Briefing by SAWS on the support that is provided to farmers in response to climate change and the current drought

Parliamentary Portfolio Committee on Agriculture

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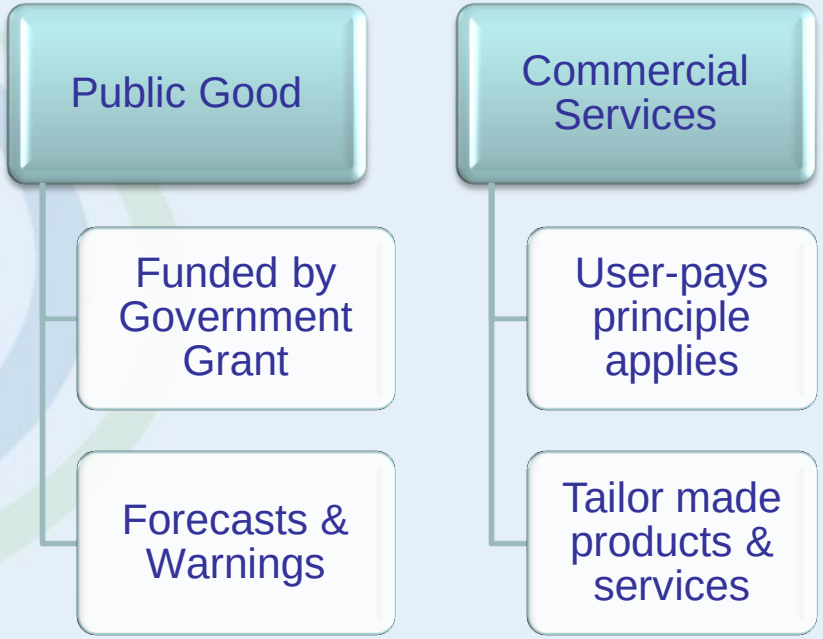
Introduction

Mandate

Established as a Schedule 3A public entity on 15 June 2001

Two distinct Services: Public Good & Commercial



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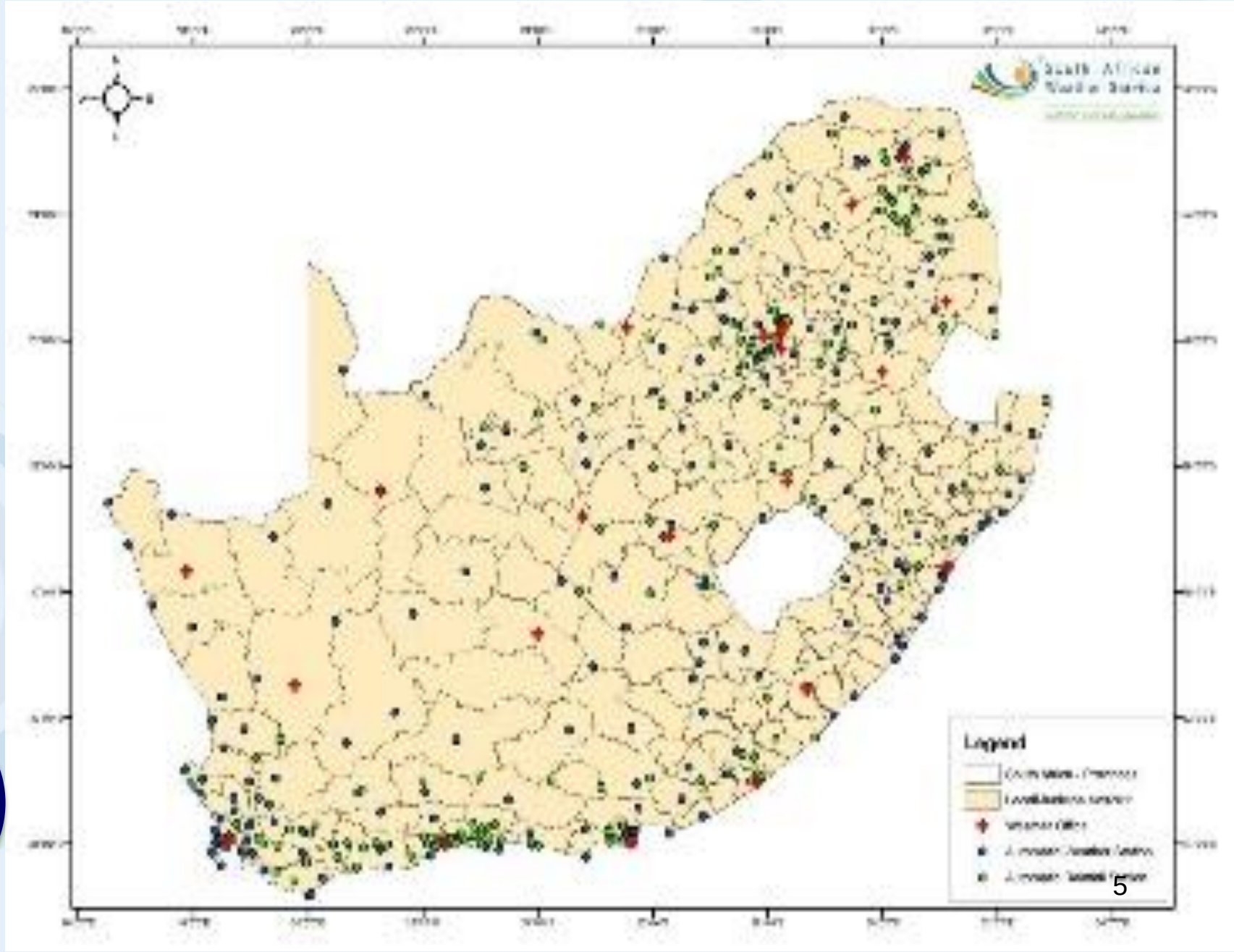
Footprint of key infrastructure per municipality - 2011

- *1277 Rainfall Stations*
- *214 Automatic Weather Stations (AWS)*
- *24 Lightning Detection Network Sensors*
- *141 Automatic Rainfall Stations (ARS)*
- *25 Climate Stations*
- *14 Meteorological Radar Systems (C-, S- and X-Band)*



Purpose

- To brief the Portfolio Committee on Agriculture, Forestry and Fisheries on the South African Weather Service (SAWS) Value Proposition for Agricultural sector:

  - assist the agricultural community to be well prepared for climate changes and weather issues that could affect crops, livestock and livelihood

  - play an advisory role that informs relevant stakeholders beforehand of weather and climate patterns/issues likely to affect the agricultural sector

  - Provide an overview of SAWS response to the Government Drought Plan

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Climate change Challenges for the Agricultural Sector

- Climate change affects rainfall, temperature and water availability for agriculture in vulnerable areas.
- Weather and climate are critical for agriculture in risk assessment and agricultural production management systems (crop planning and irrigation scheduling, for example)
- Degradation of arable soils and loss of fertility due to high exposure to climatic stress and human pressure on forests and other vegetation cower under a changing climate will lead to a 50% drop in agricultural production in Africa by 2030.
- Persistent drought due to increase in temperature and unreliable rainfall patterns, is expected to affect the lifestyles of most of the migratory wild species, in particular the wildebeest and some bird species.
- Increasing temperatures, in combination with changes in rainfall and humidity, may have significant impacts on wildlife, domestic animals and human diseases.
- The increase in water temperature has detrimental effects on the physiology of marine organisms

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Who is likely to suffer the most?

- Drought effects are felt by:
  - Municipalities, Business Community, Agricultural enterprises,
  - Households and Individuals,
  - Government (at National, Regional and Local level).
  - Everyone……(you and me)

- In South Africa, worst affected regions are:
  - KwaZulu-Natal, the Free State, Limpopo, North West and the Northern Cape, where farmers growing white and yellow maize, soya beans and sunflower have already incurred major losses. We have already observed impacted livestock farming.

SAWS Strategic context – Agricultural Sector

South African Weather Services Value Chain – Enabling the Agricultural Sector

Strategy

Networks Data Collection	Science Processing & Data Management	Devices Dissemination	Content Value Add

Weather – ready Nation

- Develop Products and services enabling the Agricultural Sector
- Develop and facilitate Implementation of National Framework for Climate Services in partnership with various stakeholders
- Socio-economic benefits study

Scientific Capability

- R&D and Innovation towards establishing a robust Agro-Hydrometeorology
- competence

Infrastructure Recapitalisation

Capacity Development

- Infrastructure upgrade, expansion and optimisation
- Improved service delivery to the agricultural sector – adoption of new products and applications

Human Capital Development

Skills Development

National Education Plan

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SAWS Climate Change and Drought Response Initiatives

Forecasting Services

Weather Forecasts and Warnings

Observations	Numerical Weather Prediction	Global Climate Model	Coupled: GCM+ Ocean

Tools

- Satellite
- Radar
- SAFFG
- Synops
- LDN
- Upper Air

- Regional (SADC)
- Local (SA)
- Mesoscale
- Ensembles
- MOS

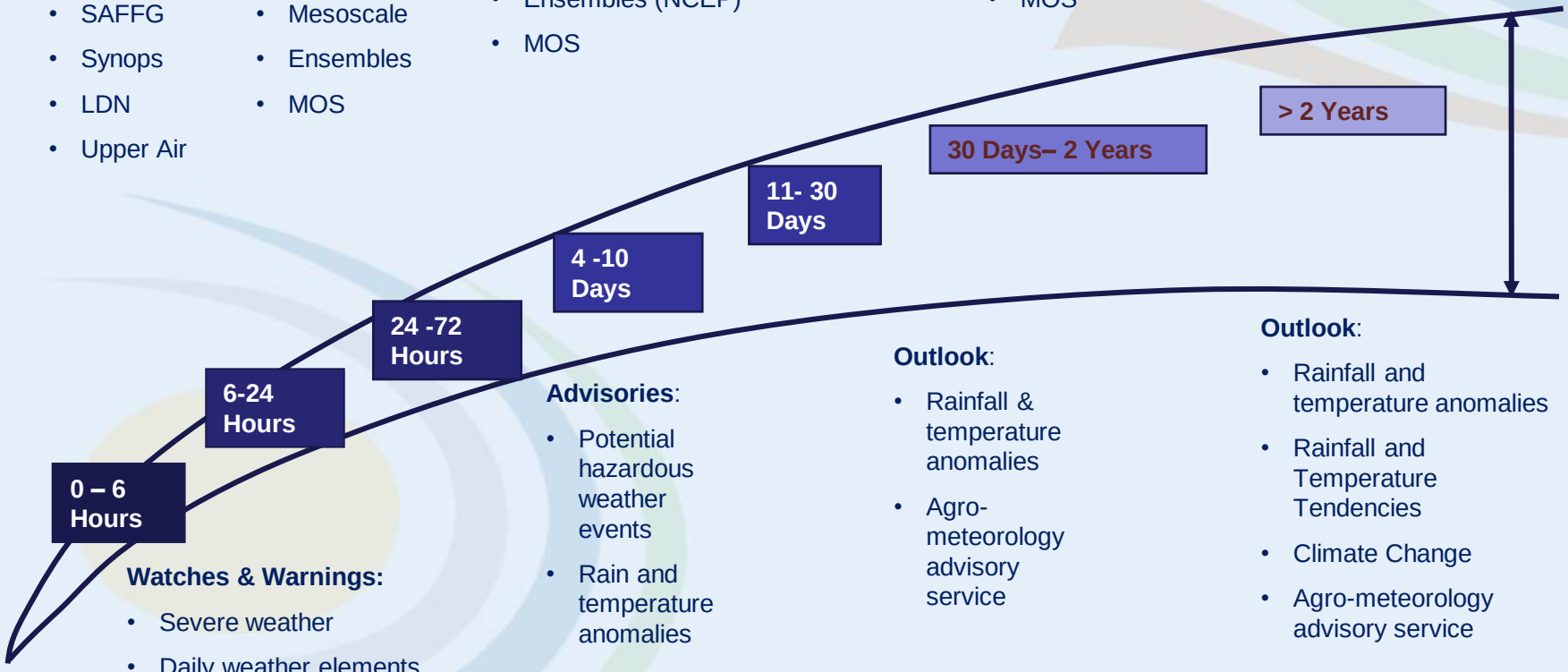
- Medium range (ECMWF)
- Ensembles (NCEP)
- MOS

- Ensembles
- MOS

- Multi-model Ensembles
- MOS

- Ocean Models - GCM Ensembles

Forecast



Products

Watches & Warnings:

- Severe weather
- Daily weather elements

Advisories:

- Potential hazardous weather events
- Rain and temperature anomalies

Outlook:

- Rainfall & temperature anomalies
- Agro-meteorology advisory service

Outlook:

- Rainfall and temperature anomalies
- Rainfall and Temperature Tendencies
- Climate Change
- Agro-meteorology advisory service

Benefits

- Reducing the vulnerability of society, crops and livestock to climate-related hazards - air pollution, heat, floods, drought, lightning detection and diseases
- Build necessary skills in the agro sector that enables better decisions – offering training to farmers and ensuring protection of assets
- Maximising the utilisation of existing weather and climate service infrastructure
- Improving coordination, and strengthening and building infrastructure where needed – strategically positioning observation network

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Customized solutions for the Agricultural Sector

Prior to a severe weather event

- **Customised Forecasts**
  (low rainfall patterns e.g.. Kakamas)
- **Instrumentation**
  (geo-specific monitoring some AWS's on farms)

Real-time (During the severe weather event)

- **Lightning Detection**
  (Prevent damage to property and loss of life)
- **Storm notification**
  (e.g.. move livestock to a safer area – prevent drownings)

After a severe weather event

- **Climate information**
  (Risk planning and activities e. g. Dairy vs game farming)
- **Tailored products and channels**
  (geo-specific apps e.g.. rainmaps)

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Forecasts or predictions

Target – Agricultural and other economic sectors
e.g. Forestry plantations - Mondi

Record Reference: MF-FORECAST-WCUFPA-04_03_2016 Date: Fri 04 Mar 08:03:35 2016

FIRE DANGER INDEX AND WEATHER FORECAST issued @ 08:03 on Fri 04 Mar 2016

Lowveld FDI Description	Colour	Category	Lowveld FDI Precaution
SAFE	BLUE	0 - 20	Low fire hazard. Controlled burn operations can normally be executed with a reasonable degree of safety
MODERATE	GREEN	21 - 45	Although controlled burning operations can be executed without crating a fire hazard, care must be taken when burning on exposed, dry slopes. Keep constant watch for unexpected wind speed and direction changes
DANGEROUS	YELLOW	46 - 60	Controlled burning not recommended when fire danger index exceeds 45. Aircraft should be called in at early stages of a fire.
VERY DANGEROUS	ORANGE	61 - 75	No controlled burning of any nature should take place. Careful note should be taken of any sign of smoke anywhere, especially on the upwind side of any plantation. Any fire should be attacked with maximum force at hand, including all aircraft at the time.
EXTREMELY DANGEROUS	RED	75<	All personnel and equipment should be removed from the field. Fire teams, labour and equipment are to be placed on full stand-by. At first sign of smoke, every possible measure sjoud be taken in order to bring the fire under control in the shortest possible time. all available aircraft are to be called for without delay.

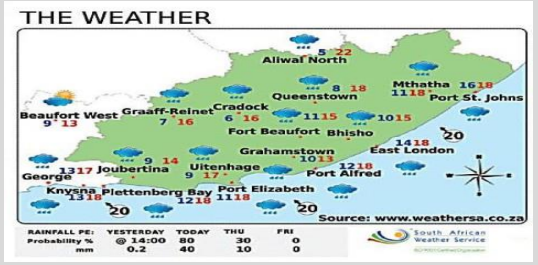
3. **CAPE PENINSULA FPA** - Cape Metropolitan

Forecast for Fri 04 Mar 2016	Min Temp(C)	Max Temp(C)	Max Hum (%)	Min Hum (%)	Prob Rain %	Rain (mm)	Low-veld FDI-D	Low-veld FDI-W
City Of Cape Town 1 / Cape Point	18	24	85	75	0	0	43	43

Time	Temp C	Weather	Wind Speed	Wind Gusts
08:00	18	Clear skies	SE 28 km/h	0 km/h
14:00	24	Clear skies	W 19 km/h	0 km/h
20:00	20	Clear skies	S 19 km/h	0 km/h

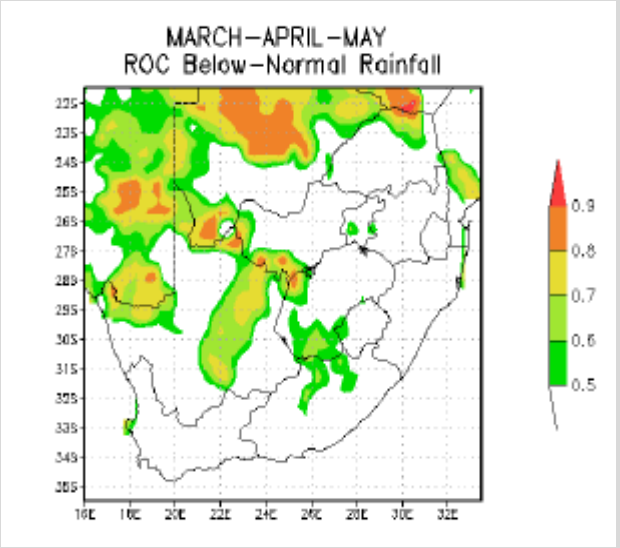
Forecast for Sat 05 Mar 2016	Min Temp(C)	Max Temp(C)	Max Hum (%)	Min Hum (%)	Prob Rain %	Rain (mm)	Low-veld FDI-D	Low-veld FDI-W
City Of Cape Town 1 / Cape Point	19	23	90	75	0	0	47	47

Time	Temp C	Weather	Wind Speed	Wind Gusts
08:00	19	Fog	SSE 19 km/h	0 km/h
14:00	24	Partly cloudy	SW 19 km/h	0 km/h
20:00	20	Partly cloudy	SW 28 km/h	0 km/h



HEAT AND FIRE DANGER INDEX

Seasonal Climate Watch



Benefits:

- Forecasts provided ahead of time to enable careful planning of resources around severe weather events
- Instrumentation with cameras enable visuals with key parameters to be viewed in key locations supporting quick decision making
- This product can assist farmers to put their safety measures such as ventilation when the heat value exceed certain threshold

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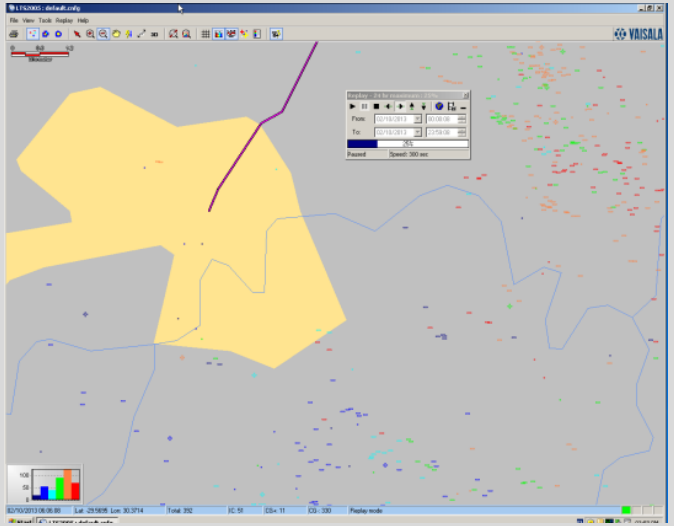
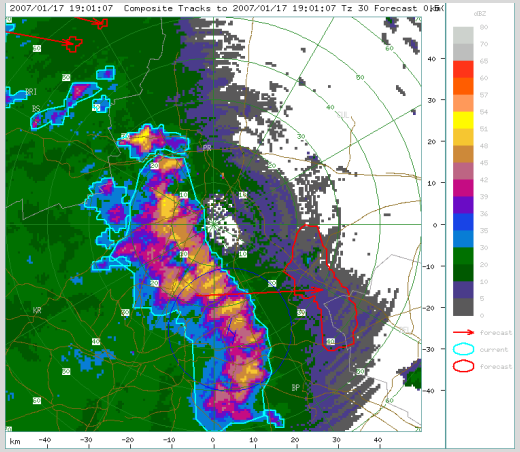
Real-time data

Lightning strokes as they occur



Instrumentation

Storm tracking



Benefits:

- Real-time data enables visual monitoring of weather conditions as it occurs
- *Farm safety*
- Tracking of lightning and storm activity increases capability to react quickly to address pertinent issues eg. fires, power outages

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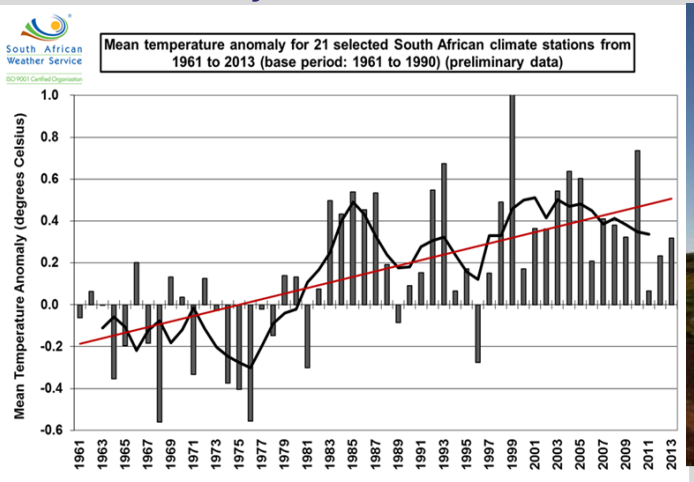
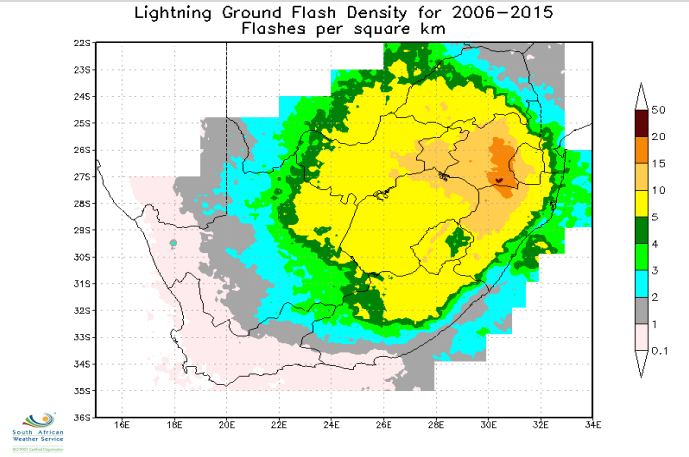
Historical data

Trend analysis - historical data



Lightning Ground Flash Density



Benefits:

More than 150 years of data for various positions across the country

All meteorological data can be processed in format to suit user requirements

- Trend analysis of the data provides insights for user specific outputs
- Long term climate trend analysis to determine the impacts of climate change on the severe weather phenomena

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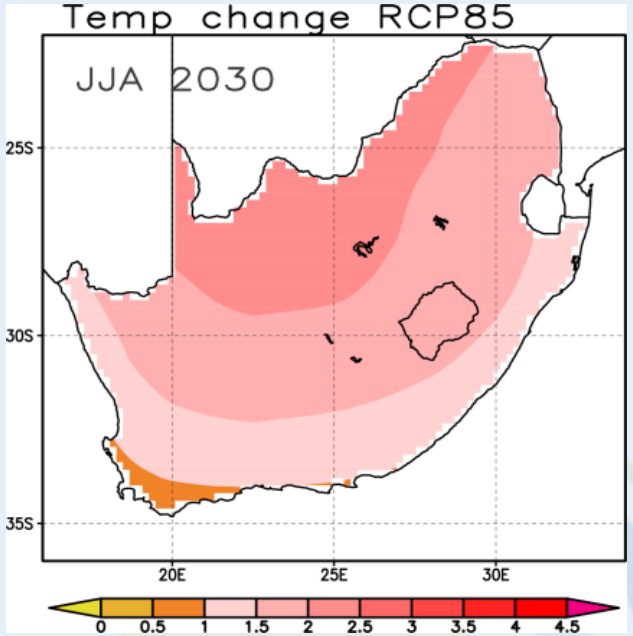
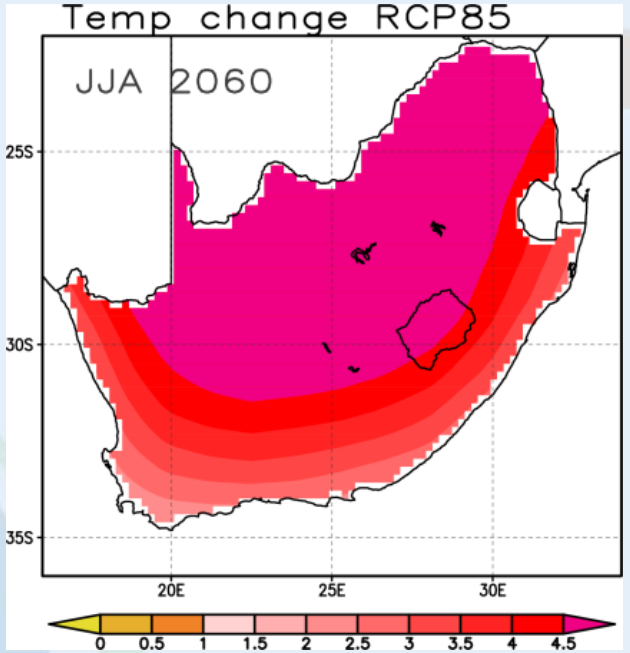
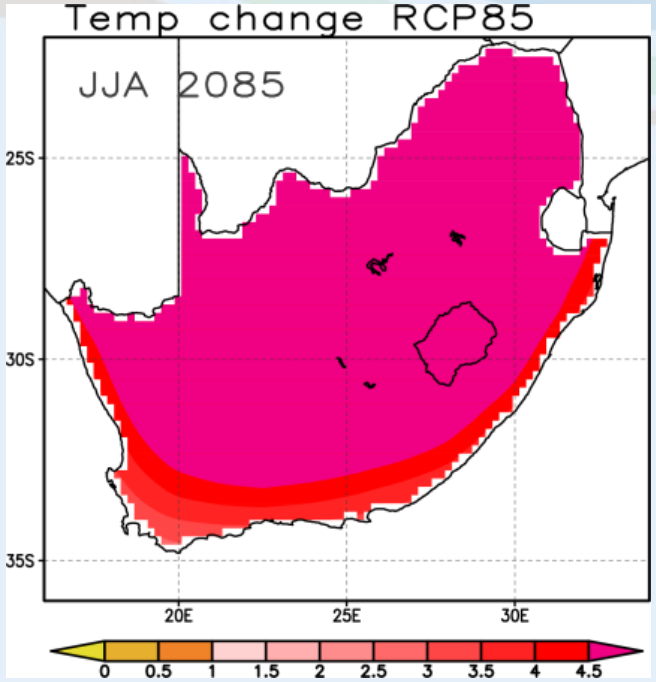
Research and Development

Scientific Capability/Knowledge Generation Research Projects

National Temperature Scenarios







- In the business-as-usual case (i.e. no mitigation), warming continues throughout the 21st century
- the inland areas are projected to warm by more than 4°C above the 1986-2005 reference period by 2071-2100 (centered on 2085, right panel)

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Findings - Eastern Cape Province

Variable	Findings
Temperature	With aggressive mitigation, the average 21st century warming is about 0.7°C [0.4 – 1.7] in all seasons
Temperature	With Business-as-usual scenario, warming increases progressively in the 21st century from about 0.9°C [0.6 – 1.5] between 2016-2045 to 2.2°C [1.7 – 3.2] during 2046-2075 and 3.3°C [2.6 – 4.9] towards the end of the century
Precipitation	Winter precipitation is projected to decrease by up to 15% [4 – 26%] towards the end of the century (2071 – 2100) under the business-as-usual scenario
Precipitation	The range is very wide during other seasons, with some models projecting an increase in precipitation and some projecting a decrease

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Findings - Free State Province

Variable	Findings
Temperature	With aggressive mitigation, the average 21st century temperature stabilize around 1.5°C [0.5 – 2.3] in all seasons
Temperature	With Business-as-usual scenario, warming increases progressively in the 21st century from about 1.2°C [0.7 – 1.9] between 2016-2045 to 2.7°C [1.9 – 4.1] during 2046-2075 and 4.2°C [3.2 – 6.2] towards the end of the century
Precipitation	Winter precipitation is projected to decrease by up to 20% [8 – 28%] towards the end of the century (2071–2100) under the business-as-usual scenario
Precipitation	The range is very wide during other seasons, with some models projecting an increase in precipitation and some projecting a decrease

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Findings – Gauteng and KZN

Gauteng

- In the business as usual case, warming reaches 6C towards the end of the 21st century

KZN

- Under the aggressive mitigation scenario, warming in the KZN is projected to remain below 2.5°C above the 1986-2005 reference period

- In the business-as-usual case warming exceed 4°C towards the end of the 21st century

- Projected changes in total seasonal rainfall have large uncertainties with no clear sign, an exception being under the intermediate concentration pathway

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Capacity Building Research Projects

Project Name	Deliverables - 2015/16	Outcomes
Impact-based SWWS (Severe Weather Warning System)	Prototype System developed and tested in a Pilot Area	Predict the likely severity of the impact of severe weather on communities
NEPAD Project	Trained farmers and agricultural extension officers on the use and application of agro-meteorological information towards climate change adaptation	Enhanced agricultural production and thus ensuring food supply and security
Adaptive capacity for small scale farmers-FAO Project	Testing different cultivars Set up of AWS	- Optimized agricultural farming under changing climate

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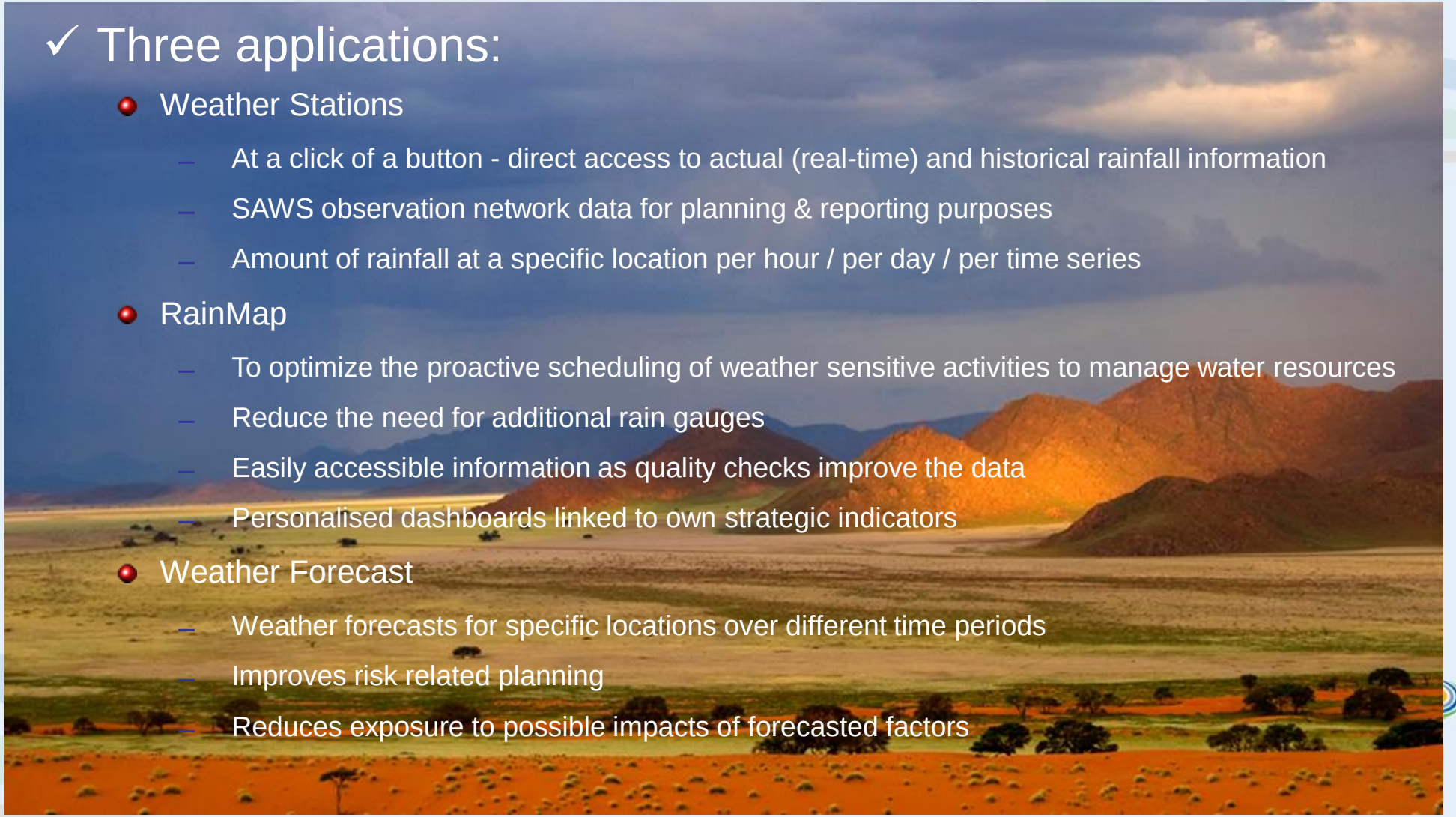
Product Development Research Projects

Project Name	Target market and product descriptor	Benefits
Temperature Humidity Index (THI) - (Development of a THI forecasting system)	• **Livestock farmers** (Informs farmers of increases in humidity and temperature that may impact production**)**	• **Enhanced production of milk and thus ensuring dairy food supply and security** • **Improved management of feed and ambient temperatures in intensive farming systems**
Enthalpy index - Heat index: Poultry (Enthalpy is the total heat content of air and serves as a key indicator for heat stress in animals)	• **Livestock farmers** (Informs intensive system farmers of heat stress conditions)	• **This product can assist farmers to put their safety measures such as ventilation when the heat value exceed certain threshold**
6 – 12 hour forecast of severe weather which includes storm tracking, hazardous weather notification e.g.. hail etc.	• **Crop and live stock farmers**	• **Warning to farmers prior to the event to implement loss reduction measures** • **Management of day to day operations**

Products and Services for the Agricultural Sector

HydroNET : Web Portal

- Customised weather-related web portals with security access, pprovides data and applications via the Internet to support weather sensitive industries to reduce water related challenges



✓ Three applications:

- Weather Stations
  - At a click of a button - direct access to actual (real-time) and historical rainfall information
  - SAWS observation network data for planning & reporting purposes
  - Amount of rainfall at a specific location per hour / per day / per time series
- RainMap
  - To optimize the proactive scheduling of weather sensitive activities to manage water resources
  - Reduce the need for additional rain gauges
  - Easily accessible information as quality checks improve the data
  - Personalised dashboards linked to own strategic indicators
- Weather Forecast
  - Weather forecasts for specific locations over different time periods
  - Improves risk related planning
  - Reduces exposure to possible impacts of forecasted factors

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Products and Services for the Agricultural Sector

Product Name	Description/application	Benefit to Agriculture
Real time satellite based rainfall estimation Rainfall Products: a) Convective Rain Rate(CRR) a) Hydro Estimator (HE) a) Rapidly Developing Thunderstorm(RDT)	Product is derived from the Nowcasting Satellite Application Facility (SAF). a) Real-time satellite based rainfall estimation adapted from the Nowcasting Satellite Application Facility (SAF) b) Real-time satellite and model based rainfall estimation product. c) RDT-monitors the phase (growing/decaying) and moment of thunderstorms	Planting time, harvesting time farming management

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Products and Services for the Agricultural Sector

Product Name	Description/application	Benefit to Agriculture
Severe Weather Forecasting Demonstration Products (SWFDP)	Product is derived from the Nowcasting Satellite Application Facility (SAF): a) Real-time satellite based rainfall estimation adapted from the Nowcasting Satellite Application Facility (SAF) b) Real-time satellite and model based rainfall estimation product. c) RDT-monitors the phase (growing/decaying) and moment of thunderstorms Various severe weather information maps and products supplied to the SWFDP-web	Planting time, harvesting time farming management
Utilizing Numerical weather prediction model to develop various application products: Products include: Frost Forecast (Agriculture) Future scenarios under climate change impacts(under development)		Information utilized for long term planning of agriculture

Community Rainfall Station

- Designed by SAWS for communities
- Product can be placed on farms or communal land(co-operatives)
- Placement in vulnerable areas to provide geo-specific rainfall information
- Built in modem for SMS dissemination

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Development of Agro-meteorology Capacity and Capability

SAWS Agro-meteorology Human Capacity Development

- Functional Agro-meteorology function – skilled experts
- Developed National Education Plan – Develop National capability – Skills at national, provincial and local government levels
- Regional Training Centre – WMO –accredited –Design courses focusing on agro-meteorology
- User capacity development projects – NEPAD project

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Enabling the Drought plan

SAWS contributions: Drought monitoring plan

- SAWS provides technical advisory service to the National Joint Drought Coordinating Committee as well as the Ministerial Committee on Drought
- SAWS contributed to the National Drought Monitoring Plan - SAWS Drought Monitoring plan attached
- SAWS Contributes to National Disaster Management Centres/National Agricultural Centres as follows:
  - Weekly reports on drought regarding rainfall, temperature (tmin, tmax, heat waves & drought index)
  - Seasonal outlooks(1-3 months ahead)
  - Report on dam/water reservoir levels
  - Communicate confidence level of likelihood and probability of events

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Conclusion

- Continue to enable the Agricultural sector:
  - Provision of sector-specific products and services
  - Provision of advisory services to industry and key decision makers
  - Continued monitoring of drought, water resources and climate change impacts
  - Collaboration with Key sector players
  - Capacity building
    - Train users on Interpretation, usage and pro-active response to weather and climate information
    - Infrastructure operation and maintenance
    - Availability of human capital skilled in agro-meteorology
- Infrastructure network expansion and optimisation
  - Improved prediction and accuracy
  - Strategic positioning of infrastructure – geo-specific information

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Thank You!
Questions?