or plan.

In contrast, the provinces (Western Cape and Gauteng Province) with least proportion of agricultural households have climate change response strategies in place. In 2014/15, the Western Cape further developed a climate change adaptation plan specifically for the agricultural sector. However, the Theewaterskloof Local Municipality does not have a climate adaptation plan for the agricultural sector. The Gauteng Climate Change Adaptation Plan explicitly addresses climate change impacts in the agriculture sector. The Mogale City Municipality developed a climate change adaptation plan to complement the provincial plan.

Overall, a major drawback of all the case studies reviewed lies in the lack of (or limited) funding mechanisms and the institutional set-up to implement the climate change adaptation plans.

8. CONCLUSIONS AND RECOMMENDATIONS

Government has a crucial role to play in climate change adaptation, both in delivering adaptation strategies devised from above and coordinating bottom-up action. The Mpumalanga case study demonstrates that climate change adaptation has largely been developed within municipalities in response to local concerns rather than as a result of guidance or directives from the national level. Focusing on the local level does not in any way decrease the role of the national government. It suggests instead that national government must be much more effective at connecting with remote areas and people. In addition, the instinct to rely on local people is correct, for they have much pertinent knowledge.

Nevertheless, the policies or strategic plans reviewed in this brief are not clear on how local government should deal with climate change-related issues. This suggests that it might be useful for other functions which cut across different governmental spheres to be clearly assigned to local government. This could be specific powers for mitigation and adaptation actions. As a result, the Department of Cooperative Governance and Traditional Affairs should critically review the policy and legislation on the powers of local government with regard to climate change.

The notable absence of a strong national political agenda around climate change (and the natural environment more generally) in South Africa means that very little political or fiscal support exists for local programmes. Indeed, across the reviewed policies/strategic plans, possible sources of financing for adaptation measures in the agricultural sector are not identified. Furthermore, at the local level, there is little institutional support for

managing and acquiring financial resources in the field of climate change adaptation in the agricultural sector. More efforts are required to integrate climate change adaptation efforts as a systemic element of municipal planning and budgeting.

The current fiscal mechanisms do not provide municipalities with any incentive to integrate effective climate change responses into local government activities, and the policies do not indicate how the different government departments are assisting farmers to adapt to climate change. The National Treasury should re-examine the fiscal measures and incentives necessary for encouraging local government to drive adaptation and mitigation measures.

Government relief has helped, and is helping, farmers get through the current prolonged drought and has protected the productive capacity of the country's agricultural areas. However, a changing climate means that South Africa, as a nation, must rethink how it plans for, and responds to drought in the future. South Africa needs to better prepare for droughts to lessen impacts. Even when the current drought breaks, others will reoccur. For example, investing in more drought-resistant practices today and over time reduces the need for drought relief. Ultimately, moving the policy focus from drought relief to drought management and preparedness is recommended, while also ensuring that South Africa's agriculture emerges from this current severe and debilitating drought with its productive capacity maintained.

Government should support research institutions (such as the Agricultural Research Council) and weather stations (such as the South African Weather Service and the Institute for Soil, Climate and Water) to continue developing new crop types and making quality climate data accessible to all (particularly the most disadvatanged) farming communities. The development of more and better heat- and drought-resistant crops will help fulfill current and future food demand by enabling production in marginal areas to expand. Improvements will be critical because the country's population continues to increase, with or without climate change. The South African Government should take a bold step to establish more and better-equipped weather stations. This will lead to more accurate weather forecast and predictions and help prevent weather-related disasters through early warning and effective response/ adaptation systems. In addition, efforts need to be made towards tackling the dilapidated infrastructure in the country, such as the ARC's Agriclimatology programme.

In addition to this, understanding of the linkages between climate change, trade and industrial development considerations, currently lacking at all policy levels, should be fast-tracked. The need to understand the cumulative impact of climate change measures and the qualitative shifts and pressures on a country like South Africa is critical. Creeping protectionist measures that are not as obvious as tariff barriers, such as private labelling schemes and the greening of value chains, can ultimately have a significant impact. This is primarily important for South Africa's agricultural sector, which is already targeted by such responses. For example, South Africa's wine industry has experienced growing pressure, justified on environmental grounds, to export to the European Union in bulk as opposed to branded glass packaging. An in-depth threat analysis at sectoral level related to trade and climate change is needed, as preparation is key to dealing with the associated risks. Focus should be put on being prepared to deal with potential threats, which should essentially be factored as issues of risk. The importance of keeping track of how South Africa's trading partners respond to climate change issues, and how this could impact the economy, should not be underestimated.

Overall, despite a comprehensive policy framework, its implementation demonstrates the lack of comprehensive strategic and integrated planning for the sustainable development of South Africa's natural resources, compromising the country's economic and social growth and potentially jeopardising the sustainability of the country's natural capital. In identifying and developing South Africa's natural resources in a given region, government and other relevant stakeholders must consider the expected long-term national objectives, outcomes and return on investment from an economic, social and environmental perspective. The financial sustainability of an economic activity in a given area, the associated long-term national social (e.g. number of jobs, skills development, education opportunities, social projects) and environmental returns and the assimilative capacity of the receiving environment should all be equally considered to determine: (a) the best use of natural resources

for a given area to ensure the most sustainable long-term economic, social and environmental returns; and (b) the most suitable way to conduct such an activity to ensure the most sustainable long-term economic, social and environmental returns. It is only by clearly considering all these factors that the desired national returns will be realised. Only a strategic and integrated national perspective, i.e. not one driven by individual projects and considerations, will strategically inform and direct the sustainable development of South Africa's natural resources to avoid, or at least minimise, negative impacts (especially cumulative ones) on the environment and promote the implementation of better practices in a collaborative way while maximising economic and social returns in the long run.

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