



Better Markets, Better Lives



Contextualising Pathways to Resilience in Kenya's ASALs under the Big Four Agenda

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AUTHORS:

Robina Abuya
Joanes Atela
Joseph Muhwanga
Mohammed Said
Stephen Moiko
Fred Atieno
Simon Wagura Ndiritu
Claire Bedelian

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This report is a knowledge product by the Kenya Markets Trust (KMT) on the five-year project 'Pathways to Resilience in Semi-Arid Economies (PRISE)', giving findings arising from the research and how they can be used to contribute towards achievement of two of Kenya's Big Four Agenda; food and nutritional security and employment creation through manufacturing. The collective effort for this project has been achieved by collaboration and support from a five-year research carried out in four counties in Kenya; Laikipia, Kajiado, Narok and Makueni, being implemented by Kenya Markets Trust and coordinated by Overseas Development Institute (ODI).

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LIST OF ABBREVIATIONS:

ASAL	Arid and Semi-arid Lands
CARIAA	Collaborative Adaptive Research in Africa and Asia
CIDP	County Integrated Development Plan
CSP	County Spatial Plan
DFID	Department for International Development
GDP	Gross Domestic Product
GoK	Government of Kenya
IDRC	International Development Research Centre
IOM	International Office for Migrations
IPCC	Intergovernmental Panel on Climate Change
JJAS	June – July – August - September
KMT	Kenya Markets Trust
KNBS	Kenya National Bureau of Statistics
KSh	Kenya Shillings
MAM	March – April – May
MSMEs	Micro, small and medium size enterprises
MT	Metric Tonnes
NAPs	National Adaptation Plans
NCCAP	National Climate Change Adaptation Plan
ODI	Overseas Development Institute
OND	October – November – December
PAMACC	Pan African Media Alliance for Climate Change
PRISE	Pathways to Resilience in Semi-arid Economies
RCP	Representative Concentration Pathways
SAL	Semi-arid Lands
UK	United Kingdom
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VC-ARID	Value Chain Analysis for Resilience In Drylands

LIST OF FIGURES:

Figure 1:	The importance of livestock and pastoralism to the Kenya economy	Page 4
Figure 2:	Temperature changes in Kenya ASAL counties from 1960–2014	Page 8
Figure 3:	Projected rainfall changes in Kenya by: a) 2030s and b) 2050s for the 4 seasons – annual, MAM (March–April–May), JJAS (June–July–August–September), and OND (October–November–December).	Page 9
Figure 4:	Projected maximum temperature changes in Kenya by: a) 2030s and b) 2050s for the 4 seasons – annual, MAM (March–April–May), JJAS (June–July–August–September), and OND (October– November–December).	Page 10
Figure 5:	Livestock population trends in the 21 ASAL counties 1977 – 2016	Page 11
Figure 6:	Project impacts of temperature changes on livestock range in the ASALs of Kenya	Page 12
Figure 7:	Summary of historical changes in climate, livestock population and projected impacts both socially and economically.	Page 13
Figure 8:	Enabling framework for climate compatible Big Four Agenda in the ASALs	Page 14
Figure 9:	Population dynamics in the ASAL counties between 1962 and 2009	Page 23

LIST OF TABLES:

Table 1:	Projected maximum temperatures changes (°C) in the Kenya arid and semi-arid lands in 2030s, 2050s and 2070s	Page 10
Table 2:	Summary of recommendations from PRISE research findings to achieve food and nutrition security by promoting livestock value chain	Page 18
Table 3:	Summary of recommendations from the PRISE research to achieve employment creation through manufacturing in a changing climate in the ASALs, by promoting the livestock value chain	Page 20

EXECUTIVE SUMMARY

According to Kenya's Vision 2030 Development Strategy for Northern Kenya and Other Arid Lands, approximately 89% of the country's land area is arid and semi-arid (Republic of Kenya, 2012). These arid and semi-arid lands (ASALs) are home to more than 60% of the total livestock in Kenya, and produce over 50% of the meat consumed countrywide (KNBS, 2010). They also host about 38% of the country's population and continue to experience a boom in population as large numbers of people move to these areas in pursuit of emerging economic opportunities. Kenya recently re-focused its development targets into four key areas that are critical not only for economic growth, but also for social and environmental progress – dubbed the Big Four Agenda. The Big Four Agenda are: affordable and decent housing; affordable healthcare; food and nutrition security; and employment creation through manufacturing. This brief synthesizes insights from the five-year multi-county research project 'Pathways to Resilience in Semi-Arid Economies' (PRISE) using climate change research in four counties of Kenya (Makueni, Narok, Kajiado and Laikipia) and focusing on four thematic areas (beef value chain, private sector investment, migration and land tenure management). The brief examines climate change impacts in ASALs, and how these impacts threaten the realization of food and nutrition security and employment creation through manufacturing in ASALs. It also discusses options to enhance the contribution of the semi-arid economies to the realization of these two of the Big Four Agenda.

Arid and semi-arid lands are climate change hotspots, where climate change is already having significant and documented impacts, such as longer and more frequent droughts and unreliable rainfall. This threatens the opportunities for realizing the Big Four Agenda objectives. Findings from PRISE research indicate that there has been a general decline in rainfall in more than half of ASALs counties of Kenya. Climatic projections based on all the three Representative Concentration Pathways (RCPs) 2.6, 4.5 and 8.5 also show that, the short rainy season of October-November-December will become more reliable compared to the main rainy season of March-April-May. The decline in rainfall and changes in temperature, have led to a 26.5% decrease in the number of livestock in the last few years. Evidence from PRISE research provides some options that could enable climate compatible interventions under the Big Four Agenda.

PRISE research indicates that actions to upgrade the livestock chain can also be climate compatible. Investments in the livestock value chain offer opportunities for growth and transformation of the livestock sector, while reducing current or future climate risk. For example, hay production and storage allow for fodder storage and stocking for use during critical dry periods. Initiatives such as, fattening livestock on privately-owned ranches and diversification of value addition provides an opportunity for enhancing the climate compatible pastoral system and linking pastoralists to high-end markets. Diversification of the value-chains into the tourism sector enable access to wildlife conservancies for dry season grazing, while providing population employment and other forms of additional income associated with tourism (Bedelian et. al., in review; Ndiritu et. al., in review).

The Micro, Small and Medium Enterprises (MSMEs) in ASALs account for about 80% of the total employment and provide livelihood opportunities in Sub-Saharan Africa. PRISE research in ASAL counties shows that the counties host a diversity of enterprises including agricultural production and beef and milk co-operatives as well as cottage industries run by both men and women (Atela et.al, 2018). However, these MSMEs face severe impacts of climate change and at the same time have very low adaptive capacity. In their efforts to adapt to climate change, MSMEs in ASALs encounter a range of barriers such as high levels of poverty, dispersed and rurally located populations, high levels of informality, weak institutional arrangements, discriminatory tenure regimes and poorly developed infrastructure (Gannon et.al., 2018). These challenges provide avenues through which the government and relevant agencies can intervene to support effective micro-enterprise development. Options such as availing financial options for micro-enterprises especially the cottage industries in ASAL counties could increase employment creation. The pastoral communities in ASALs are engaged in cyclical migration patterns in and between counties in search of pasture and water. Therefore, seasonal mobility forms a critical element

of their livelihood (IOM, 2010; Frouws, 2015; World Bank, 2015a). With climate change impacts, the rural communities are increasingly facing many challenges including increasing competition and conflicts over the scarce natural resources, which in many cases threaten their mobile lifestyles (DFID, 2014; Schrepfer and Caterina, 2014; UNDP, 2015). The PRISE study concluded that the ASALs which are more prone to frequent and prolonged droughts experience more internal migration within and between counties in comparison to out of the country, as a way of coping with climate change and variability. Migration thus requires not only physical mobility but also economic and social capacities. In addition to pastoral migration, semi-arid lands have become frontiers where people are moving in from the high potential areas. There is need for more strategic management of migration into the ASALs to minimize negative impacts and exploit beneficial opportunities of such migrations. Harnessing and providing opportunities for the immigrant skills to promote climate compatible innovations and enterprises could promote job creation. Initiatives such as strengthening local institutions, building capacity of rural communities and integrating mobility into land management systems are options that could contribute to better management of migration in ASALs.

Land tenure forms (communal or individual) determine the options communities pursue in climate change adaptation and land use investment including livestock value addition. Findings from PRISE show that Kenyan ASAL counties have witnessed rapid land tenure transition from communal to more privatized regimes (Moiko et.al., 2018). This tenure transition has been driven by a number of factors including land tenure reforms, and market and demographic changes. Population pressure is also creating more consciousness around land in the ASALs and this is translating into emerging tensions around ownership and use. Options such as integrated land management can help take into account both pastoralists' needs, as well as emerging forms of more intensified livestock investments by establishing land use zones that allow both free movements of large herds as well as livestock intensification under private land tenure. Land zoning can be facilitated through appropriate enabling policies and spatial planning processes. Such integrated frameworks should provide security to pastoralists and enable them to negotiate for various financial, livelihood and technological opportunities in light of climatic shocks and changing tenure regimes.

KEY MESSAGES

PATHWAYS TO RESILIENCE IN SEMI-ARID ECONOMIES (PRISE) FINDINGS IN KENYA

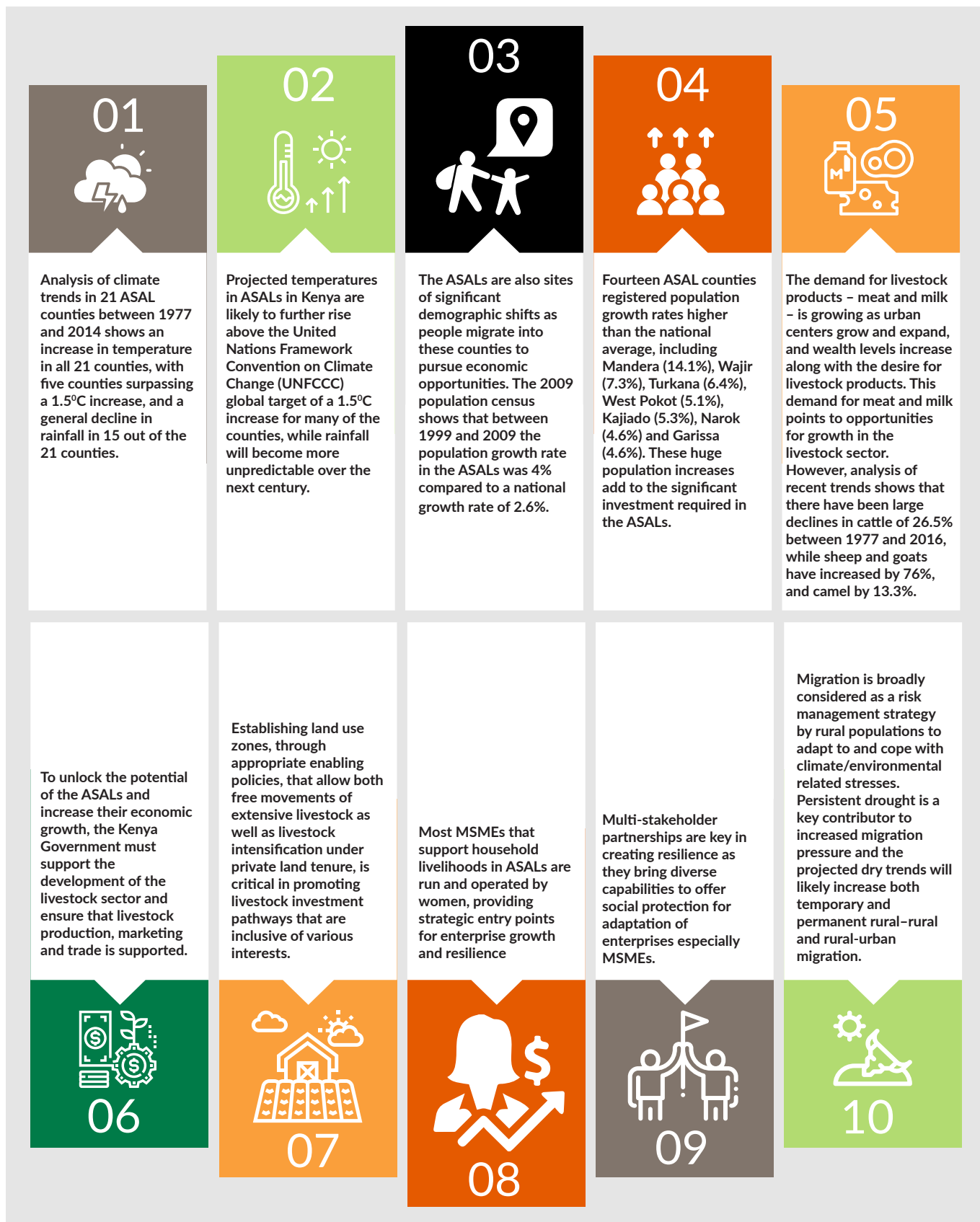


TABLE OF CONTENT

IV	EXECUTIVE SUMMARY
VI	KEY MESSAGES
VII	TABLE OF CONTENT

1

INTRODUCTION – THE PRISE INITIATIVE AND THE CONTEXT OF THE BIG FOUR AGENDA

Page 2	BACKGROUND
Page 4	ARID AND SEMI-ARID LANDS – AN OPPORTUNITY FOR TWO OF KENYA'S BIG FOUR AGENDA

2

CLIMATE CHANGE IMPACTS ON ARID AND SEMI-ARID LANDS – A MAJOR THREAT TO THE BIG FOUR AGENDA

Page 8	HISTORICAL AND PROJECTED CLIMATIC CHANGES ON 21 ASAL COUNTIES
Page 11	IMPACTS OF EXTREME CLIMATE CHANGE
Page 12	PROJECTED POTENTIAL IMPACTS OF CLIMATE ON LIVESTOCK IN THE ASALS
Page 13	POTENTIAL ECONOMIC AND SOCIAL IMPACTS OF CLIMATE CHANGE ON CATTLE AND PEOPLE

3

PROMOTING A CLIMATE COMPATIBLE BIG FOUR AGENDA

Page 16	CLIMATE COMPATIBLE BIG FOUR
Page 17	PROMOTING THE LIVESTOCK VALUE CHAIN
Page 21	PROMOTING RESILIENT AND INCLUSIVE ENTERPRISES (ESPECIALLY MSMEs)
Page 23	LAND TENURE MANAGEMENT

4

CONCLUSION AND RECOMMENDATIONS

Page 25	CONCLUSION AND RECOMMENDATIONS
Page 28	REFERENCES
Page 29	ANNEX I: PRISE PROJECT RESEARCH AREAS



1 INTRODUCTION

The PRISE initiative and the context of the Big Four Agenda

1.1. BACKGROUND

Arid and semi-arid lands (ASALs) are characterized as areas with 150mm to 550mm of rainfall annually and often very high temperatures throughout the year. Semi-arid lands (SALs) by contrast, are characterized with rainfall ranges of between 550mm and 850mm annually, often with shallow and infertile but variable soils (GoK, 2015b). These areas have high seasonality and annual variability in climatic parameters especially rainfall and temperatures with high rates of evapotranspiration. They are typical of steppe, dry savannas and tropical scrublands with scattered grazing lands. Globally, more than 1 billion people live in semi-arid lands and even more in the larger arid lands.

Arid and semi-arid lands are climate change hotspots (IPCC, 2007), where climate change is already having significant and documented impacts, such as longer and more frequent droughts and unreliable rainfall, what has been described as the 'triple whammy' of semi-arid regions (Mountfort, 2015). This high exposure to climate risk is coupled with lack of development, including poor infrastructure, poor access to markets, and high levels of poverty (De Souza et al., 2015). Challenges within the ASALs which are further exacerbated by climate change include food insecurity, limited diversified livelihood resources such as land, continued population increase, low economic and infrastructural development, limited access to markets, low productivity, water shortages and limited incentives for private sector investment.

Kenya's semi-arid lands are home to more than 60% of the total livestock in Kenya, producing over 50% of meat consumed countrywide (KNBS, 2010). According to the Vision 2030 Development Strategy for Northern Kenya and Other Arid Lands – almost 90% of the land is classified as arid or semi-arid and is likely to expand with continued climatic changes (Republic of Kenya, 2012). These ecosystems host about 38% of the country's population and continue to experience a boom in population as large numbers of people move to these areas in pursuit of emerging economic opportunities. For instance, semi-arid counties in Kenya have experienced an increase in population that is relatively higher compared

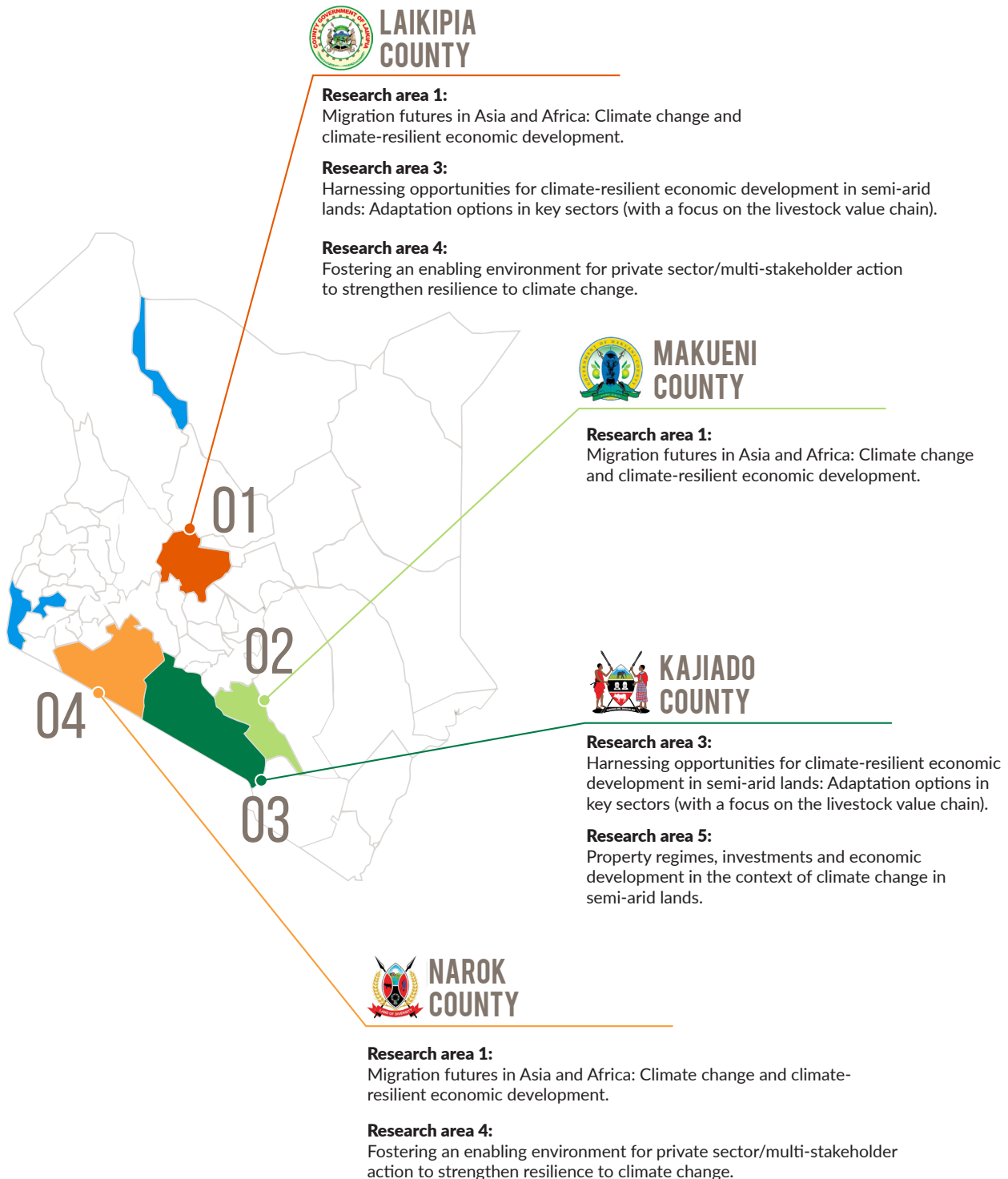
to the national average, that is above 4% (Said et. al., 2018) as compared to the national average of 2.5% (World Bank, 2018).

Kenya recently re-focused its development targets into four key areas that are critical not only for economic growth, but also for social and environmental progress, of the country. The development targets – dubbed The Big Four Agenda – were launched on 2nd December 2017 by President Uhuru Kenyatta. The Agenda focuses on key basic needs critical in uplifting the standards of living of Kenyans on the path to becoming an upper middle-income country by 2030. These include: affordable and decent housing; affordable healthcare; food and nutrition security; and employment creation through manufacturing. These four areas are expected to bolster strong inclusive economic growth. Moreover, these key areas are expected to guide national development efforts, strategies and actions during the 2018–2022 period.

As a contribution to the realization of Kenya's policy pursuits under Vision 2030 and the Big Four Agenda, this report synthesizes insights from a research project 'Pathways to Resilience in Semi-Arid Economies' (PRISE). PRISE is a five-year, interdisciplinary multi-country research project that generates new knowledge about how economic development in semi-arid regions can be made more equitable and resilient to climate change. PRISE aims to strengthen the commitment of decision-makers in local and national governments, businesses, and trade bodies to rapid, inclusive and resilient development in these regions. It does so by deepening their understanding of the threats and opportunities that semi-arid economies face in relation to climate change. The PRISE consortium comprises the Kenya Markets Trust; Overseas Development Institute (lead), UK; Grantham Research Institute on Climate Change and Environment, UK; Innovation Environnement Développement en Afrique (IED), Senegal; and the Sustainable Development Policy Institute (SDPI), Pakistan. Country research partners include: Regional Environmental Centre for Central Asia, Tajikistan; University of Ouagadougou, Burkina Faso; and the University of Central Asia, Kyrgyzstan.

The PRISE project in Kenya identified four semi-arid counties where the research was carried out. Four of PRISE's seven research areas (Annex I) were implemented. This report links the evidence that emerged to two of the

Big Four Agenda, namely: food and nutrition security; and employment creation through manufacturing. This report also suggests four pathways on how these can be achieved in a climatically vulnerable ecosystem.



1.2. ARID AND SEMI-ARID LANDS – AN OPPORTUNITY FOR TWO OF KENYA’S BIG FOUR AGENDA

Arid and semi-arid lands in Kenya are increasingly becoming key livelihood and economic zones that drive the country’s development agenda in line with Vision 2030 and more specifically the Big Four Agenda. Kenyan ASALs contribute to employment creation – one of the Big Four Agenda objectives – in several ways. First, the livestock sector, which is a predominant activity through pastoralism, employs 50% of the agricultural workforce (Figure 1), providing a substantial source of income and livelihood to over 10 million Kenyans living in the ASALs (Kenya Climate Smart Agriculture Strategy, 2017–2026). Second, the sector contributes to manufacturing by providing various raw materials.

The leather industry alone is projected to earn the country US\$ 146.8 million per year, and it employs 14,000 people in the formal sector during peak seasons, with more numbers in the informal businesses (World Bank, 2015). Overall, the livestock sector, which is based predominantly in the ASALs, contributes 12% of the national GDP (approximately US\$ 4 billion annually) and 43% of the agricultural GDP (Behnke and Muthami, 2011). These figures suggest that semi-arid lands are going to be the next frontiers of labour movement as people and livestock migrate, and provide skill sets and capacities critical for capital accumulation, innovation and enterprise-setting in these areas.

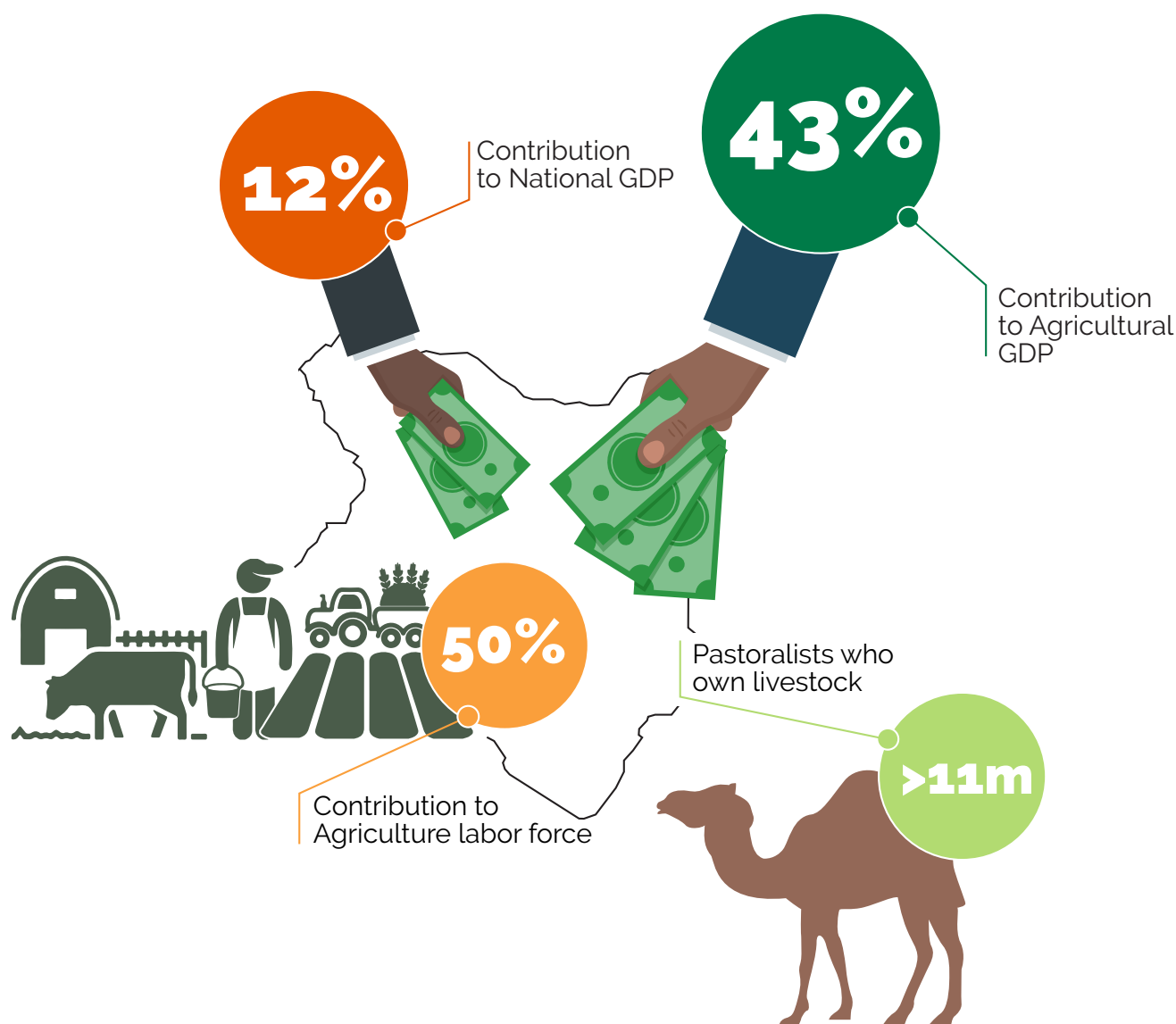


Figure 1: The importance of livestock and pastoralism to the Kenya economy.

Source: KMT

Third, semi-arid lands in Kenya provide unique contexts for the emergence of economic opportunities. As the humid and semi-humid areas reach their carrying and productive capacity, these areas are increasingly being targeted by various investors who are attracted by the extensive resource base such as land and labour that are relatively abundant and could reduce the costs of investment compared to other contexts. These investments are being fueled by recent discoveries of commercial products such as oil in Turkana, natural gas in Lamu, coal in Mui Basin, and government-led mega projects such as the Isiolo dam, Isiolo airport, LAPPSET corridor and the recently completed Isiolo–Marsabit–Moyale road.

Arid and semi-arid lands also contribute to food and nutrition security through the supply of beef, milk and other livestock products, which are consumed by a majority of Kenyans. These areas provide the main contexts and resources supportive to livestock investment including the rangelands and ranches that support livestock practices and investments at small, medium and large scales. Despite the current economic value of ASALs, Kenya still experiences deficits in most of the products and services. The meat deficit, for example, has to be met through imports from Tanzania, Ethiopia, Somalia and to some extent South Sudan (Aklilu 2009; KMT, 2014). This means that there still are high unmet domestic market demands and economic opportunities for products and services which will also help achieve the food and nutritional security of the people. To achieve this, there is a need for targeted policies, investments and actions that tackle major threats in order to unlock their potential for the Big Four Agenda objectives.

Furthermore, tourism is a key activity in ASALs and a major source of revenue for Kenya. About 92% of the country’s protected areas (including national parks and wildlife conservancies) that steer tourism investments are located in the ASALs (Republic of Kenya, 2018). Tourism contributes close to 10% of the national GDP which is a key component for financing the Big Four Agenda whilst also supporting and marketing opportunities for small to medium enterprises and local manufacturing entities such as cottage industries (Republic of Kenya, National Wildlife Strategy 2030, 2018). Investment in the ASALs could contribute to further development of the tourism industry with corresponding increases in job opportunities in the sector.

From the foregoing it is apparent that Kenya’s arid

and semi-arid areas are critical for the future of the economy and the region holds large socio-economic growth potential. Despite this opportunity, climate change is increasingly becoming a threat to these areas, particularly in relation to food security and manufacturing prospects by directly affecting the livestock sector and pastoralism. Furthermore, many investments, environment and businesses in these areas – as in the high potential areas – are increasingly at risk of climatic change and climate variability.

Therefore, this synthesis report examines climate change impacts, using research findings in four counties of Kenya (Makueni, Narok, Kajiado and Laikipia) and four thematic areas (beef value chain, private sector investment – MSMEs, migration as an adaptation strategy and land tenure system changes), and how these impacts threaten the realization of two of the Big Four Agenda in ASALs. The paper also discusses options to enhancing the contribution of the semi-arid economies to the realization of the Big Four Agenda.



Mr. Albert Kimetu the owner of Alkim farmers centre assists a buyer to load animal feed onto his motor-bike.

“Enterprises employ more than 50% of ASAL inhabitants and are critical for the realization of food and nutrition security and creation of employment.”





2 CLIMATE CHANGE IMPACTS ON ARID AND SEMI-ARID LANDS

A major threat to the Big Four Agenda

2.1. HISTORICAL AND PROJECTED CLIMATIC CHANGES ON 21 ASAL COUNTIES

Findings from PRISE research indicate that there has been a general decline in rainfall in 15 out of the 21 ASAL counties of Kenya¹ (except Narok, Baringo, Laikipia, Turkana, West Pokot and Elgeyo Marakwet). Similarly, the average temperature in all the 21 ASAL counties has increased during the 1960 to 2014 period (Ogutu et al., 2016). Five counties that have surpassed the 1.5°C increase are: Laikipia

(1.59°C), Narok (1.75°C), Turkana and Baringo (1.8°C), and West Pokot and Elgeyo Marakwet (1.91°C) (Said et al., 2018) (Figure 2). Discussions with residents of these counties, reveal that most pastoralists continue to experience severe decline and more unpredictable rains alongside changing temperatures.

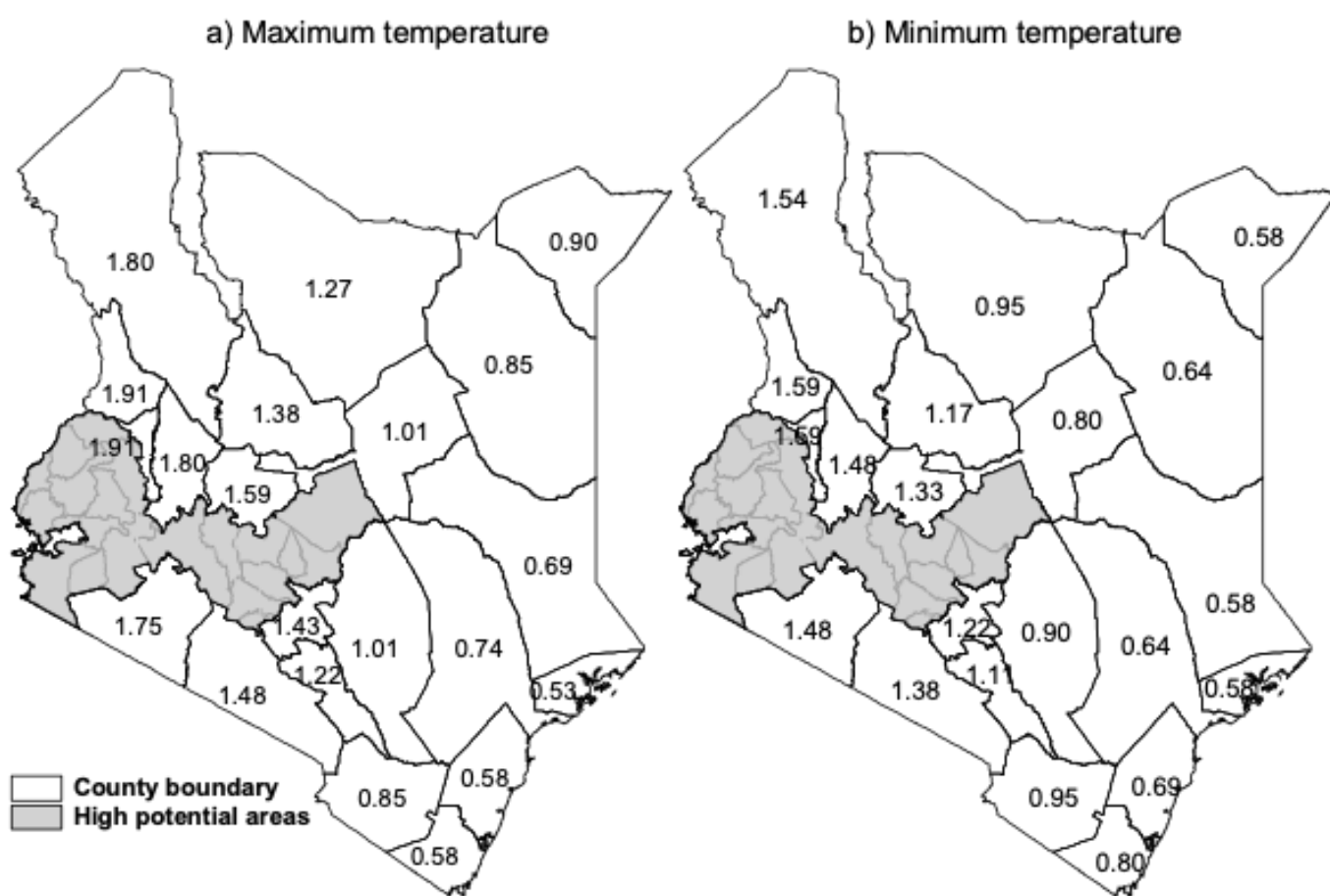


Figure 2: Temperature changes in Kenya ASAL counties from 1960–2014

¹The 21 ASAL study counties: Baringo; Elgeyo Marakwet; Garissa; Isiolo; Kajiado; Kilifi; Kitui; Kwale; Lamu; Laikipia; Machakos; Makeni; Mandera; Marsabit; Narok; Samburu; Taita Taveta; Tana River; Turkana; Wajir and West Pokot.

PRISE research findings on climate projections based on three Representative Concentration Pathways (RCPs)² 2.6, 4.5 and 8.5³ show that, the short rainy season of October–November–December (OND) will become more and reliable compared to the main rainfall season

of March–April–May (MAM), suggesting a switch in the current intensity, onset and cessation of rainfall periods. The June–July–August–September (JJAS) period will get drier (Figure 3).

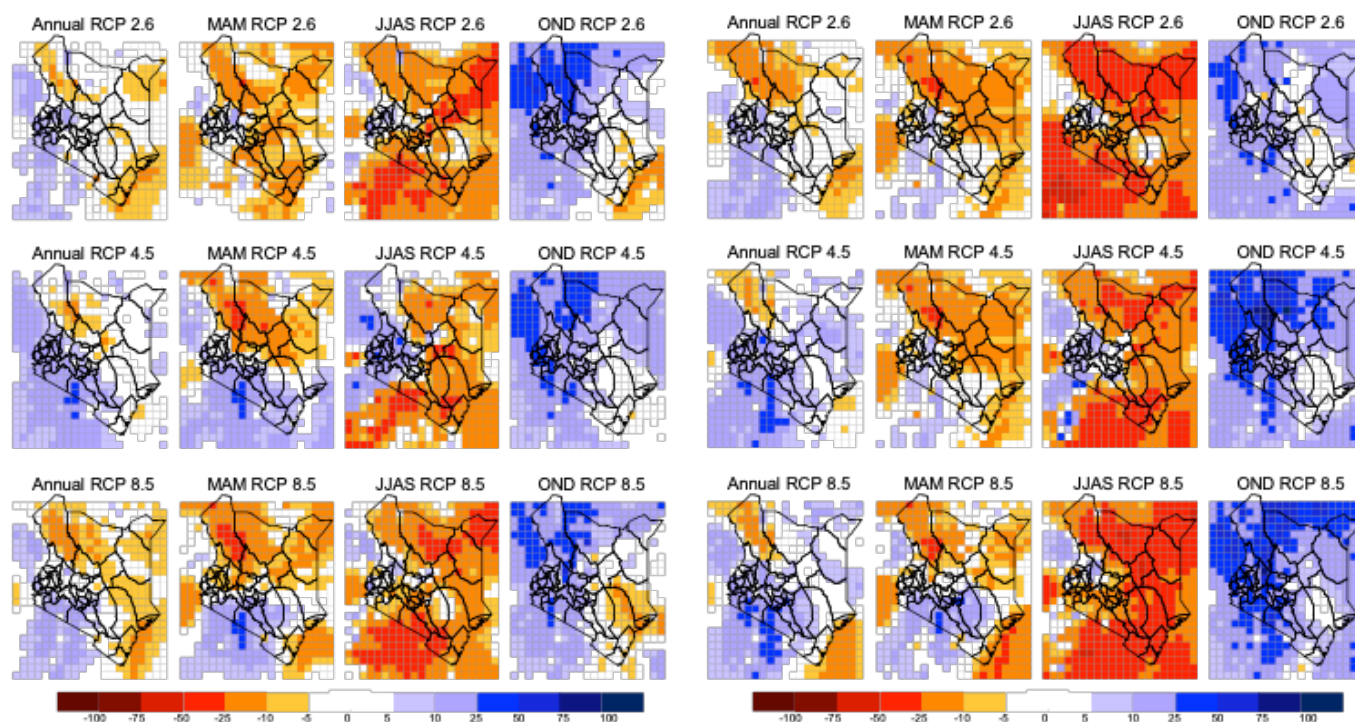


Figure 3: Projected rainfall changes in Kenya by: a) 2030s and b) 2050s for the 4 seasons – annual, MAM (March–April–May), JJAS (June–July–August–September), and OND (October–November–December). Source: Said et al., in review

The potential impacts of temperature changes on livestock in this report focused on RCP 4.5. For RCP 4.5, by 2030, 16 counties will have maximum temperatures increases greater than 1°C. By 2050, in 17 counties the temperature would have increased by more than 1.5°C and

by 2070, in all counties, temperature increases are expected to exceed 1.5°C, and in the counties of Wajir, West Pokot and Tana River, temperature increases will exceed 2°C (Figure 4, Table 1).

²RCPs are scenarios that include time series of emissions and concentrations of all greenhouse gases. Scenarios describe plausible trajectories of different aspects of the future that are constructed to investigate the potential consequences of anthropogenic climate change.

³RCP 2.6 represents low emission scenarios, RCP 4.5 represents medium range and RCP 8.5 represents high range emission scenarios.

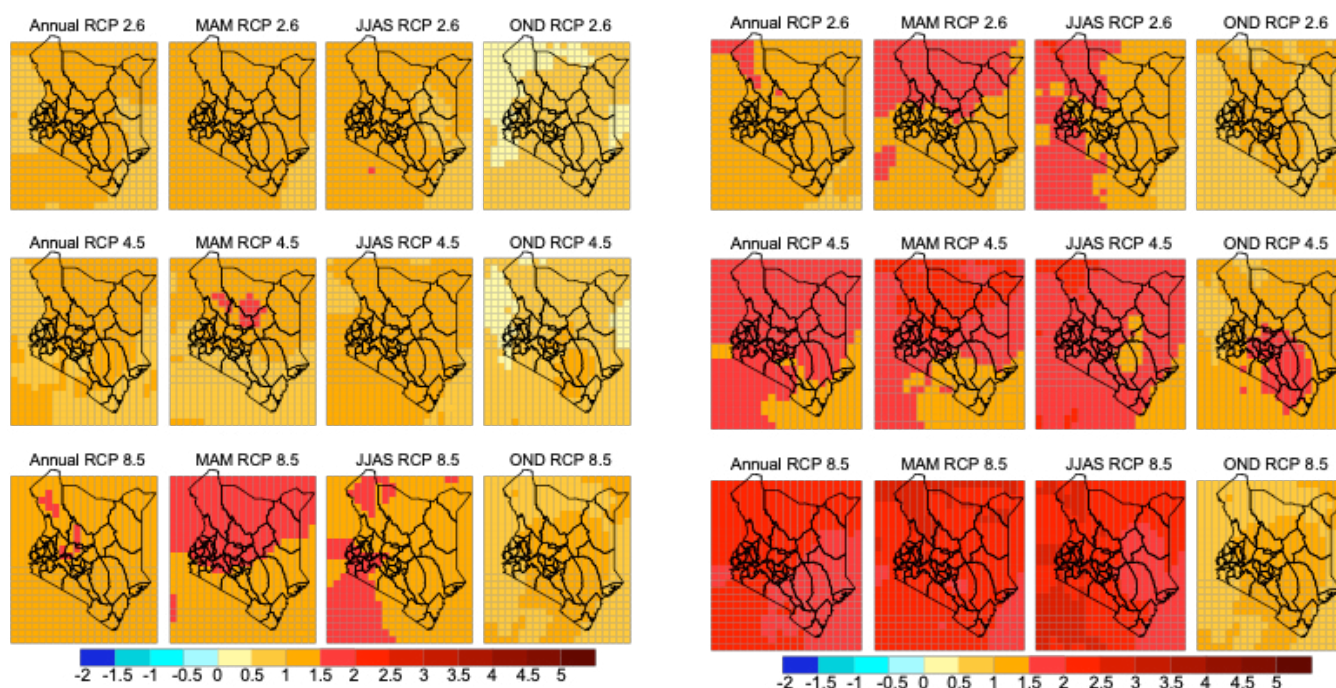


Figure 4: Projected maximum temperature changes in Kenya by: a) 2030s and b) 2050s for the 4 seasons – annual, MAM (March–April–May), JJAS (June–July–August–September), and OND (October– November–December). Source: Said et al., in review

Table 1: Projected maximum temperatures changes (°C) in the Kenya arid and semi-arid lands in 2030s, 2050s and 2070s

	RCP 2.6			RCP 4.5			RCP 8.5		
	2030s	2050s	2070s	2030s	2050s	2070s	2030s	2050s	2070s
No. of cases	21	21	21	21	21	21	21	21	21
Minimum	0.86	1.03	0.82	0.90	1.39	1.59	1.11	1.75	2.62
Maximum	1.16	1.50	1.37	1.22	1.84	2.07	1.51	2.28	3.43
Mean	1.06	1.26	1.10	1.06	1.62	1.84	1.35	2.04	3.07
Standard Dev	0.07	0.14	0.17	0.09	0.15	0.15	0.11	0.17	0.26

2.2. IMPACTS OF EXTREME CLIMATE CHANGE

The actual and potential role of ASALs in driving Kenya's national economic growth and key facets of the Big Four Agenda and Kenya's vision 2030 faces multiple challenges from the effects of climate change. The impact of climate change in ASALs is further complicated by a variety of other factors such as population expansion and competition for available resources such as land.

For instance, the decline in rainfall and changes in temperature, have led to a decrease in the number of livestock in the last few years (Figure 5). More frequent droughts continue to affect available livestock feeds, whilst increases in

temperature limit livestock productivity, feed intake, reproduction and performance across the range of livestock species. An increase in animal pests and diseases as well as the emergence of invasive species have also been reported. Invasive species such as *Prosopis juliflora* have specifically been reported to outgrow the common (adapted) pasture thus affecting the availability, quantity and quality of available feeds.

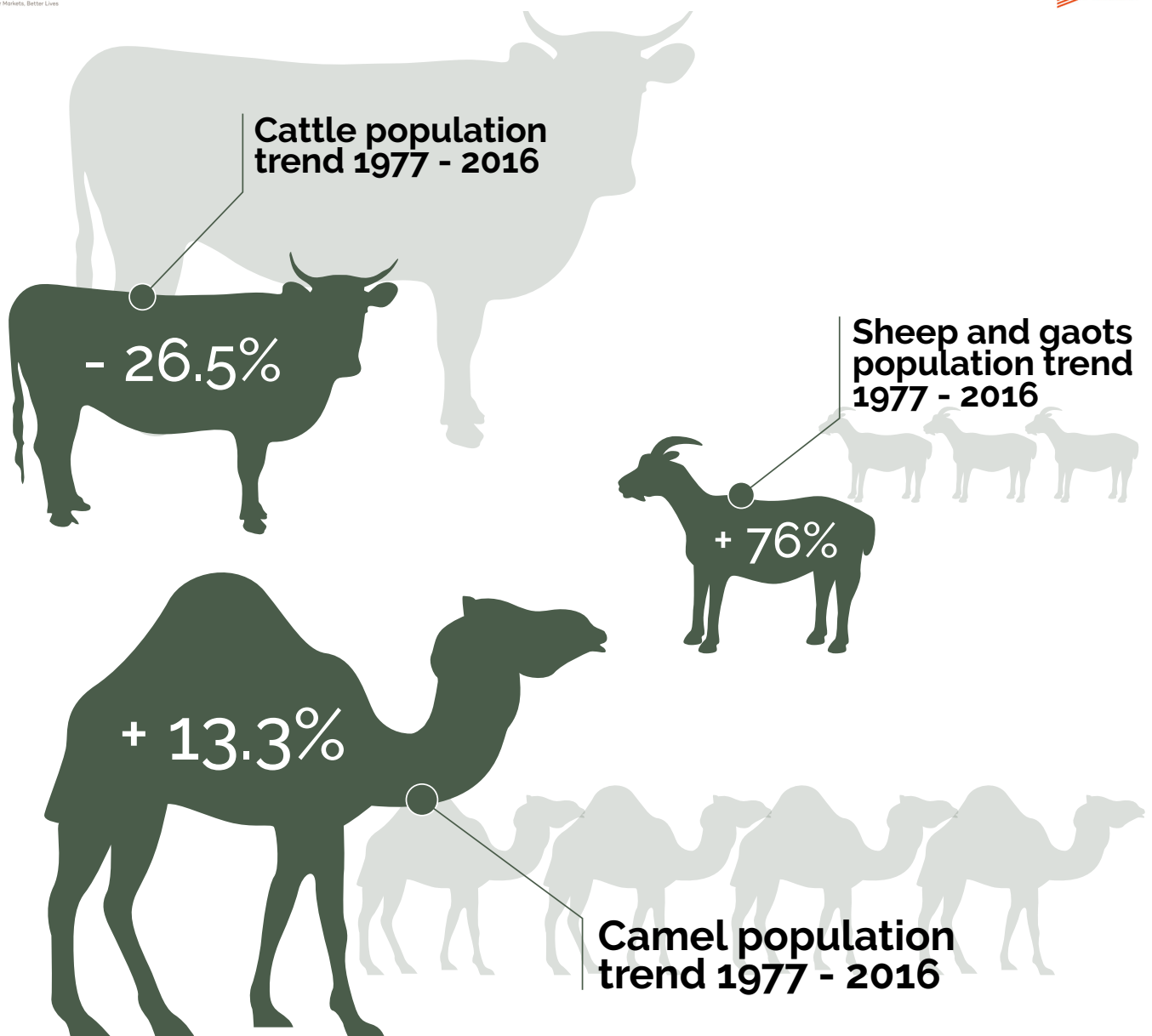


Figure 5 Livestock population trends in the 21 ASAL counties 1977 - 2016
Source: Ogutu et al., 2016.

2.3. PROJECTED POTENTIAL IMPACTS OF CLIMATE ON LIVESTOCK IN THE ASALS

The RCP 4.5 2030s scenario projects that 7 out of 21 counties will have over 50% of their cattle range experience temperatures above 30°C. It is projected that this will result in lower cattle production per unit area. These counties include Garissa, Tana River, Wajir, Mandera, Isiolo, Turkana and Marsabit. Another five counties will have their cattle range moderately impacted, and these are Baringo, Samburu, Kitui, Elgeyo Marakwet and West Pokot. The counties of Lamu, Kajiado, Kilifi, Makueni, Kwale, Taita Taveta, Narok, and Laikipia will be affected minimally (Figure 6a). Twelve out of the 21 counties will have their sheep and

goat ranges affected by temperatures above the 30°C threshold. The counties that will be least affected by these temperature changes are Kajiado, Machakos, Laikipia and Narok (Figure 6b). Thirteen out of 21 counties have a high potential of rearing camel. These are the counties of Kitui, Baringo, West Pokot, Marsabit, Mandera, Tana River, Wajir, Garissa, Taita Taveta, Isiolo, Turkana, Samburu and Makueni (Figure 6c). However, camel rearing is currently not practiced in some of these counties (Makueni and Taita Taveta), but present an adaptation opportunity for the future.



Wajir Agrovet proprietor; Mr. Ugas Sharif examining a sheep for treatment

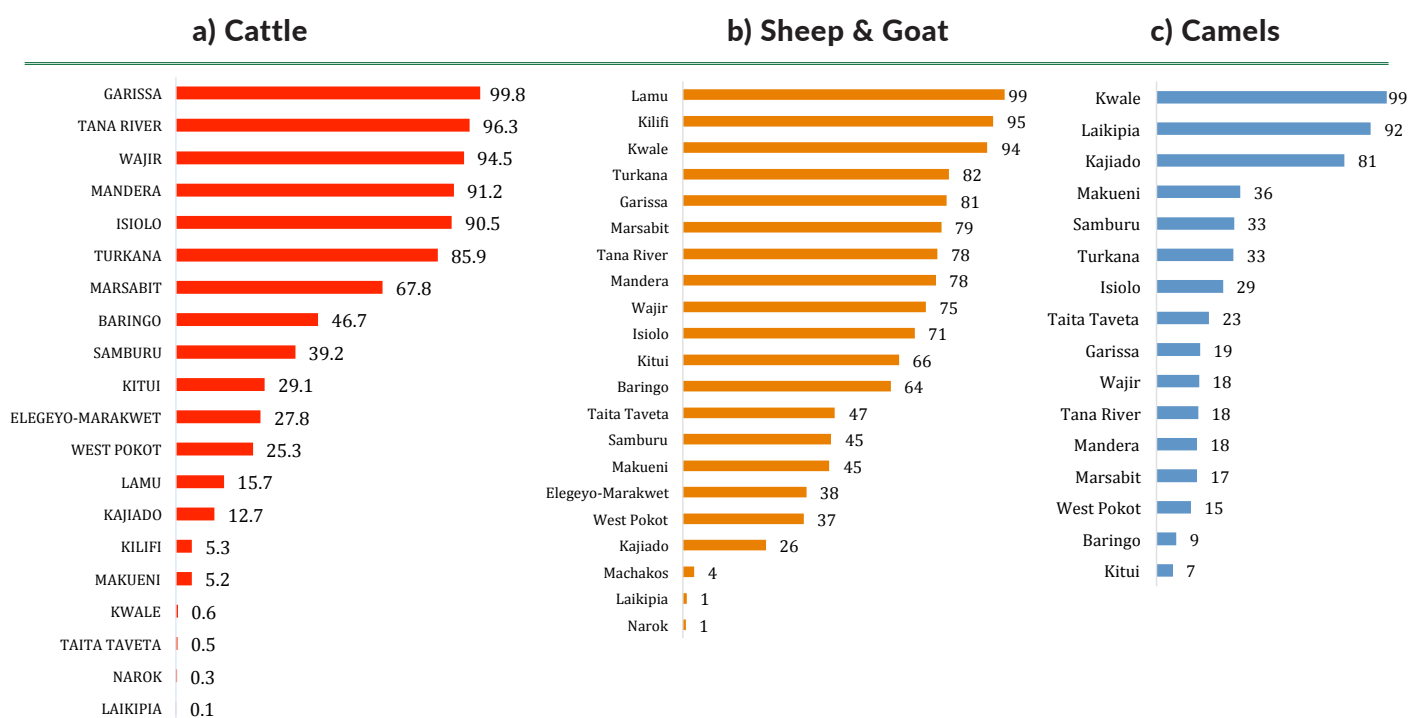


Figure 6: Project impacts of temperature changes on livestock range in the ASALs of Kenya

2.4. POTENTIAL ECONOMIC AND SOCIAL IMPACTS OF CLIMATE CHANGE ON CATTLE AND PEOPLE

Coupled with land tenure changes, especially the privatization of group ranches, impacts of climate change are getting more pronounced and complex. Continuous transition towards land privatization and the establishment of enclosures and fences on communal ranches inhibits livestock movement and access to grazing and water resources. Discussions with residents of semi-arid counties further indicate

that these climatic changes require pastoralists to travel long distances through cities and sometimes across highways and railway lines in search of pasture. This has increased livestock losses through death, injuries and disappearance. Under these circumstances, livestock owners are forced to sell their livestock at less than half the market price to avoid complete loss of income and capital. Climatic

risks are further exacerbated by population increase, either through immigration or through natural birth processes which exert increasing pressure on available resources such as land and related adaptation options.

The overall effects of climate change are manifested in reduced food and nutritional supply due to reduced beef and milk production, and also weakening the manufacturing sector dependent on livestock-based raw materials such as skins and hides. The costs due to reduced cattle productivity and the potential cattle losses are likely to be significant. For example, using average price estimates for cattle in semi-arid lands of between KSh 20,000 (approximately US\$ 200) to KSh 40,000 (approximately US\$ 400) per animal, it is estimated that 1.7 million cattle will

be lost resulting in a loss of between 34 and 68 billion Kenyan shillings (US\$ 340 to 680 million), if the temperatures in cattle range areas exceed 30°C for an extended period. Up to 1.4 million pastoralists will be adversely affected by the year 2030.

Taking a population growth rate of 3.4% as based on the average increase in the population of the ASALs between 1962 and 2009 (KNBS 2010; Said et al., 2017), it is projected that by 2030, 13.4 million livestock keepers will be affected by maximum temperatures above 30°C (Figure 7). The counties where the largest numbers of people are projected to be affected are Kilifi, Mandera, Turkana, Wajir, Kwale, Garissa and Kitui. Figure 7 summarizes the potential impacts of projected temperature changes on cattle.



Goats getting into a slaughterhouse.

“Between KSh 34 and 64 billion will be lost if temperatures in cattle range areas exceed 30°C.”

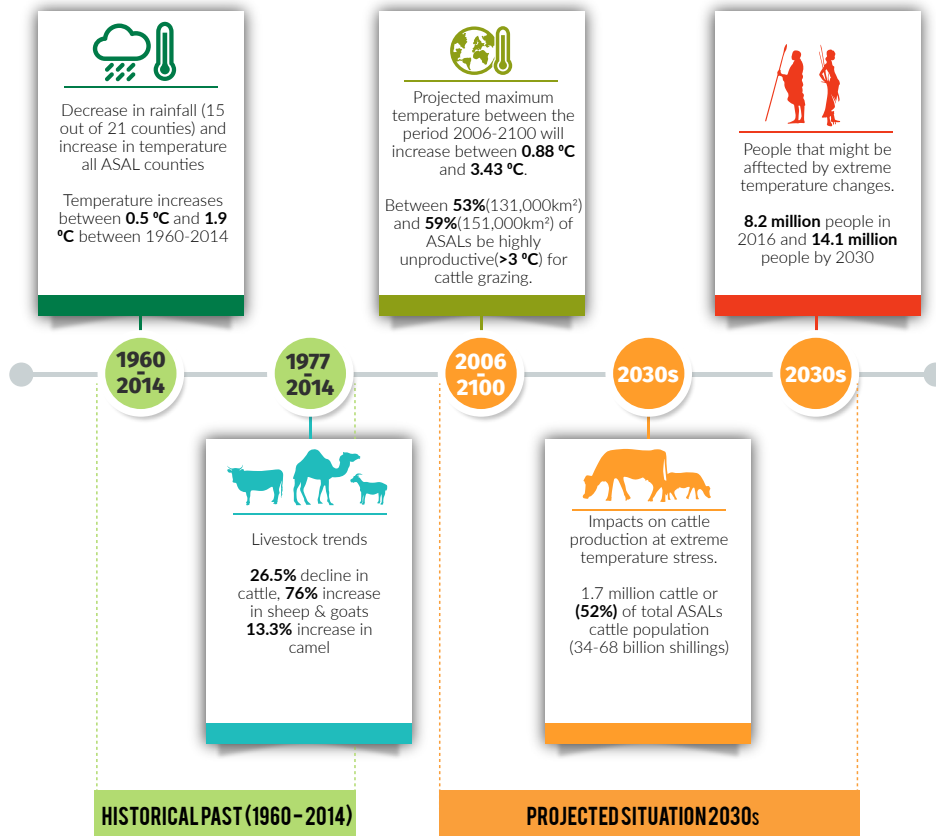


Figure 7: Summary of historical changes in climate, livestock population and projected impacts both socially and economically. Source: Said et al., in review)



3 PROMOTING A CLIMATE COMPATIBLE BIG FOUR AGENDA

1 Manufacturing 

3 Universal Health Coverage 

2 Affordable Housing 

4 Food Security 

The previous sections indicate that climate change remains the biggest threat to the sustainability of the Big Four Agenda's prospects in ASALs. As such, promoting climate compatible interventions is key in ensuring that actions initiated under the Big Four Agenda not only withstand the impacts of climate change but also take advantage of the various opportunities presented by climate change. 'Climate compatible' in this regard implies that interventions and investments, if enhanced, can help to achieve and sustain the Big Four Agenda while being resilient to the impacts of climate change.

Evidence drawn from PRISE research provides options that could enable climate compatible interventions under the Big Four Agenda and the broader Kenya Vision 2030. The climate

compatible options comprise four interlinked pathways to resilience in ASALs. They include: promoting the livestock value chain, managing livestock and human migration, promoting resilient enterprises, and the development of integrated land tenure frameworks. The four pathways define the social, economic and environmental dynamics in ASALs that in turn influence opportunities for promoting food security and economic transition in a climate compatible manner (Figure 8).

This section discusses the four pathways and investment and policy recommendations for each pathway that could contribute to the realization of food and nutrition security and employment creation in the ASALs.

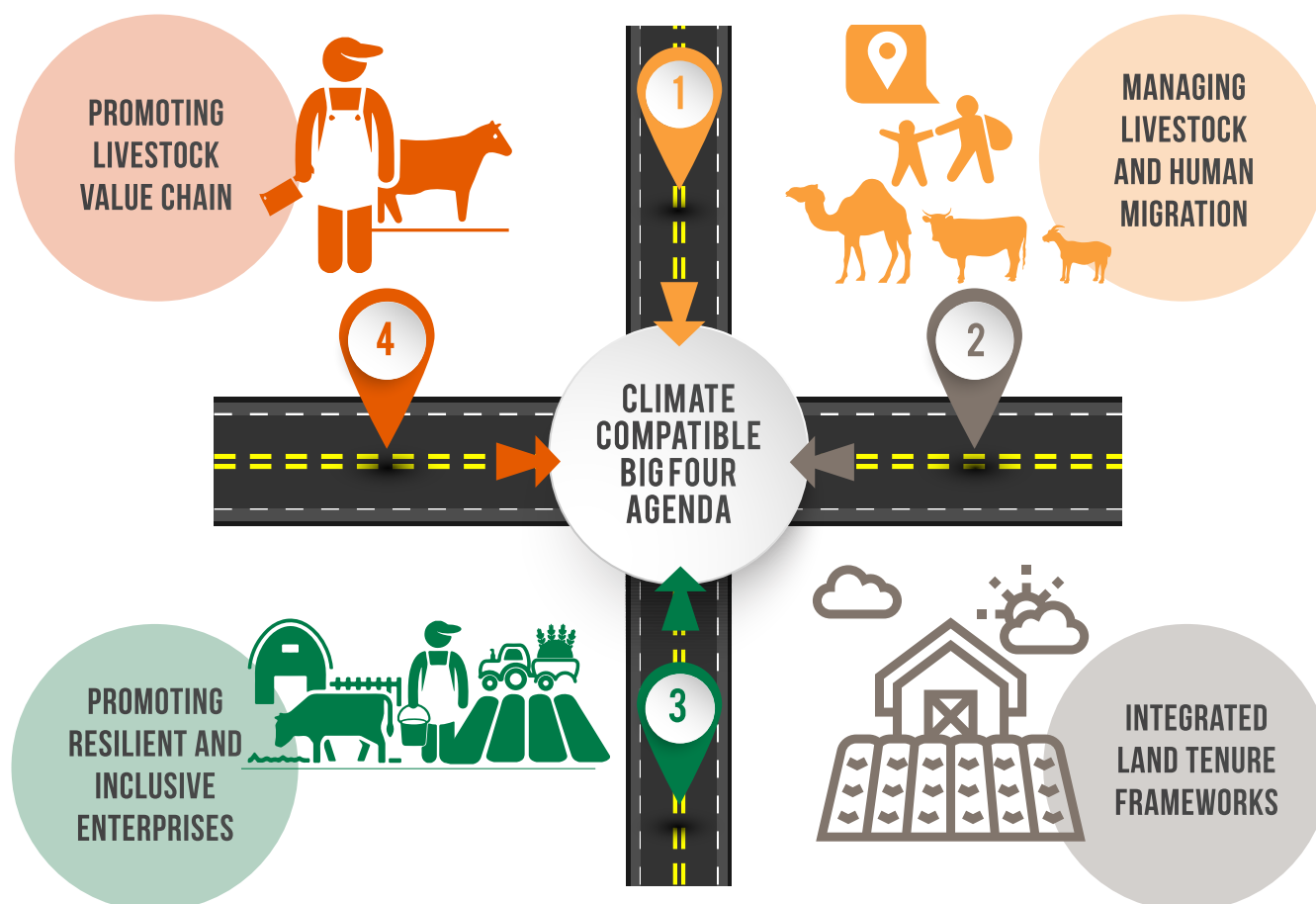


Figure 8: Enabling framework for climate compatible Big Four Agenda in the ASALs

3.1. PROMOTING THE LIVESTOCK VALUE CHAIN

Enhancing the livestock value chain remains a key part of climate compatible development. Under the PRISE initiative, value chain analysis was undertaken using the Value Chain Analysis for Resilience in Drylands (VC-ARID) approach to identify climate risk, adaptation options and opportunities for private sector development (Carabine and Simonet, 2018). The VC-ARID tests the various pathways for climate resilient economic development such as upgrading of key value chains (vertical transformation) and diversification within or across sectors, for example milk and tourism among, others (horizontal transformation) (ibid). Evidence drawn from Laikipia and Kajiado counties indicate that actions to upgrade the chain can also be climate compatible (Bedelian et. al, in review; Ndiritu and Said, in review). Investments in the livestock value chain offer opportunities for growth and transformation of the livestock sector, while reducing current or future climate risk (Tables 2 and Table 3). For example, hay production and storage allow for fodder storage and stocking for use during critical dry periods. In Laikipia, fattening livestock on privately-owned ranches and diversification of value addition provides an opportunity for enhancing the climate compatible pastoral system and linking pastoralists to high-end livestock markets. Diversification of the value chains into the tourism sector enable access to wildlife conservancies for dry season grazing, as well as benefiting from employment and other forms of additional income associated with tourism (Bedelian et al in review; Ndiritu et al in review).

Upgrading the livestock value chain and diversifying markets needs to be supported through value addition activities and the right investments. At least 50% of beef consumed in Kenya is imported on-the-hoof from Tanzania

(Aklilu, 2009), which indicates that the Kenyan herd is not meeting the increasing domestic demand for meat. There are opportunities for private sector investments in feedlot fattening programs for the pastoralists to increase the quality of the beef produced in group ranches. If pastoralists move towards managing livestock commercially in these ranches, they could effectively negotiate with processors on consistent markets for their prime beef. Improved livestock breeding kept in closed paddocks or zero grazing are managed within smaller confined spaces under controlled conditions thus are less impacted by prevailing climatic conditions. During drought, the government can invest in feedlot salvage of livestock for breeding after the drought. This could reduce the current loss of livestock in the ASALs during drought. The government can also allow duty free importation of fattening feeds, given the shortage of feeds produced in the country.

While promoting value addition is critical for climate compatible pathways in support of the Big Four Agenda, caution has to be taken to ensure that concerns on inclusivity are addressed. Discussions revealed that pastoralists are concerned about the new livestock investments being mainly owned and driven by immigrant investors with adequate capital and technological awareness but with little engagement with and integration of local pastoralists. This has been reported to spur enmity and conflicts especially during harsh climatic conditions. Therefore, recommendation is made to ensure inclusivity so that commercialized livestock production and value addition also benefits communities who traditionally practice pastoralism in the regions.



A farm section with hay grass ready for harvest

Table 2: Summary of recommendations from PRISE research findings to achieve food and nutrition security by promoting livestock value chain

PRISE findings	Recommendations for ASALs to achieve food and nutrition security
Climate analysis and projections	
<p>Climate change analysis between 1960 and 2014 shows a general decline in rainfall in 15 out of the 21 ASAL counties (Ogutu et al., 2016). All 21 ASAL counties showed increases in temperature over the same period. Five counties surpassed the 1.5°C global average increase in temperature.</p>	<p>Assessment of the potential impacts of projected climate change on livestock (range and productivity) and agriculture (land suitability and productivity), genetic or breed preferences (animals, crops and fodder) and establish the economic cost of inaction viz-a-viz implementing adaptation and mitigation measures by the national government.</p>
<p>Climate projections indicate that the ASALs will continue to experience increase in temperature (range of between 0.82°C and 3.43°C depending on climate scenario) and high rainfall variability and seasonal changes.</p> <p>The short rains are becoming more reliable and important for livelihoods (World Bank 2013, Hulme et al., 2001, Said et al., in review).</p> <p>Rainfall and temperature changes have direct implications on livestock productivity.</p>	<p>Factor in climate change scenarios in the development of the Big Four Agenda objectives, County Integrated Development Plans and National Climate Change Action Plan.</p> <p>Make hay production and storage a mandatory for ASALs to mitigate against droughts and associated livestock losses.</p> <p>Actively and through programs match animal species and breeds to appropriate environments.</p>
Livestock population	
<p>Large declines of cattle population (- 26.5%) in ASALs and an increase in sheep and goats (76%), and camels (13.3%) (Ogutu et al., 2016).</p>	<p>Include communities and small businesses into national and international livestock value chain planning to incentivize investment in livestock production as a viable and preferred means of income generation in the ASALs.</p> <p>At the local level, work to enhance local demand for other livestock products such as goat and sheep meat and milk. This can be done by consumer awareness and economic incentives such as premium prices and targeting niche market using taglines such as 'organic milk'.</p> <p>Establish working trade links with goat and sheep markets in the Middle East and other livestock products markets internationally.</p> <p>Support and establish systems on commercialized livestock feed production and animal traceability. Enhanced access to affordable livestock encourages livestock production, while traceability minimizes losses related to insecurity and conflict.</p>

<p>Kenya is currently deficient in meat production with the deficit estimated at about 300,000 MT. The declining trend in cattle numbers will continue to adversely impact both food security and nutritional needs for the nation, in particular protein food content and milk, mainly needed by children under 10 years.</p>	<p>Improve niche market for milk from traditional cows, camels and small ruminants through incentivizing the private sector and other investors into the value chains. Consumer programs that promote awareness on the quality and nutritive values of these livestock products.</p> <p>Support the establishment of livestock finishing and fattening infrastructure such as abattoirs, cold chain structures, marketing infrastructure (e.g. well equipped vehicles) and develop alternative and supplemental feed sources for cattle.</p>
<p>Increase in land fragmentation, range degradation and loss of key livestock habitats and refuge (dry season grazing, wetlands and forests) and blockage of migratory routes.</p>	<p>Establish mechanisms for sustainable land and pasture management in the ecosystems. Validate migratory corridors linking livestock to critical resources.</p> <p>Develop active measures and incentives to discourage fragmentation of pasture lands and protect communal grazing resources such as easement laws.</p>
<p>Infrastructure</p>	
<p>Livestock value chain and marketing infrastructure are poorly developed in ASALs leading to low value addition and poor returns to livestock producers.</p>	<p>Develop appropriate livestock marketing infrastructure (markets, finishing lots, holding grounds, abattoirs, etc) and link this to serve the growing rural and urban markets as well as to emerging export markets.</p> <p>Introduce value addition innovations in the livestock value chain: in feed production at producer level, and products at processing level (making of products like sausages, use of bones, etc) to reduce wastages and optimize value obtainable from livestock.</p>
<p>Market access</p>	
<p>Productivity in the livestock value chain is inhibited by poor access to markets, such as when access to livestock markets and milk processing facilities are inaccessible because of floods, adversely affecting manufacturing of livestock products.</p>	<p>Develop climate-proof infrastructure in routes leading to key livestock markets and processing facilities to enhance access across seasons for livestock produce.</p>
<p>Land under irrigation</p>	
<p>Irrigated pasture and alternative feed systems are under developed in ASALs.</p>	<p>Establish and expand irrigation in pasture production areas and identify high capacity pasture varieties and seeds for use in ASALs.</p> <p>Develop hay storage facilities and feed distribution mechanisms that work to reduce livestock vulnerability to droughts. This will promote fodder bulking and stocking.</p>

Table 3: Summary of recommendations from the PRISE research to achieve employment creation through manufacturing in a changing climate in the ASALs, by promoting the livestock value chain

PRISE findings	Recommendations for ASALs to achieve creation of employment
Leather	
<p>Kenya has the fifth largest livestock population in Africa.</p> <p>Over the last 40 years, cattle numbers in Kenya have declined by 26.5% while the sheep and goats have increased by 76%, and camels by 13.3%.</p>	<p>Develop and open up local markets for hide and skin processing and value addition to increase revenues generated by the leather sector within the country.</p> <p>Enhance quality standards in leather processing to make it attractive to the local and international market. This can be done in collaboration with regional blocks or countries.</p>
Agro-processing	
<p>Agro-processing development in the livestock value chain and MSMEs are under-developed in the ASALs.</p>	<p>Promote fattening and finishing feedlot enterprises for small scale farmers or pastoralist to add value to livestock and produce prime beef for both local and export markets.</p>
<p>Quality and affordable veterinary services (products and personnel), critical for animal production are commonly lacking for livestock producers in ASALs.</p>	<p>Develop accessible and affordable systems for quality veterinary services and drugs in ASALs for effective and responsive treatment and vaccination of livestock and containment of outbreaks such as: information provision on mapped veterinary service providers, establishing mobile centers especially during peak periods of need, providing subsidized drugs, revival or enhancement of veterinary extension service.</p>
<p>Access to and uptake of credit services in ASALs is low due to the nature of collateral needed by financial institutions, which pastoralists and farmers normally lack.</p>	<p>Develop social collateral guarantee systems to enable access to credit financing, thereby assisting investments in livestock value chains, trade and agro-processing in the ASALs. The investments will result in more food production and increase the productivity of the livestock sector.</p>

3.2. PROMOTING RESILIENT AND INCLUSIVE ENTERPRISES (ESPECIALLY MSMEs)

Micro, Small- and Medium Enterprises (MSMEs) form a critical part of the ASAL economy and are an opportunity for the Big Four Agenda objectives. The MSMEs in ASALs support most livelihood opportunities in Sub-Saharan Africa and are considered to be fundamental to more inclusive and equitable development, since they are strongly integrated into communities

and hold the potential to make an important contribution to female employment and the social integration of marginalized groups.

Evidence from the PRISE research shows that these MSMEs face severe impacts from climate change and at the same time have very low adaptive capacity. Insights from

Kajiado, Laikipia and Narok counties show that they host a diversity of enterprises including agricultural production and beef and milk co-operatives as well as cottage industries run by both men and women (Atela et.al, 2018). These enterprises employ more than 50% of the inhabitants in these counties and are critical for the realization of both agenda of food and nutrition security, and creation of employment through manufacturing. Research findings indicate that the majority of MSMEs are concentrated in pastoral and small-holder farming sectors (which are typically rain-fed) and are climate sensitive. Climate impacts, such as drought and climate-related disease (among crops and livestock) are often linked, hitting MSMEs business assets and result in reduced growth and loss of income and employment. Business losses are exacerbated by the lack of adequate capacity to adapt, forcing businesses to pursue reactive – rather than proactive – coping strategies that further result in a loss of capital and profits.

In their efforts to adapt, MSMEs in ASALs encounter a range of barriers such as high levels of poverty, dispersed and rurally located populations, high levels of informality, weak institutional arrangements, binding natural resource constraints such as land shortage and poorly developed infrastructure (Gannon et.al., 2018). These challenges provide avenues through which the government and relevant agencies can intervene to support effective micro-enterprise development. For example, options such as availing finance for micro-enterprises especially the cottage industries in ASAL counties could increase employment

creation, as more enterprises will be able to access and expand their businesses. Such incentives, coupled with enabling policies (for trading, access to markets, infrastructure and finance) enhance growth and robustness of micro-enterprises amidst shocks such as climate change and this can be mainly influenced through policy interventions (Atela et.al, 2018, Crick et.al, 2017).

To facilitate rapid climate resilient economic growth, such enabling policies need to be developed holistically, to address the broader structural deficits and barriers that limit adaptive capacity of MSMEs. Building enabling environments enhances growth and resilient enterprises that contribute to sustainable and inclusive development. Key elements to be considered include addressing financial barriers to these enterprises and enhancing sufficient market access and linkages. Other options such as government support in providing effective policy implementation structures and increasing budgetary allocation to resilient enterprises could promote manufacturing and agribusiness in the ASAL counties.

Further analysis of opportunities for enterprise growth and resilience revealed that multi-stakeholder partnerships are key in promoting resilient MSMEs. Partnerships between various agencies at different governance levels (national and county governments) provide linkages that allow for sub-national enterprise development to be linked to the national Big Four Agenda. Partnerships bring diverse organizational or stakeholder capabilities to create enabling conditions and offer social



Narok Association of Bee Keepers' project officer explaining to the PRISE researcher on beekeeping as an enterprise to achieve resilience in semi-arid areas.



Reto women group representatives from Narok County discussing impacts of climate change to women-led enterprises.

protection for MSMEs' adaptation. Further, different partners having different strengths help in supporting and strengthening financial, technological and information value chains in enterprises as well as lesson learning.

Evidence from PRISE revealed that female MSME owners provide strategic entry points for enterprise growth and resilience in ASALs. Most MSMEs that support household livelihoods in ASALs are run and operated by women. These range from manufacturing-based enterprises such as small cottage industries producing touristic mats or ornaments and agricultural-based enterprises such as small-scale trade in cereals, milk and poultry products or very small-scale processing industries for cereals, fruit or vegetables. Most of the women-led enterprises face severe climatic stress due to strong socio-cultural orientations around gender roles affecting resource use and access. This confines female-led MSMEs to specific sectors

– most notably agriculture – that experience high exposure to climate risk. For the Big Four Agenda especially in relation to creation of employment, PRISE findings indicate that a gender-sensitive business environment that responds to women's greater exposure and their specific challenges to build their adaptive capacity in the private sector, is fundamental to achieving equitable enterprise growth and resilience. Further, establishing learning platforms and mentoring schemes for women where successful cases of enterprise growth and adaptation can be showcased can be critical in motivating and educating women in robust business strategies that can withstand and take advantage of climate change. Such forums can be used to increase awareness on business practices and access to markets and lobby for increasing funding for women-led enterprises and removal of land-related collateral.

3.3. MANAGING HUMAN AND LIVESTOCK MIGRATION

Semi-arid lands are mostly inhabited by agro-pastoral and pastoral communities, with a few inhabitants practicing integrated crop and livestock production systems, and are characterized by high human and livestock mobility. The pastoral communities are engaged in cyclical migration patterns in and between counties in search of pasture and water for their livestock. Therefore, seasonal mobility is a critical element of their livelihood (Oucho and Gould, 1993; IOM, 2010; Frouws, 2015; World Bank, 2015a). With climate change impacts, the rural communities are increasingly facing many livelihood challenges including increasing competition and conflicts over the scarce natural resources, which in many cases threatens their mobile lifestyles (Bilsborrow, 1998; De Haas, 2005, Frouws, 2015, IFPRI, 2011; Warner and Afifi, 2011; Black et al 2011; DFID, 2014; Schrepfer and Caterina, 2014; UNDP, 2015).

PRISE evidence concludes that ASALs are prone to frequent and prolonged droughts and that migration is a common adaptation strategy. The research has shown that internal migration within and between counties is much more common than international migration out of the country to cope with climate change

and variability. Migration requires not only physical mobility but also economic and social capacities, that are not available to all. For example, the women and elderly in pastoral communities, who often do not have or have limited ownership rights to assets such as land and livestock, have less economical disposition to help them migrate, or social networks, as they are often confined to household chores within the homestead.

In addition to pastoral migration, semi-arid lands have become frontiers where people are moving in from high potential areas in pursuit of emerging economic opportunities. Kenya's population currently stands at approximately 50 million people and is projected to reach 95.5 million in 2050. The last national census (KNBS, 2009), showed that 14 out of the 21 ASAL counties registered higher population growth rates (4%) relative to the national average rate of 2.6% (Figure 9). The high growth rates could be attributed to influxes of migrant populations from high potential areas and from neighbouring countries, and this emigration is driven by land factors, the search for better economic opportunities inherent in ASALs, and climate change dynamics.

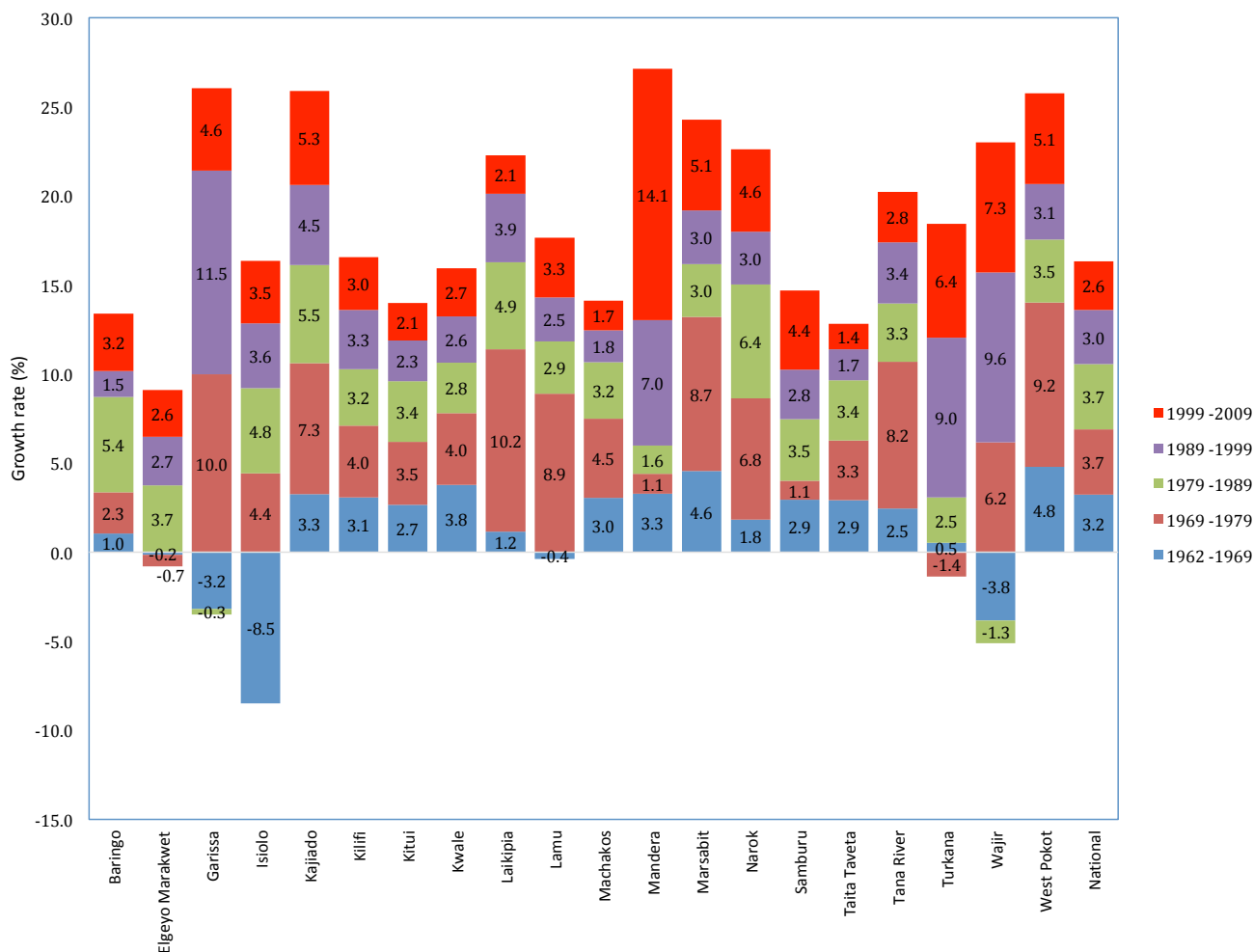


Figure 9: Population dynamics in the ASAL counties between 1962 and 2009

The above observation shows that ASALs will be the next frontiers of labour movement as the emigration of people and livestock take route in the context of increasing population and new opportunities. On one hand, this migration provides skills sets and capacities critical for capital accumulation, innovation and enterprise setting. On the other hand, migration and growing populations strain available natural resources in ASALs, leading to insecurity and conflicts over productive resources commonly witnessed between and among livestock, farming and agro-pastoral groups. Further, climate change is causing migration of pastoralists as pasture diminishes causing conflicts between the communities and ranches (Daily Nation, 2017).

There is a need for more strategic management of migration into the ASALs to minimize negative impacts and exploit beneficial opportunities

emanating from such migrations. The PRISE findings demonstrate the need for higher investments and resource allocation to ASAL counties (Ndiritu and Said, 2018) that can help in harnessing and providing opportunities for immigrant skills to promote climate compatible innovations and enterprises to promote job creation. These are needed to enable ASALs to adequately mitigate against the effects of climate change, support climate change adaptation pathways, enhance their capacities to provide livelihood and economic opportunities to the growing populations, and to manage conflict and insecurity.

A deeper understanding of the role of migration as an adaptation strategy, especially to extreme climate events is necessary to develop adaptation programs for long-term achievement of the Big Four Agenda. Initiatives such as strengthening local institutions (e.g.

cooperatives), building capacity of rural communities and integrating mobility into land management systems are options that could ensure ASALs offer better opportunities to achieve the job creation objective of the Big Four Agenda. Migration presents an opportunity to integrate human mobility and climate change adaptation policies so as to make the affected communities more resilient, for example by strengthening the implementation of National Adaptation Plans (NAPs). National and county governments and other development actors therefore need

to give particular consideration to supporting mobility as an adaptation and resilience-building tool and to reducing the vulnerability of migrants. This can be done by protecting pastoral migration corridors.

Migrant populations (temporary or permanent mobility of humans) transfer remittances to their families, a significant source of investment that represents an important resilience strategy in ASALs which can be promoted by provision of tax breaks to encourage investment into the local areas.

3.4. LAND TENURE MANAGEMENT

Land tenure form (i.e. communal or individual) determines the strategies communities pursue in climate change adaptation and in land use investment, including in livestock value addition. Findings from the PRISE research in Kajiado county showed that the county has witnessed rapid land tenure transition from communal to privatized regimes (Moiko et.al., in review). The tenure transition has been driven by a number of factors including land tenure reforms and policies, markets and demographic changes. Population pressure is also creating more consciousness around land in ASALs and this is translating into emerging tensions around ownership and use.

Land tenure status influences pastoralists' capacity for adaptation strategies when responding to climate shocks. There is a need to establish policy frameworks that capture issues such as land ownership, infrastructure development, gender inclusion and migration, to account for the needs and aspirations of pastoralist land users. These policies will help regulate external migration to pastoral lands, development of infrastructure and discrimination on gender bases in relation to especially land management. This will help minimize investment risks especially when pastoralists find it difficult to move with their livestock.

There are options such as integrated land management that take into account both pastoralists' needs, as well as emerging forms of more intensified livestock investments. Legalization of communal and customary land and pasture management systems and institutions ensures recognition of communal land zoning and resource use arrangements

in the regions. For instance, establishing land-use zones that allow both free movements of extensive livestock as well as livestock intensification under private land tenure, is critical in promoting livestock investment pathways that are inclusive of various interests. Land zoning can be facilitated through appropriate enabling policies and spatial planning processes. Such integrated frameworks should provide security to pastoralists and enable them to negotiate for various financial, livelihood and technological opportunities in light of climatic shocks and changing tenure regimes. Appropriate land tenure management can address the question of sustainable rangeland management and allow communities adopt climate change resilient practices.



A Borana bull, which is more adaptable to the dry conditions in ASALs.

“Improved livestock breeding kept in closed paddocks and managed within smaller confined spaces under controlled conditions are less impacted by prevailing climatic conditions.”



4 CONCLUSION AND RECOMMENDATIONS

With projected temperatures in many semi-arid counties in Kenya likely to increase beyond the global target of 1.5°C, and rainfall expected to be more unpredictable over the next century, climate change remains one of the biggest threats, not just to the Big Four Agenda objectives, but to Kenya's aim of achieving a middle-income status and achieving the Sustainable Development Goals by 2030. As such, promoting climate compatible interventions will be key to achieving development progress including ensuring that Big Four actions not only withstand the impacts of climate change but also take advantage of the various opportunities presented by climate change such as private sector investment in

the livestock value chain to enhance feedlots thereby promoting production and eventually quality beef that fetches better prices. Despite the impacts of climate change, semi-arid lands of Kenya have significant growth potential that can contribute to the achievement of two of the Big Four Agenda objectives: food and nutrition security and employment creation through manufacturing. However, for this to be realized, there is need for greater focus on the challenges of climate change vulnerabilities and impacts that impede growth, and inclusion of the various investment and adaptation options into specific ASAL county development agendas.

The key area of focus for investments and policy

that could contribute to the realization of a climate compatible Big Four Agenda in food and nutrition security and employment creation are:

1. Ensuring that semi-arid economies are part of national development plans (in participation and focus of implementation activities) and **scale up climate smart investments in semi-arid lands** as a way to achieve county and national development goals.
2. Develop infrastructure to open up the ASALs to enable the private sector to invest in the livestock sector, among other productive sectors, in these regions. More specifically, there is a need to **support investments that improve the quantity and quality of beef along the livestock value chain.**
3. Support the **establishment of livestock finishing and fattening grounds at the producer level;** and improved infrastructure for marketing, processing and handling of meat at the processor level. This should include **value addition** at the producer level to ensure products (meat, milk and by-products such as skins and hides) are attractive to the market, and to support food and nutrition security as well as job creation along the value chain. Besides beef and milk, this support should also be directed at the leather industry.
4. **Develop alternative and supplemental feed sources for cattle and other livestock.** This should include hay production, bulking and storage, as well as other livestock feeds such as pelleted feed.
5. Support livestock keepers to **form cooperatives to enable bulking and aggregation** of produce and inputs, and to increase the negotiation power of livestock keepers.
6. Ease **access to extension services** and make them **affordable** through establishment and support (financial, capacity and infrastructural such as transport) of mobile extension service provision, building on the high penetration of mobile use across the ASALs.
7. Support livestock keepers to **access appropriate financial products and services** that integrate socio-cultural perspectives and enhance their financial inclusion in the whole livestock value chain.
8. There is need for **participatory coordination and coherence between county and national level policies** and plans, including National Adaptation Plans (NAPs), County Integrated Development Plans (CIDPs) and County Spatial Plans (CSP).
9. The national and county governments and their development partners need to **adopt**

and implement policies that support and enhance women and vulnerable groups' adaptive capacity in ASALs as a matter of priority. Such policies should promote:

- a. Women and vulnerable groups access to assets**, including land to ensure inclusivity and ownership, thereby promoting good land management practices that ensure adaptability.
- b. Support private sector involvement especially MSMEs in the ASALs**, which often operate at the household level, such as the cottage industries that are usually operated by women. Doing so would support household livelihoods and thus create resilience at household level.
- c. Promote reliable information sharing** between ASAL community members and government agencies that could include market information, pricing, access to finance and early warning systems.
- d. Ensure access to financing and market opportunities for women** and other vulnerable groups in the ASALs.

10. County governments to **develop and enforce land use planning frameworks** anchored on legal instruments that will help mitigate against uncontrolled land use practices as well as to manage urban and industrial sprawl in ASAL counties.

11. Include human and livestock mobility into land management systems, to especially address disparities that cause mal-adaptation to vulnerable groups such as women.

12. Knowledge creation, **promoting development of social networks** within migrant populations and **strengthening local institutions such as cooperatives**. Social networks help build social capital thereby increasing social resilience within the households and communities of origin and trigger innovations across by the transfer of new knowledge, technology, remittances and other resources.

REFERENCES

- Aklilu, A. and Alebachew, A. (2009) Assessment of climate change induced hazards, impacts and responses in the southern lowlands of Ethiopia. FSS Research Report No. 4.
- Atela, J., Gannon, K.E., Crick, F., 2018. Climate change adaptation among female-led micro, small and medium enterprises in semi-arid areas: A case study from Kenya, in: Leal Filho, W. (Ed.), Handbook of Climate Change Resilience. Springer, Cham, pp. 1–18.
- Bedelian, C., Moiko, S. and Said, M. (in review). Harnessing opportunities for climate-resilient economic development in semi-arid lands: Adaptation options in the beef value chain in Kajiado County, Kenya. PRISE Working Paper. London: Overseas Development Institute; Nairobi: Kenya Markets Trust.
- Bedelian, C., Moiko, S., and Atela, J., (in review). Land tenure influences pastoralist grazing management and climate change adaptation strategies: Gender and equity implications.
- Behnke, R., Muthami, D., 2011. The contribution of livestock to the Kenyan economy. IGAD Livestock Policy Initiative Working Paper 03-11, 1–62.
- Carabine, E., and Simonet, C., 2018. Value chain analysis for resilience in drylands: Identification of adaptation options in key sectors. Pathways to Resilience in Semi-Arid Economies (PRISE) Working Paper.
- Crick F., Eskander S., Fankhauser S. and Diop M. 2017. How do African SMEs respond to climate risks? Evidence from Kenya and Senegal. PRISE Working Paper.
- Crick F., Eskander S., Fankhauser S. and Diop M. 2018a. How do African SMEs respond to climate risks? Evidence from Kenya and Senegal. World Development 108: 157–168.
- Crick F., Gannon K. E., Diop M. and Sow M. 2018b. Enabling private sector adaptation to climate change in sub-Saharan Africa. WIREs Climate Change 9 (2).
- Daily Nation 2017. Is there more than meets the eye in Laikipia land conflicts? Online Version. Accessed from: <https://www.nation.co.ke/oped/opinion/ADDRESSING-INVASION-OF-RANCHES-IN-LAIKIPIA/440808-3847206-lmcpra/index.html>
- De Souza, K., Kituyi, E., Harvey, B., Leone, M., Murali, K. S. and Ford, J. D. (2015) 'Vulnerability to climate change in three hot spots in Africa and Asia: key issues for policy-relevant adaptation and resilience building research', Regional Environmental Change, 15(5), pp. 747–753. doi: 10.1007/s10113-015-0755-8.
- Gannon K. E., Crick F., Rouhaud E., Conway D. and Fankhauser S. 2018. Supporting private adaptation to climate change in semi-arid lands in developing countries. PRISE Policy Brief.
- GoK (2015b) ASAL Classification. Accessed from: <http://www.devolutionasals.go.ke/county-information/>
- Irungu P., Ithondeka P., Wafula E., Wekesa S., Wesonga H. and Manga T. 2014. An audit of constraints and opportunities in Kenya's livestock value chain. Journal of Agricultural Science and Technology B4 (2014) 102-120.
- Intergovernmental Panel on Climate Change (IPCC) (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Geneva, Switzerland: IPCC.
- KMT 2014. Kenya livestock and meat market analysis for cattle, goat and sheep. Kenya Markets Trust/I-DEV International.
- Kenya National Bureau of Statistics (KNBS), The 2009 Kenya Population and Housing Census: Population Distribution by Age, Sex and Administrative Units, KNBS, Nairobi, 2010.
- Moiko S., Atela J., Abuya R., Bedelian C., and Said M. (2018). Land tenure influences livestock management and climate change adaptation in pastoralist communities in Southern Kenya: Gender and equity implications, 2018 (in review).
- Ndiritu, S.W. and Said, M. (in review). Harnessing opportunities for climate-resilient economic development in semi-arid lands: Adaptation options in the beef value chain in Laikipia County, Kenya. PRISE Working Paper. Nairobi: Kenya Markets Trust.
- Ndiritu S. W., and Muricho G., 2018. Impacts of climate change adaptation on food security: Evidence from semi-arid, Kenya. Paper presented in the Sixth World Congress of Environmental and Resource Economists 25th to 29th June 2018.
- Ogutu, J.O., Piepho, Hans-P, Said, M.Y., Ojwang, G.O., Njino, L.W., Kifugo, S.C., and Wargute, P.W. (2016) Extreme wildlife declines and concurrent increase in livestock numbers in Kenya: What are the causes? PLoS ONE 11(9).
- Said, M. Ogutu, JO., Bedelian, C., Moiko, S., Muhwanga, J., Abuya, R., and Carabine, L. (in review). Projected climate change impacts on cattle in Kenya's arid and semi-arid lands based on RCP 2.6, 4.5 and 8.5. PRISE working paper.
- Republic of Kenya (2012). Vision 2030: Development Strategy for Northern Kenya and Other Arid Lands. Office of the Prime Minister. Ministry of State for Development of Northern Kenya and other Arid Lands.
- Republic of Kenya (2018). National Wildlife Strategy 2030.
- World Bank and Republic of Kenya, Ministry of Industrialization and Enterprise Development (2015), Kenya Leather Industry; Diagnosis, Strategy and Action Plan.

ANNEX: I PRISE PROJECT RESEARCH AREAS

Research area 1:	Migration futures in Asia and Africa: Climate change and climate-resilient economic development.
Research area 2:	Migration, remittances, adaptation and resilience in arid and semi-arid regions of Senegal and Tajikistan.
Research area 3:	Harnessing opportunities for climate-resilient economic development in semi-arid lands: Adaptation options in key sectors.
Research area 4:	Enabling environment for private sector multi-stakeholder action to strengthen resilience to climate change.
Research area 5:	Property rights, investments and economic development in the context of climate change in semi-arid lands.
Research area 6: Part 1:	Cross-boundary multi-scale governance of semi-arid lands: Implications for climate resilience and economic development.
Research area 6: Part 2:	Resilience to climate-related shocks and stressors in Kyrgyzstan: Developing resilience indicators to predict well-being.
Research area 7:	Water governance in semi-arid lands: Political and economic insights for the management of variability and extremes in a changing climate.



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CONTACT US



14 Riverside, Cavendish Block,
2nd Floor, Suite B, Riverside Drive.



+254 20 2588343
+254 722 201233



info@kenyamarkets.org

www.kenyamarkets.org

