

ICAT COUNTRY NEEDS ASSESSMENT REPORT: SOUTH AFRICA

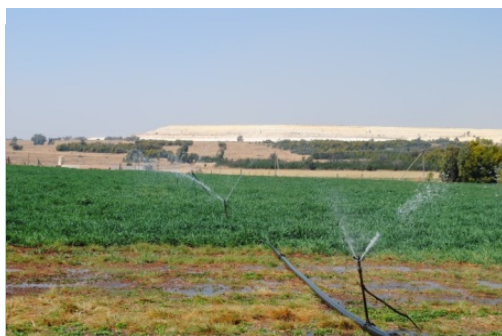


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Environmental Affairs
REPUBLIC OF SOUTH AFRICA



THE ENERGY AND
RESOURCES INSTITUTE



ICAT COUNTRY NEEDS ASSESSMENT REPORT: SOUTH AFRICA

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Table of Contents

1. Introduction	4
2. Climate change responses and priorities	4
2.1. Climate trends	4
2.2. Climate priorities and policies that support climate change action	5
3. Existing monitoring and evaluation frameworks in country	8
3.1. Overview of National Framework for Climate Services (NFCS) and priority sectors	8
3.2. Overview of existing M&E framework and existing needs or gaps within framework	9
4. Focus area and progress in M&E	11
4.1. Selection of focus area	11
4.2. Overview of what has been or is currently being done in the focus area in terms of M&E	14
4.3. Gaps identified in terms of M&E for focus area	16
5. Next steps	17
6. References	18

1. Introduction

South Africa, like many other developing countries, is vulnerable to the effects of climate change, and has the task of balancing accelerating economic growth and transformation with sustainable use of environmental resources and responding to climate change (DEA, 2017). South Africa has been warming significantly over the period 1931-2015, with the observed rate of warming at 2°C per century and higher, which is in the order of twice the global rate of temperature increase (DEA, 2018). The strongest warming has been observed in the west over the Western Cape and Northern Cape, and in the north-eastern provinces of Limpopo and Mpumalanga, extending southwards to the coastal areas of KwaZulu-Natal. The country is also projected to face a higher frequency of climate-related disasters that are increasing in intensity, and these events are likely to be associated with impacts that are on par with, if not worse than those already experienced (DEA, 2018).

The country has made substantial progress towards becoming a low carbon and climate resilient society and is a signatory to numerous global climate change responses including the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreement. South Africa progressed significantly in developing its policies to respond to climate change, through its National Climate Change Response (NCCRP) White Paper, Nationally Determined Contributions (NDC) and Climate Change Bill. The development of the country's Disaster Management Act, supports the development of local disaster risk plans. It is through these climate change and disaster risk-related activities that the country is progressing toward reducing vulnerabilities and increasing resilience to climate change impacts and climate related disasters.

This report highlights the country's climate change priorities and responses and the current monitoring and evaluation framework used to track progress of climate change responses to highlight the role of the ICAT-A project in supporting the country's current M&E system though addressing gaps highlighted specifically in terms of M&E related to disaster risk reduction and early warning systems in South Africa.

2. Climate change responses and priorities

2.1. Climate trends

Observed trends of the country's climate, reported in the South Africa's Third National Communication (TNC) on Climate Change to the UNFCCC, include (DEA, 2018):

- South Africa has been warming significantly over the period 1913-2015. The observed rate of warming has been 2°C per century or even higher over the western parts of the country, including much of the Western and Northern Cape, and also in the east over Gauteng, Limpopo and the east coast of KwaZulu-Natal; this is in the order of twice the global rate of temperature increase,
- Associated increases in the annual number of hot days, with decreases in the number of cold nights have occurred over most of the country,
- Over the period 1921-2015, there is strong evidence of statistically significant increases in rainfall over the southern interior regions, extending from the western interior of the Eastern Cape and eastern interior of the Western Cape northwards into the central interior region of the Northern Cape. Extreme daily rainfall events

have increased in these areas, extending northwards into Northwest, the Free State and Gauteng. Decreases in annual rainfall totals over Limpopo were also observed.

South Africa is vulnerable to natural disasters such as drought, flooding, extreme storms and fires and has faced a number of devastating climate-related disasters over the last few decades and their impacts have been varying. The country is projected to face a higher frequency of climate-related disasters that are increasing in intensity, and these events are likely to be associated with impacts that are on par with, if not worse than those already experienced (DEA, 2018). The impact of climate related disasters are wide-ranging and impact multiple sectors, including damage to infrastructure, damage to ecosystems, and contributing to water shortages, rising food insecurity and impacting public health.

2.2. Climate priorities and policies that support climate change action

South Africa's national responses to climate change seek to address both the country's development needs and climate change obligations. South Africa's climate change response actions are guided by Section 24 of the Constitution of the Republic of South Africa, the National Development Plan (NDP) and the National Climate Change Response Policy White Paper (DEA, 2011). The country's development pathway, defined by the NDP, is closely aligned to the Sustainable Development Goals (SDGs). The Medium Term Strategic Framework (MTSF) provides key performance indicators for all spheres of government.

The NCCRP (DEA, 2011), gazetted in 2011, and provides a policy framework for the country's response to both climate change mitigation and adaptation. Interventions proposed in the NCCRP aim to ensure that the country is able to manage impending climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity (DEA, 2011). The national priorities highlighted in the NCCRP and in the country's National Development Plan (NDP) (NPC, 2011) are the basis from which other programmes, plans and reports are developed on a national, regional and local level.

South Africa is a signatory of numerous global climate change responses including the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement. The Department of Environmental Affairs (DEA) plays a central coordinating and policymaking role and is responsible for providing guidance and ensuring that there is a clear alignment of policies and international obligations when it comes to climate change. As a signatory to the UNFCCC, South Africa has prepared and submitted, or is preparing the following documents:

- National Communications
 - Initial National Communication (2004)
 - Second National Communication (2011)
 - Third National Communication (2018)
- Biennial Update Report (BUR)
 - BUR (2014)
 - BUR (2019)
- (Intended) Nationally Determined Contribution (2015)

- South Africa’s Climate Change Technology Needs Assessment (TNA)
 - TNA (2007)
 - An update of the TNA (2019, in preparation)
- National Adaptation Strategy (2019 – Under review)

Key developments since the NCCRP has been the submission of the country’s Nationally Determined Contributions (NDC) (DEA, 2015a) and the Draft National Climate Change Adaptation Strategy (NCCAS) which has been drafted and revised (DEA, 2019a). The Carbon Tax Bill, Greenhouse Gas Emissions reporting, Climate Change Bill and Pollution Prevention Plan regulations are substantial policy steps undertaken by the country to curb GHG emissions.

South Africa’s Nationally Determined Contribution (NDC) consists of an adaptation component, a mitigation component, and a support component. The adaptation component addressed adaptation through six goals for the period 2020-2030 which are underpinned by key elements of adaptation planning, cost of adaptation investment requirements, equity and means of implementation (DEA, 2015a). The mitigation component takes the form of a peak, plateau and decline GHG emissions trajectory range which is different from SA’s “deviation from business-as-usual” form of commitment. The support component of the NDC includes the analyses of specific sectors and initiatives to report on indicative scales of finance and investment required for both adaptation and mitigation.

The draft National Climate Change Adaptation Strategy (NCCAS), developed in 2016 and further revised in 2019, aims to reflect a unified, cross-sectoral, economy-wide approach to climate change adaptation. The NCCAS will support South Africa in meeting its international obligations by demonstrating progress on climate change adaptation, and also serve as South Africa’s national adaptation plan (the development of which was highlighted as one of six goals for adaptation in the country’s NDC).

South Africa’s climate change policy framework which supports the country’s low-carbon transition within the context of the NDP and SDGs, outlined in Table 1, includes legislation, national policy and policies in draft, international commitments, voluntary instruments and policy informing studies.

Table 1. South Africa’s climate change policy framework (DEA-NBI, 2017)

YEAR	TYPE	NAME
1996	Legislation	The Constitution of the Republic of South Africa (Section 24)
2005-2008	Policy Informing Study	Long-Term Mitigation Scenarios (LTMS)
2011	National Policy	National Climate Change Response Policy (NCCRP)
2011	Legislation	Energy Efficiency Building Regulations

YEAR	TYPE	NAME
2013	Policy Informing Study	Long-Term Adaptation Scenarios (LTAS)
2014	Policy Informing Study	Mitigation Potential Analysis (MPA)
2014	Legislation	National Environmental Management: Air Quality Act, 2004 (as amended)
2015	Policy Informing Study	National Terrestrial Carbon Sinks Assessment (NTCSA)
2015-2016	International Commitment	South Africa's Nationally Determined Contribution (NDC)
2015-2016	Policy Informing Study	National Terrestrial Carbon Sinks Atlas (NTCSA) (Phase 1 and 2)
2016	Policy Informing Study	Towards the development of a GHG emissions baseline for the agriculture, forestry and other land use (AFOLU) sector in South Africa
2016	Policy Informing Study	National Climate Change Annual Report
2016	Policy Informing Study	Near-Term Priority Climate Change Flagship Programmes
2016	Draft Policy	National Energy Efficiency Strategy (Post 2015)
2016	Draft Policy	Draft Integrated Energy Plan (IEP)
2016	Draft Policy	Draft Integrated Resource Plan (IRP)
2016-2020	Voluntary Instrument	Desired Emission Reduction Outcomes (Sectoral Emissions Targets)
2016-2020	Voluntary Instrument	Carbon Budgets
2017	Policy Informing Study	Reduction in Emissions from Deforestation and Forest Degradation (REDD+) Assessment Report for South Africa
2017	Policy Informing Study	Post 2020 Mitigation System
2017	Draft Policy	National Adaptation Strategy
2017	Draft Policy	Climate Change Legal Framework
2017	National Policy	Green Transport

YEAR	TYPE	NAME
2017	Legislation	GHG Reporting and Pollution Prevention Plans
2017	National Policy Study	National Employment Vulnerability Assessment
2017	Policy Informing Study	Grid Emission Factor (GEF) Review
2018	Policy Informing Study	GHG Emission Pathways Study
2018	National Policy Study	Policies and Measures (PAMs)
2018	Draft Legislation	Carbon Tax
2018	Policy Informing Study	Low-Carbon Technology Stocktake
2019	Draft Policy	National Climate Change Adaptation Strategy

3. Existing monitoring and evaluation frameworks in country

3.1. Overview of National Framework for Climate Services (NFCS) and priority sectors

The National Framework for Climate Services for South Africa (NFCS-SA) is the country's response to the declaration of the World Climate Conference-3 (WCC-3), held from 31 August to 4 September 2009 in Geneva, Switzerland. The conference declaration was that a Global Framework for Climate Services (GFCS) is established to strengthen the production, availability, delivery and application of science-based climate monitoring and prediction services. The five pillars of the GFCS are the (1) User Interface Platform (UIP), (2) Climate Services Information System (CSIS), (3) Observations and monitoring, (4) Research, modelling and prediction, and (5) Capacity development. The NFCS can enable the country to implement the GFCS requirements and contribute towards the implementation of legislation such as the Weather Service Act (Act No. 8 of 2001) and the Disaster Management Act (Act No. 57 of 2002) in terms of climate services ((DEA and SAWS, 2016). The vision of the NFCS-SA is "To enable society to better manage the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable to climate-related hazards".

The mission of the NFCS-SA is to:

- Mainstream and enhance climate observations and monitoring information and transform it into sector -specific products and applications;
- Develop users' capacity to manage risks of climate variability and change at all levels;
- To be user driven, and address the entire value chain for the production, processing and application;

- Strengthen local, regional and global collaborative

The sectors focussed on in the NFCS-SA are based on climate-sensitive sectors identified in the NCCRP namely: (1) disaster risk reduction, (2) health, (3) water resource management, (4) agriculture and food security, (5) human settlements (rural, coastal and urban), (6) infrastructure, (7) transport, and (8) biodiversity. In addition, oceans and coasts, and energy are prioritised (DEA and SAWS, 2016).

The ICAT-A project can contribute to the pillars of the NFCS and other DEA-lead programmes in the disaster risk reduction and oceans and coasts priority sectors though providing an understanding of gaps in early warning systems though its linkage to the DEA M&E system and support of capacity building and increased transparency of country reporting under the Paris Agreement.

3.2. Overview of existing M&E framework and existing needs or gaps within framework

South Africa's National Climate Change Response Policy (DEA, 2011) called for the establishment of a National Climate Change Response Monitoring and Evaluation (M&E) System, which would 'evolve with international measuring, reporting and verification (MRV) requirements'. South Africa is developing a comprehensive, integrated National Climate Change Response Monitoring and Evaluation System which includes the current National Climate Change Response Database (NCCRD) and the National Greenhouse Gas Inventory System (NGHGIS) and will serve as a data and information coordination network. The M&E system enables the country to assess, analyse and understand progress made in achieving its climate change commitments and actions, thus tracking the transition to a climate-resilient and lower-carbon society. The National Climate Change Response M&E System Framework was published in 2015 (DEA, 2015b) to provide high-level guidance on information requirements and assessment methodologies.

South Africa's approach to climate change M&E is premised upon continuous learning and improvement of the system implemented in phased manner. A phased approach to the rollout of the National Climate Change M&E system has been taken over the following four phases, with full-implementation of this system envisaged in 2020 (DEA, 2019a):

- Phase 1 (2013-2016): System Setting-up
- Phase 2 (2017-2018): Operationalisation
- Phase 3 (2019-2020): System Refinement
- Phase 4: (2021-2015): Automation

The concept of Desired Adaptation Outcomes (DAOs) have been developed to complement the building blocks of the monitoring and evaluation framework and to facilitate and focus the M&E of the country's progress towards resilience.

Nine generic DAOs have been developed, each of which is of cross-cutting, cross-sectoral relevance and describes, in a general sense, a desired state that will enhance South Africa's transition towards climate resilience and fall into two distinct groups. Six of the nine DAOs

(G1–G6) describe the ‘inputs’ (namely processes, resources and capacities) that need to be in place to enable effective climate change adaptation; and three DAOs (G7–G9) describe the key ‘impacts’ of adaptation interventions and associated measures (for example, reductions in vulnerability of human and natural systems) (DEA, 2019a) (Table 2).

Table 2. Generic Desired Adaptation Outcomes (DAOs)

<i>‘Inputs’ to enable effective adaptation</i>	
G1	Robust/integrated plans, policies and actions for effective delivery of climate change adaptation, together with monitoring, evaluation and review over the short, medium and longer-term.
G2	Appropriate resources (including current and past financial investments), capacity and processes (human, legal and regulatory) and support mechanisms (institutional and governance structures) to facilitate climate change adaptation.
G3	Accurate climate information (e.g. historical trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate-related events) provided by existing and new monitoring and forecasting facilities/networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction.
G4	Capacity development, education and awareness programmes (formal and informal) for climate change adaptation (e.g. informed by adaptation research and with tools to utilise data/outputs).
G5	New and adapted technologies/knowledge and other cost-effective measures (e.g. nature-based solutions) used in climate change adaptation.
G6	Climate change risks, impacts and vulnerabilities identified and addressed.
<i>‘Impacts’ of adaptation interventions and associated measures</i>	
G7	Systems, infrastructure, communities and sectors less vulnerable to climate change impacts (e.g. through effectiveness of adaptation interventions/response measures).
G8	Non-climate pressures and threats to human and natural systems reduced (particularly where these compound climate change impacts).
G9	Secure food, water and energy supplies for all citizens (within the context of sustainable development).

Clearly defined synergies exist between the generic DAOs and the adaptation commitments in a number of key international agreements such as South Africa’s Nationally Determined Contributions, the Sustainable Development Goals, the United Nations Convention to Combat Desertification, UN Habitat New Urban Agenda and the Sendai Framework for Disaster Risk Reduction.

The approach used to monitor and evaluate progress on achieving individual DAOs involves the use of traffic light colours as a basis of a scoring system to summarise progress as follows:

- Red indicates that no or only preliminary work has begun towards the strategic outcome,
- Amber indicates that significant progress is being made towards the strategic outcome,
- Green indicates that work on the strategic outcome is in an ideal state.

This approach will enable all stakeholders, operating at different spatial scales (i.e. national and/or provincial and/or local), to gather basic data for each DAO, from which a cumulative 'score' of progress can be derived.

The ICAT-A project intends to contribute to DAO G3, which is "Accurate climate information (e.g. historical trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate-related events) provided by existing and new monitoring and forecasting facilities/networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction".

4. Focus area and progress in M&E

4.1. Selection of focus area

South Africa has made significant progress in terms of developing overarching policies and frameworks to support climate change responses in the country. These responses are aligned with the goals of the NDP and thus support sustainable development. As highlighted in the sections above, South Africa is vulnerable to natural disasters such as drought, flooding, extreme storms and fires and has faced a number of devastating climate-related disasters over the last few decades, and is projected to face a higher frequency of climate-related disasters of increasing intensity. These disasters pose risks to human lives, infrastructure and the economy, with varying impacts across geographical areas, sectors and communities. The possibility of increased disaster risk is considered to be one of the most concerning and potentially costly impacts of future climate change in South Africa and globally (DEA, 2018). Disaster risk management is viewed by the country as being one of the key areas where action is needed to ensure that lives are protected and is one of the climate sensitive sectors identified in the NCCRP.

The South African policy context has positioned the country to take a leading role with the progressive national disaster management regulatory framework and incremental cross-sectoral support for practical disaster, risk and emergency management of which climate change response is acknowledged as a critical factor (DEA, 2018). The National Disaster Management Centre (NDMC) has been developed, as mandated by the Disaster Management Act of 2002, to address the country's vulnerability to natural disasters with the objective being to promote an integrated and coordinated system of disaster management with special emphasis on prevention and mitigation across national, provincial and municipal organs of state (RSA, 2002). The Disaster Management Act Amendment Bill (RSA, 2015a) requires disaster management plans to be developed at national, provincial and municipal levels and need to include expected climate change impacts and risks, and measures for disaster risk reduction and climate change adaptation measures. The disaster risk responses, and related infrastructure and systems that are implemented now to respond to climate related disasters, will help to strengthen the capacity of the country to respond to future climate risks.

Developing an early warning, vulnerability and adaptation monitoring system is one of six adaptation goals highlighted in the country's NDC outlined six adaptation NDC (A-NDC) goals covering adaptation objectives and planning, adaptation needs and costs and adaptation investments and set out how national commitments for adaptation will be met over the period 2020 to 2030, (Figure 1).

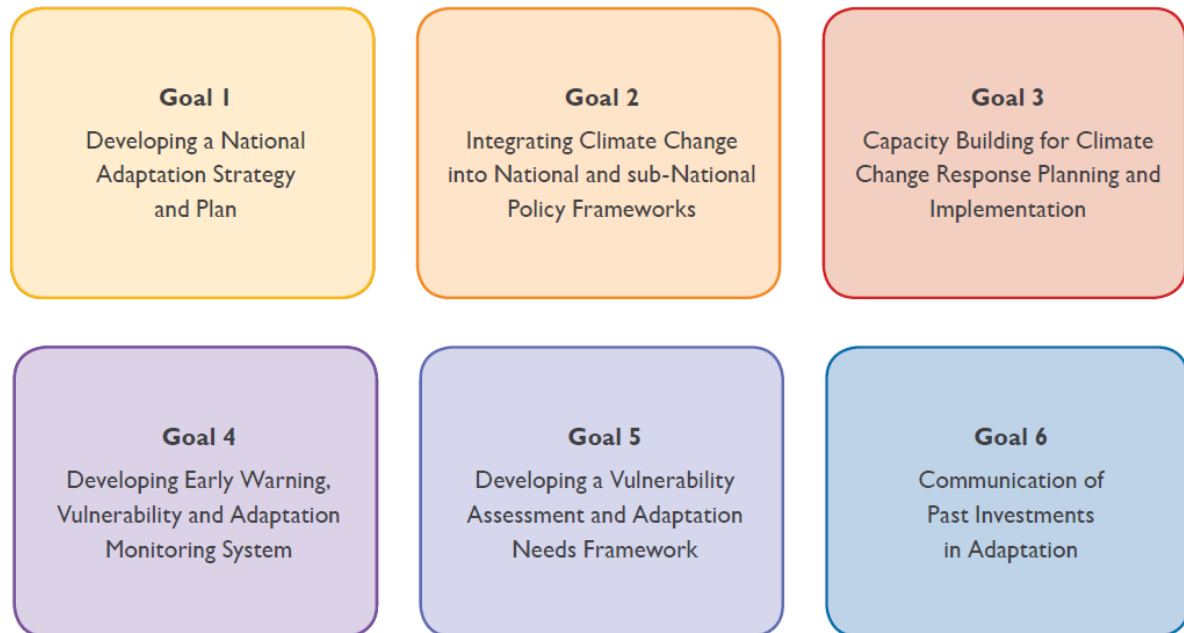


Figure 1. Overview of South Africa's adaptation NDC (DEA, 2017)

Initiatives such as the Long Term Adaptation Scenarios (LTAS), the South African Risk and Vulnerability Atlas (SARVA), and the Third National Communication (TNC) have assisted with understanding and communicating climate risks, such that stakeholders have access to information on potential future climate risks and have a starting point to develop response plans (DEA, 2018). Recent collaboration between different weather services, emergency services and other organisations has resulted in much improved early warning systems, and a subsequent reduction in damage to infrastructure and loss of life as a result of disasters (DEA & SAWS 2016). The table below highlights some of the national early warning disaster management systems that have been developed to prepare for different types of disasters, including flood, drought and fire (DEA, 2019b).

Table 3. Disaster management warning systems (DEA and SAWS, 2016; DEA 2015c; EM, 2019)

System name	Function of the system	System Developers
The South African Flash Flood Guidance (SAFFG) system	The system provides guidance on potential flash flood watches and warnings within 1 to 6 hours	SAWS
National Storm Surge Early Warning System	Tide conditions, wave height and local atmospheric conditions provide an indication on storm surge conditions and the issuing of storm surge alerts	SAWS
Drought Early Warning systems	Provides information on drought conditions based on the interpretation of satellite and climate data	NDMC
The Drought Monitoring Desk	System provides information on long range seasonal forecasts, observed rainfall as well as maps of Standardised Precipitation Index (SPI)	SAWS
National Fire Danger Rating System (NFDRS)	Provides for the prevention of fires	CSIR/ DWS
The Advanced Fire Information System (AFIS)	System locate fires in near real time over Southern Africa	CSIR
Severe Weather Warning System (SWWS)	Aims to make warnings easy to understand by the public, and focuses on managing disaster at a community level. The system integrates risk knowledge, monitoring and warning, dissemination, and response capability. The SWWS relies on good interactions between SAWS and local disaster management centres	SAWS
Wide Area Monitoring Information System (WAMIS)	Uses satellite data to provide real-time monitoring and mapping of extreme events such as fires, floods and droughts	CSIR
Forecast Early Warning System (FEWS)	Links hydraulic models, rainfall data and warning system in order to mitigate flooding	eThekweni Municipality
Water-level detection system	As soon as the water level at the low-level bridge on the Newton Park side in Nelson Mandela Bay Municipality is deemed dangerous, red lights will be switched on remotely to inform motorists that they cannot use the road safely any longer.	Nelson Mandela Bay Municipality
The Campbell Scientific system	State-of-the-art system lightening detection-warning system for Swayimana High School near Wartburg.	uMgungundlovu District Municipality
IMQS telemetry solution	Monitor water levels in the municipality's reservoirs that can be used by operators to monitor the status or condition of water supply equipment or infrastructure.	Stellenbosch Municipality
Lumkani fire detection system (Bonnici et al.	Heat sensors installed in 5000 shacks in Imizamo Yethu informal settlement, Cape Town and other communities. In the event of a fire situation, the in-	Lumkani

System name	Function of the system	System Developers
2019)	home hear detector will sound an alarm, alerting the family inside the home enabling them to be proactive before the fire becomes unmanageable. A community wide alert is transmitted if the in-home device is not silenced after 20s.	

4.2. Overview of what has been or is currently being done in the focus area in terms of M&E

The draft National Climate Change Adaptation Strategy outlines priority areas for adaptation with the aim of guiding adaptation efforts and informing resource allocation. The strategy lists nine strategic interventions, one of which, Intervention 2, is to “Develop a risk, early warning, vulnerability and adaptation monitoring system for key climate vulnerable sectors and geographic areas”. Strategic Outcome 2.1, “An Early warning and monitoring system for key climate vulnerable sectors and geographic areas developed and implemented” is the intended outcome for Intervention 2. Monitoring needed for this outcome includes:

- i. historical climate trends;
- ii. fine-scale projections, forecasts (seasonal to inter-annual and intra-seasonal variability) and early warning systems for provincial and municipal use;
- iii. dissemination and communication platforms for weather and climate-related events (e.g. SMS and media);
- iv. utilisation of data/information products by end-users; and
- v. maintenance and enhancements of monitoring and forecasting facilities/networks.

Table 4 highlights the associated actions, lead organisation, partners, timeframe and indicators associated with Strategic Outcome 2.1 in the draft NCCAS. The desired adaptation outcome for monitoring and evaluation (G3) “Accurate climate information (e.g. historical climate trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate-related events) provided by existing and new monitoring and forecasting facilities/networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction”, is linked to Strategic Outcome 2.1.

Table 4. Actions, lead organisations, partners, timeframes and indicators linked to Outcome 2.1 (timeframe: medium term) (adapted from DEA, 2019b)

	Action	Lead	Partners	Indicator
2.1.1	Improve the climate monitoring and observation network	SAWS	DEA	Reliable, comparable, up to date climate data available

2.1.2	Develop a national climate information and early warning system	SAWS	COGTA	An efficient national information system
2.1.3	Develop provincial early warning systems for vulnerable geographical areas	Provincial lead departments	DEA, SAWS	Number of provincial early warning systems
2.1.4	Develop municipal early warning systems for vulnerable geographical areas	Local Government	DEA, SAWS	Number of municipal early warning systems
2.1.5	Improve/develop national early warning systems for key climate vulnerable sectors and risks	Sector departments	DEA, SAWS	Number of national early warning systems for key sectors and risks
2.1.6	Develop and support a climate change early warning and vulnerability network with the involvement of relevant stakeholders	SAWS	DEA	A multi-stakeholder network that collaborates and shares information on early warning systems established
2.1.7	Investigate alternative technologies that can be used	DEA	SAWS	A number of alternative early warning system application options
2.1.8	Disaster risk management and reduction in coastal areas	SANTAM	Local municipalities, Department of cooperative governance and traditional affairs	Research and support on risk and resilience and disaster management. Work together with coastal municipalities to reduce risk, e.g. the Eden District Municipality.
2.1.8	Climate Monitoring Services	ARC-ISCW	DAFF	Maintains an operational national agro-climate network of weather stations (approximately 500) and a climate databank.
2.1.9	Seasonal Weather Forecast	ARC-ISCW	DAFF	Seasonal Weather Forecast Communication Project
2.1.10	Environmental observation network	SAEON	DST	<i>in situ</i> South African Earth observation network that delivers long-term reliable data for scientific research and informs decision-making for a knowledge society and improved quality of life.
2.1.11	Climate Change & Disaster Management	DAFF	DST	Implement climate change programmes in support of risk and disaster management

2.1.12	Climate change risk and vulnerability tool for the SA coast	DEA	CSIR	The coastal viewer provide data to support decision making processes focussing on access to the coast, protecting sensitive coastal ecosystems and protecting people, property and economic activities that may be affected by dynamic coastal processes.
2.1.13	Research on Geohazards in coastal areas	Council for Geoscience		Geoscientific investigations to assess the suitability of several coastal localities for the development of critical infrastructure
2.1.14	Research on cities and climate change	South African Cities Network (SACN)		Analyse the effectiveness of climate change resilience systems in cities
2.1.15	Disaster information: vulnerability and early warning	National Disaster Management Centre	Department of cooperative governance and traditional affairs	Promote an integrated and co-ordinated system of disaster management, with special emphasis on prevention and mitigation, by national, provincial and municipal organs of state

4.3. Gaps identified in terms of M&E for focus area

A number of national and sector specific early warning systems have been implemented in South Africa (Table 3), however, there is a need to improve the coordination of early warning systems in the different spheres of government. This can be facilitated through developing a climate change early warning and vulnerability network to create a common understanding of the status of early warning systems; share information and promote collaboration among role players such as government and research institutions, technology start-ups, community organisations and neighbouring states.

While the DAOs have been developed to complement the building blocks of South Africa's monitoring and evaluation framework and to facilitate and focus the M&E of the country's progress towards resilience, there remains gaps in terms of M&E that need to be addressed. Based on input at a national stakeholder consultation meeting for the ICAT-A project in March 2019, it was agreed that there was a need to refine existing measures for M&E in the area of disaster risk reduction (DAO G3), as the focus area of the ICAT-A project for South Africa) and to include more detail in terms of defining indicators used and assessing what can be improved. It is also necessary to develop a better understanding of what tools can support refining the indicators and assessing what are the associated capacity building needs.

In addition, there is a need to identify gaps in the monitoring and observation network and addressing these gaps to ensure that national climate data is reliable, comparable, up to date and accessible (DEA, 2019b). For example, in terms of drought management, an assessment is required to investigate the barriers to the implementation of drought management responses across government tiers. Streamlining and promoting collaborations between disaster management government stakeholder committees at various tiers can improve the communication of drought warnings and emergencies when these occur (Baudoin et al. 2017). Research on how to involve the private sector/insurance schemes in this effort is also needed to identify pathways to supplement governmental resources for risk preparedness and responses. The digital application AgriCloud (Walker et al. 2018) is just one example where R&D activities are supporting farmers to adapt to drought events. Seasonal forecasts can be a suitable data source to quantify and map drought risks for farmers, however there have been barriers experienced to effectively disseminating seasonal forecasts to the broader agriculture community including complexity of the data, coarse spatial resolution and accuracy of the forecasts (Wilk et al. 2017). Information could be collected in greater detail on emerging drought conditions based on regular monitoring of suitable indicators and observations, as well as ground truthing of vegetation activity maps to validate, update and increase map accuracy. Disaster Management Services at provincial level could investigate if officers at the district municipality and service centre levels can understand and interpret Seasonal Forecast texts and maps. District municipality forums can be created for agricultural extension officers to collectively discuss the latest Seasonal Forecasts. Clear understandings within government is needed about the roles that different provincial divisions have in making seasonal forecast informed recommendations about crop and animal management, who has responsibility for disseminating them to district municipality and service centre levels and through which channels in order to improve communication platforms and increase dialogue between agriculture and disaster management stakeholders. Policy changes could make the collection and bottom-up dissemination of information about emerging drought conditions from ground observations and monitoring to higher administrative levels mandatory and include directives that guide the integration of the information with the latest forecasts.

5. Next steps

The focus area selected for South Africa in the ICAT-A project is early warning systems, with an initial focus on coastal regions, with the aim of enhancing efficiency in monitoring and tracking effectiveness of adaptation actions of early warning systems in South Africa towards supporting the country's NFCS and the Desired Adaptation Outcomes. A stakeholder mapping was done to get an understanding of key experts and decision-making organisations or groups at different tiers of government and across institutions involved in disaster risk reduction and early warning systems. The output of this was a stakeholder mapping report and additional stakeholders may be included, where relevant, as Phase 1 progresses. A database of adaptation projects, based on the national climate change response database, has been used to shortlist selected adaptation projects for use in identifying pilot case studies.

The next step is to hold a series of focussed stakeholder consultations with targeted groups of stakeholders to further refine these shortlisted projects, identify additional studies for use as pilot studies which can be used to test and refine the basic tools and methodologies identified for use in the ICAT-A study, as well as identify additional stakeholders relevant for inclusion in the policy-practitioner-expert dialogue platform that will be formed. These workshops will also serve to develop a better understanding of capacity needs to support M&E within these projects and how capacity development can contribute to bridging some of the gaps identified in the study. These stakeholder inputs will inform the capacity needs assessment component of this project in terms of user needs, and resources and activities required going forward. The basic tools and methodologies identified in Activity 1 of this study will be discussed with stakeholders in further consultations to ensure they are relevant to the country needs and how they can best be refined and utilised to ensure they are relevant to national needs.

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