agriculture, land reform & rural development

Department:
agriculture, land reform & rural development
NORTHERN CAPE PROVINCE
REPUBLIC OF SOUTH AFRICA

Northern Cape Province

EARLY WARNING COMMITTEE REPORT ON DROUGHT

MAY 2019

EXECUTIVE SUMMARY

The Northern Cape is experiencing one of the worst droughts in more than a century. The magnitude of this drought affects all five districts and it is recommended that all districts of the Province be declared as disaster areas and that the drought be classified as a Provincial disaster.

Currently almost 10 000 farms with a carrying capacity of 166 000 large stock units, covering more than 5.8 million hectares have experienced prolonged drought. This is estimated to escalate to 1 million large stock units if above normal rainfall is not reached during the coming winter and summer rain seasons.

Given current values of products and levels of production, it is estimated that the value of production during normal situation in the affected area, would amount to R691 million per annum. If the knock-on effect of backward and forward linkages to the rest of the economy is added, the total value of production for the entire economy is estimated at R2.143 billion per annum. The corresponding values for the potential affected area would increase to R4.370 billion and R13.546 billion respectively. It is estimated that production in the affected area will employ 3 774 full-time equivalent jobs and with the backward and forward linkages to the rest of the economy, it is responsible for 6 124 full-time equivalent jobs throughout the economy. The employment on direct level will be mostly in the affected area, while the additional employment through linkages is from direct level right throughout the entire economy and country. The corresponding values for the potential affected area would increase to 23 858 and 38 714 full-time equivalent jobs respectively.

It is estimated that the fiscal impact of the abovementioned production leads to an estimated R213 million contribution to taxes throughout the economy. The corresponding value for the potential affected area would increase to R1.346 billion.

The direct impact of this current drought and potential escalation if the drought prevails will be disastrous to the economy of the Northern Cape Province. **In order to assist currently affected farmers with drought relief, R 111.6 million will be required over a 3 month period.** This amount will escalate to R 612 million if below average rainfall continues and the drought intensifies towards December 2019.

1) INTRODUCTION

The Northern Cape is the largest province with a landmass of 361,830 km² and covering approximately 30% of South Africa. However, it has the smallest population (approximately 1.8% of population in South Africa). The province is divided into 5 district municipalities namely Frances Baard, Pixley ka Seme, Namakwa, ZF MgCawu and John Toalo Gaetsewe.

Despite the largely semi-arid and arid environment in the province, agricultural sector is regarded as one of the major contributors to job creation, food security and economic growth. Almost 35% of agricultural production in the Northern Cape contributes 32% of foreign earnings. 25% of these earnings go directly to labour. The Northern Cape has a healthy, self-sustaining agricultural economy, due to the fact that a large percentage of the agricultural earnings in the rural area are spent in the local economy, which make improved services possible.

Natural Resource Base

A number of vegetation units make up the area that constitutes the Northern Cape. Nama-Karoo, Desert, Savanna, Succulent Karoo and Fynbos are the five Biomes that make up the area. These biomes describe the general structure of the vegetation found in each area while more than 150 vegetation types fall within these biomes, each defined by the vegetation community occurring there.

Currently however, below average vegetation condition is experienced over most of the Northern Cape Province, spanning almost all of these vegetation communities. Stock farmers all over the Province are exposed to very limited food supply from natural rangelands and borehole levels in many areas and specifically in the winter rainfall and southern parts of the Karoo are dropping significantly. This puts severe strain on communities and negatively impacts on social security and job creation. Crop production in the Province is not affected due to access to irrigation water from mainly the Vaal, Riet and Orange Rivers. Dry land production of wheat and fodder crops in the Namakwa District has come to a standstill and farmers in the Roggeveld and Kamiesberg areas whom rely heavily on these plantings for animal feed are severely impacted. While all of the five districts of the Province are affected the main areas of concern remains the Richtersveld, winter rainfall areas and southern portion of Province around towns such as Loeriesfontein, Calvinia, Williston, Fraserburg, and Sutherland where below average rainfall has been experienced since 2014. Vegetation conditions in the southern and western portions of JTG and the entire Pixley ka Seme district are also deterioration at a rapid rate.

2) SITUATION ANALYSIS

Climatic data were obtained from the South African Weather Service, ARC, Soil Climate and Water and the National Oceanic and Atmospheric Administration Climate Prediction Centre. Predictive vegetation indices such as the SDVI, Vegetation Condition Index (VCI) and the Standardized Precipitation Index (SPI) were used as objective supporting instruments during physical visitations where drought stricken areas were investigated.

The disaster drought situation in large parts of the Northern Cape Province is supported by weather station data as well as satellite derived data and from this it is apparent that a large portion of this Province is experiencing below normal vegetation conditions and a number of weather stations recorded below average precipitation over the previous 12 months.

Figure 1 indicates the annual precipitation for the current season, while figure 2 expresses the seasonal precipitation as a percentage of the long term average.

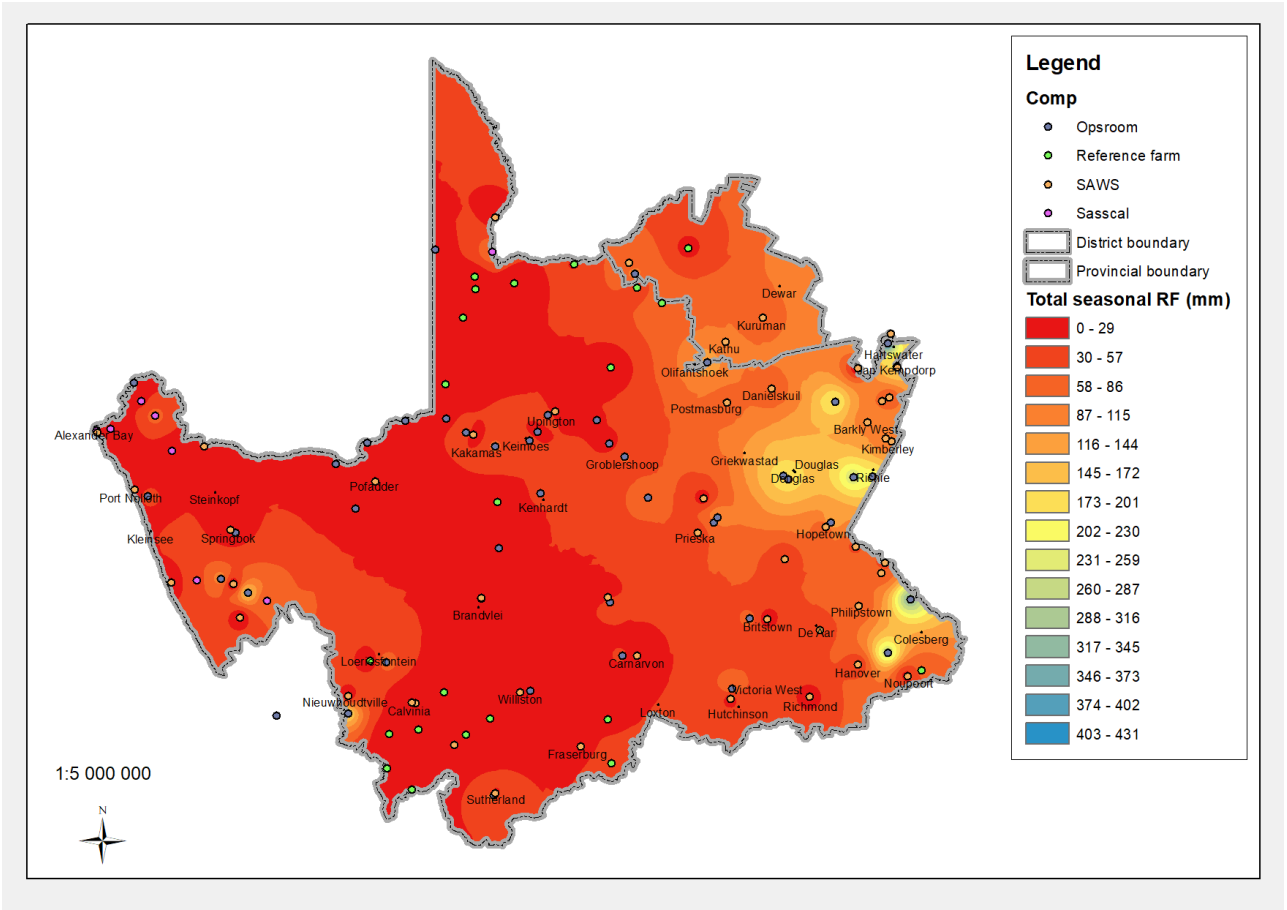


FIGURE 1: Annual rainfall (current season)

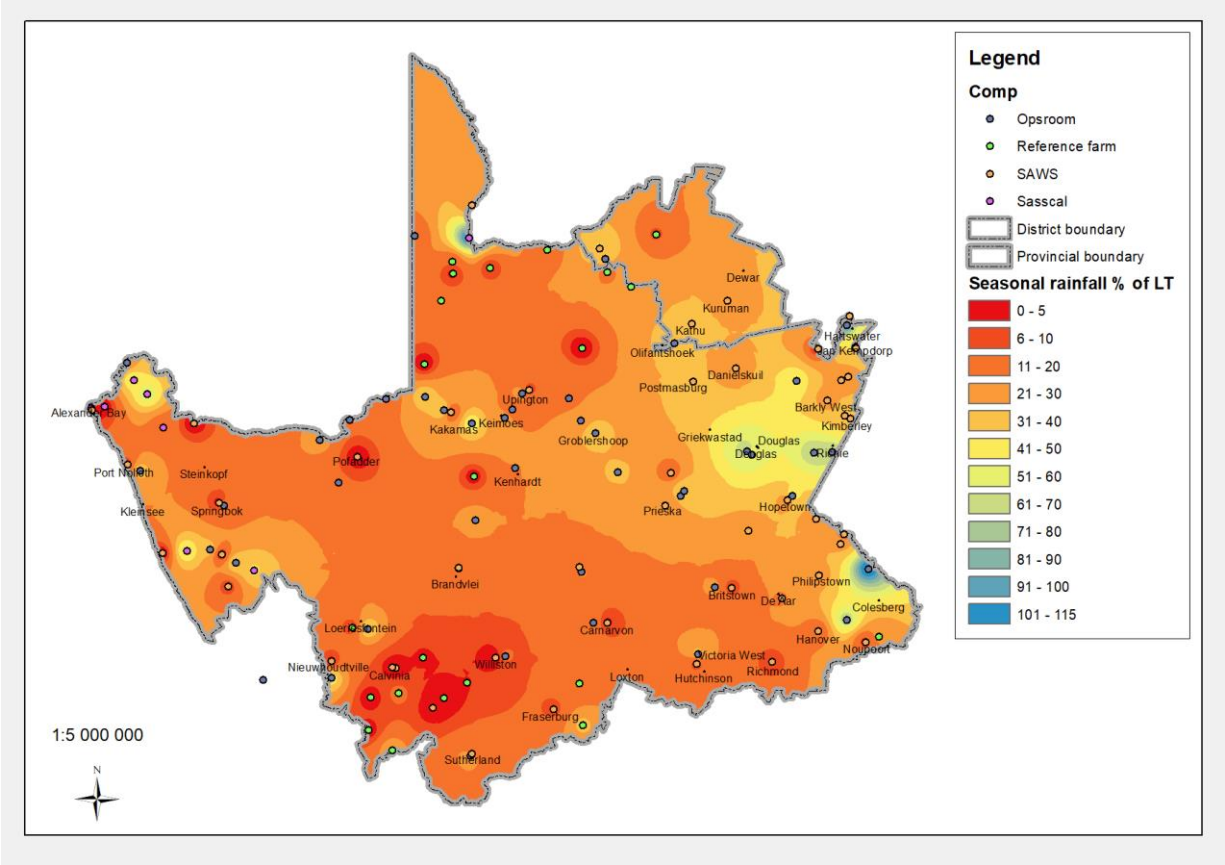


FIGURE 2: Annual rainfall as percentage of long term

From data presented in figures 1 and 2, it is clear that the majority of the Northern Cape is experiencing rainfall conditions, well below average. These maps are supported by individual weather stations. Figure 3 portrays the situation in Victoria-West.

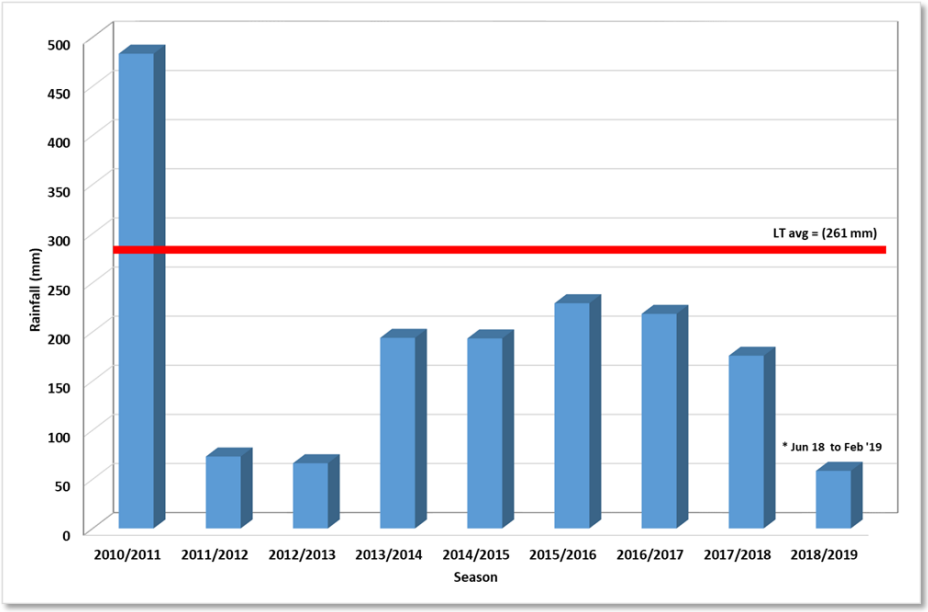


FIGURE 3: Rainfall trend versus long term average for Victoria-West

The effect of the lower than average rainfall is exacerbated by higher than average minimum and maximum temperatures throughout the Province (see Figure 4 as an example).

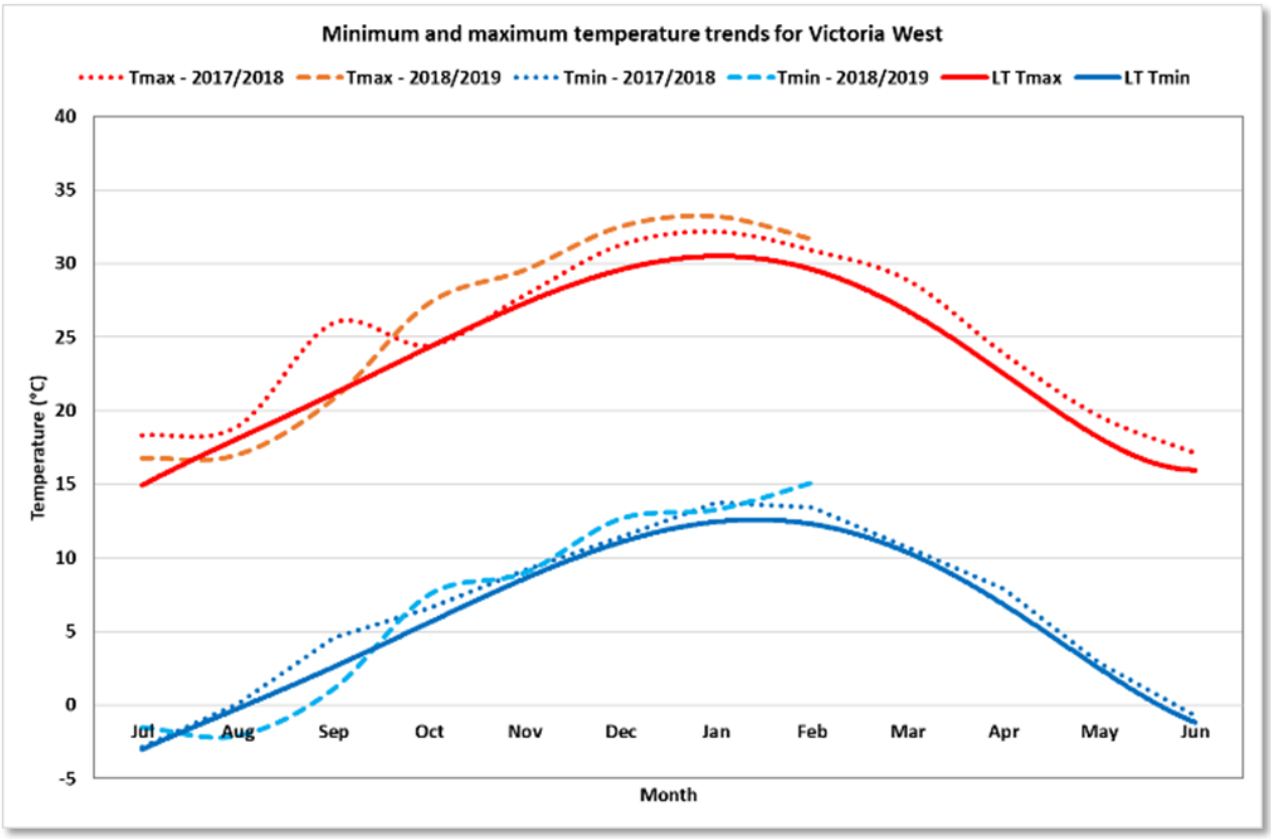


FIGURE 4: Minimum and maximum temperature trends for Victoria-West.

Indexes used as aid to physical investigation

Different drought indexes were used to assist in the investigation. Ground truthing were done by officials from the DALRRD as well as delegates from organized agriculture and individual farmers by physically driving through various regions of the Province. Deterioration of the area under investigation was apparent and this was confirmed by the following models.

1) The Standardised Precipitation Index

SPI is calculated by comparing the rainfall from a given weather station to the long term average of that specific area. It is a statistical exercise where the deviation from the mean is calculated. It is often used by National Department as indicator of drought, but depends heavily on density and spread of weather stations across a region.

2) The Standardized Difference Vegetation Index

NDVI imagery were found to be very useful in determining the extent of the drought conditions. It is computed using Infrared Reflectance and Red Band values. This describes vegetation activity and dense vegetation generally yield high values because of their relatively high near infrared reflectance and their low visible reflectance. This in itself will not be useful for drought detection. Therefore a

standardized, temporal image difference approach for change detection is used and thus comparing the same area with itself over time. While these images were consulted on a ten day basis, it was found to confirm the conditions as were experienced by the field survey. However, in order to standardise, it was decided by the drought committee to primarily make use of the Vegetation Condition Index for the purpose of this report.

3) Vegetation Condition Index

NDVI (Normalized Difference Vegetation Index) images generated from NOAA AVHRR GVI data are being used to monitor large scale drought patterns and their climatic impact on vegetation. The Vegetation Condition Index (VCI) is a tool to further separate regional NDVI variation from geographical contributions in order to assess regional drought impacts. This provide the opportunity to map areas with low vegetation activity and compare this activity with previous data sets.

VCI data was found to be very usefull in determining areas with low vegetation activity as compared to previous years. This index correlated well with conditions found during subjective assesments while visiting the region.

Standardized precipitation index

While this index is not suitable for the delineation of drought areas due to the sparse distribution of weather stations in this area, it does give an overall indication of the severity of the drought situation as to the end of January 2019 and supports the other remotely sensed data. See Figure 4.

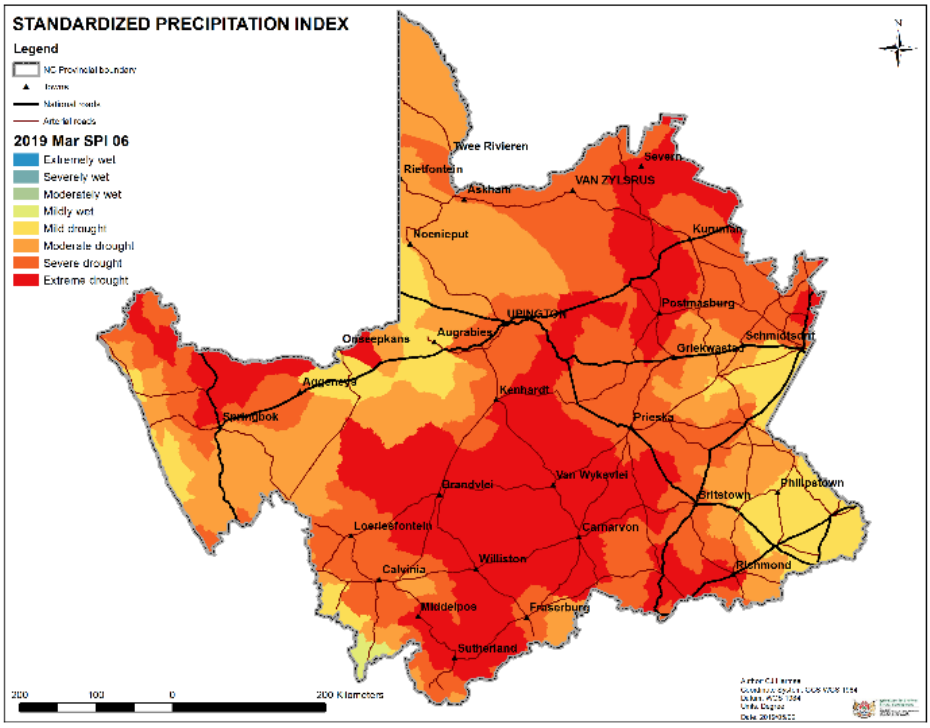


FIGURE 4. Six month Standardized Precipitation Index

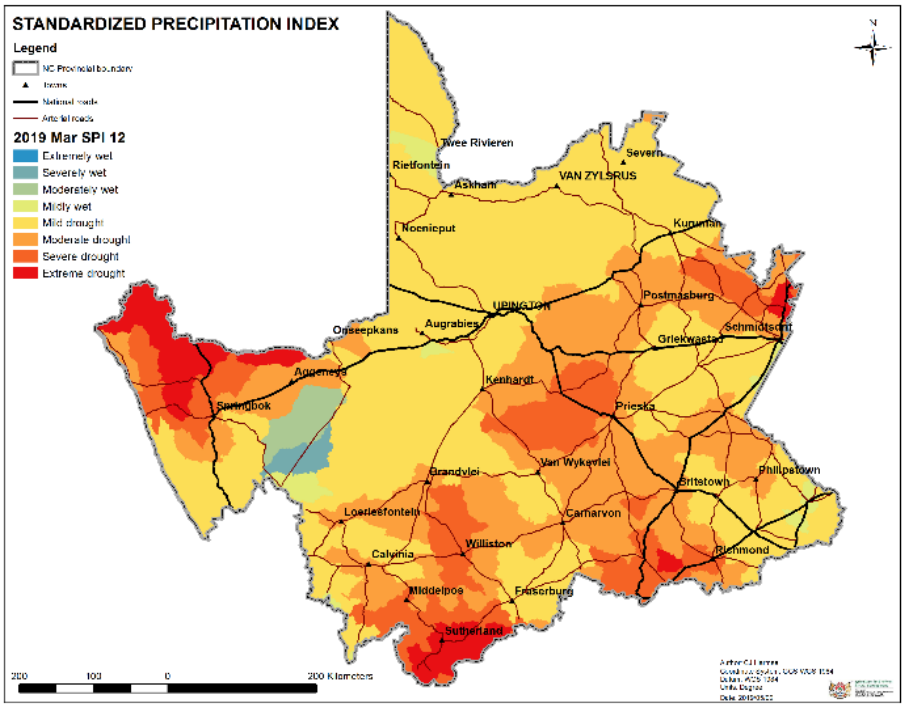


FIGURE 5. Twelve month Standardized Precipitation Index

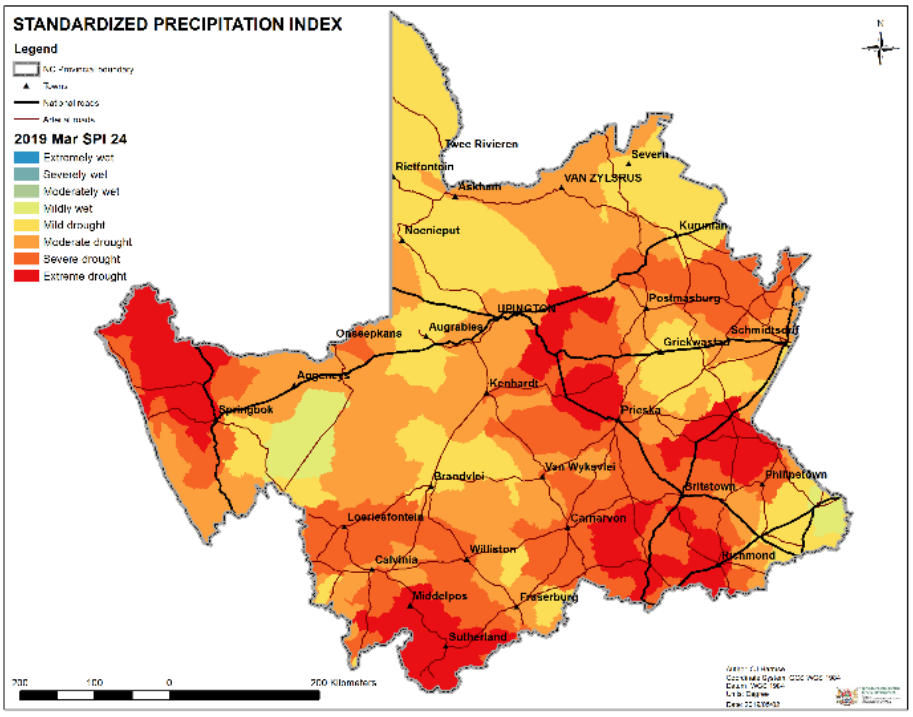


FIGURE 6: Standardized precipitation index for 24 months.

The 12 and 24 month SPI maps specifies the areas where prolonged drought have been experienced because of below normal rainfall over a long period. The lower precipitation in the early summer was preceded by lower than average winter rainfall. The cumulative effect of this is poor conditions for re-growth of vegetation during the spring period as a result of low soil moisture reserves which was exacerbated by an extremely summer period. The resultant precipitation indexes portrays the

situation as was observed. What is not displayed however is the fact that the pattern of precipitation was also erratic and rainfall which did occur was not always effective and occured outside the most favorable phenological stages for vegetative growth.

Vegetation condition

The NDVI derived vegetation condition data provides a simple graphical indicator that can be used to analyse remote sensing measurements. It is an index of plant "greenness" or photosynthetic activity where photosynthetically active vegetation absorbs most of the red light that hits it while reflecting much of the near infrared light. Vegetation that is dead or stressed reflects more red light and less near infrared light.

The Vegetation Condition Index where 23 years of data is being used, supports the drought as observed on ground level. From figure 7, it is clear that these are the worst drought conditions experienced this century in April for almost the entire Northern Cape Province.

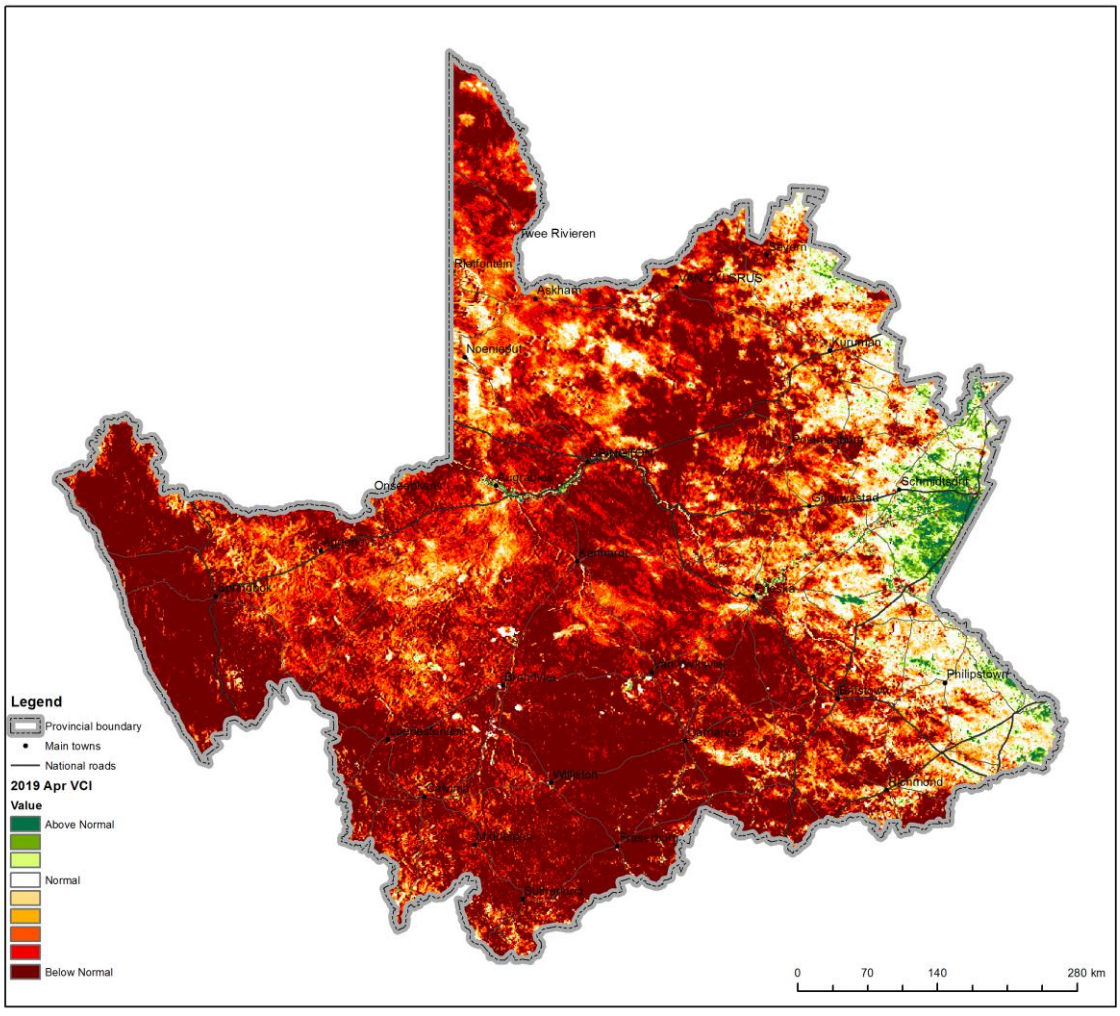


FIGURE 7: Vegetation Condition Index for April 2019

Figure 8 excludes the areas where drought conditions of a seasonal nature is prevailing and depicts the areas where drought has been experienced over an extended period as also supported by rainfall data.

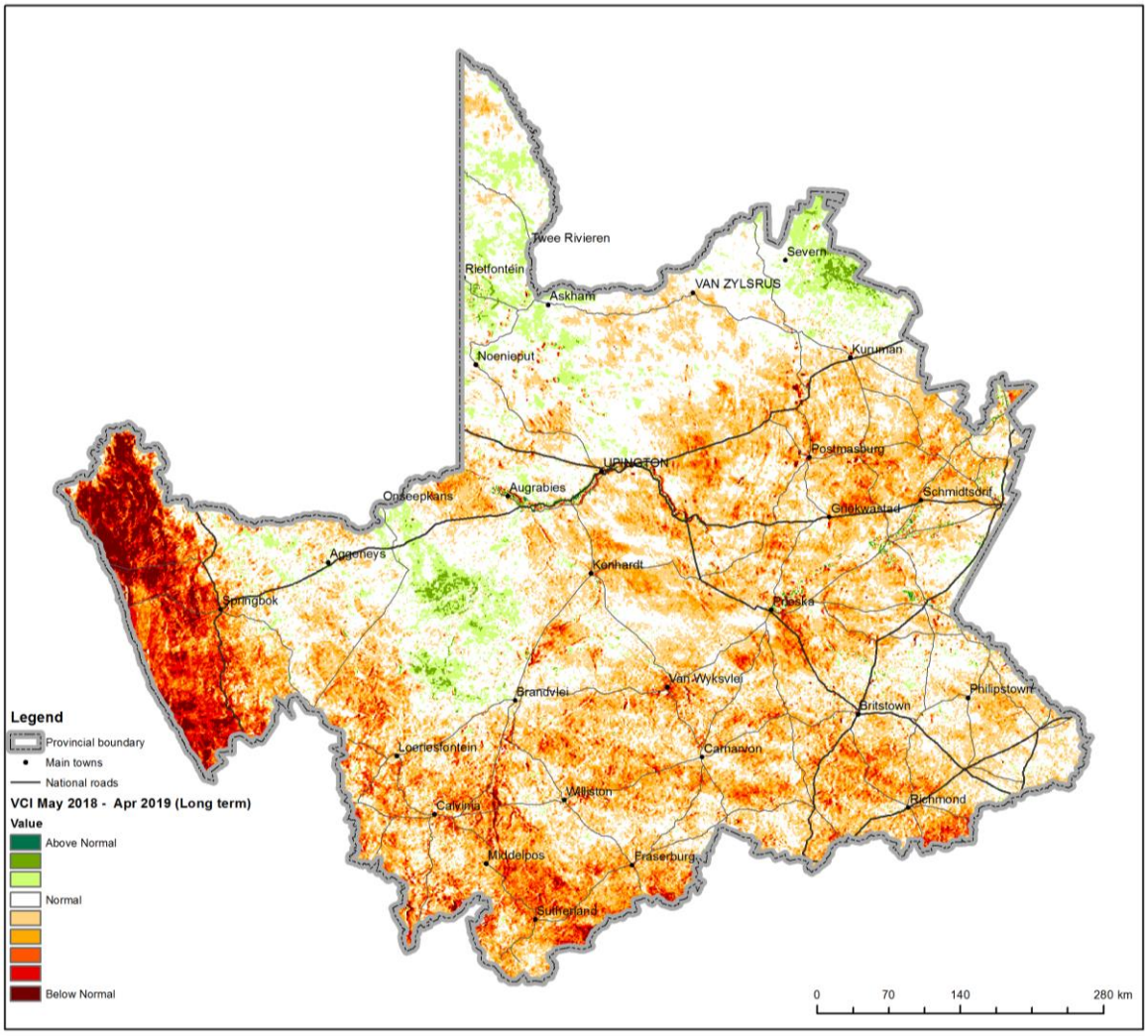


FIGURE 8: Vegetation condition index (Long term)

While the summer rain areas have only started to receive meaningful rain in April and early May 2019, the opposite is true for the winter rain area which is currently exposed to severe drought conditions which has reached disaster proportions.

3) CONTRIBUTION OF ANIMAL PRODUCTION TO NC ECONOMY (Also see attached report)

Given current values of products and levels of production, it is estimated that the value of production during normal situation in the affected area, would amount to R691 million per annum. If the knock-on effect of backward and forward linkages to the rest of the economy is added, the total value of production for the entire economy is estimated at R2.143 billion per annum. The corresponding values for the potential affected area would increase to R4.370 billion and R13.546 billion respectively.

The value that is added by this production (contribution to the Regional GDP) is calculated at R484 million per annum to the Region. This represents the value that is added by producers to the inputs they are utilizing to create their products. If the backward and forward linkages are included, the cumulative effect is that R1.037 billion is added annually to the Regional GDP and the rest of the economy. The corresponding values for the potential affected area would increase to R3.059 billion and R6.554 billion respectively.

This production also impacts households right throughout the production area, those involved in all related industries and businesses throughout the value chain and also those throughout the economy as they are influenced by the multiplier effects. It is calculated that the abovementioned production will add an amount of R121 million per annum to household income and is more or less evenly distributed between low-, middle- and high income households. The corresponding value for the potential affected area would increase to R765 million.

All economic activities are subjected to taxes, both on direct and indirect levels. All economic activities in the value chain, both forward and backward, are also subjected to taxes. It is estimated that the fiscal impact of the abovementioned production leads to an estimated R213 million contribution to taxes throughout the economy. The corresponding value for the potential affected area would increase to R1.346 billion.

Agricultural production normally has a positive effect on the balance of payment or the nett effect between exports and imports. With increased agricultural production there is prospect of increased exports, but it also decrease the dependency on imports. This has a positive effect on the balance of payment and contributes to strengthening the local currency, make all other imports cheaper. The abovementioned production is estimated to add R319 million annually to the balance of payment. The corresponding value for the potential affected area would increase to R2.019 billion.

The agricultural sector is an effective employer of labour per unit capital investment compared to other sectors. It is also one of the few sectors that can absorb a relative large part of unskilled and lower skilled labour. It is estimated that production in the affected area will employ 3 774 full-time equivalent jobs and with the backward and forward linkages to the rest of the economy, it is responsible for 6 124 full-time equivalent jobs throughout the economy. The employment on direct level will be mostly in the affected area, while the additional employment through linkages is from direct level right throughout the entire economy and country. The corresponding values for the potential affected area would increase to 23 858 and 38 714 full-time equivalent jobs respectively.

4) RELIEF REQUIRED AND EARLY WARNING (Animal Production)

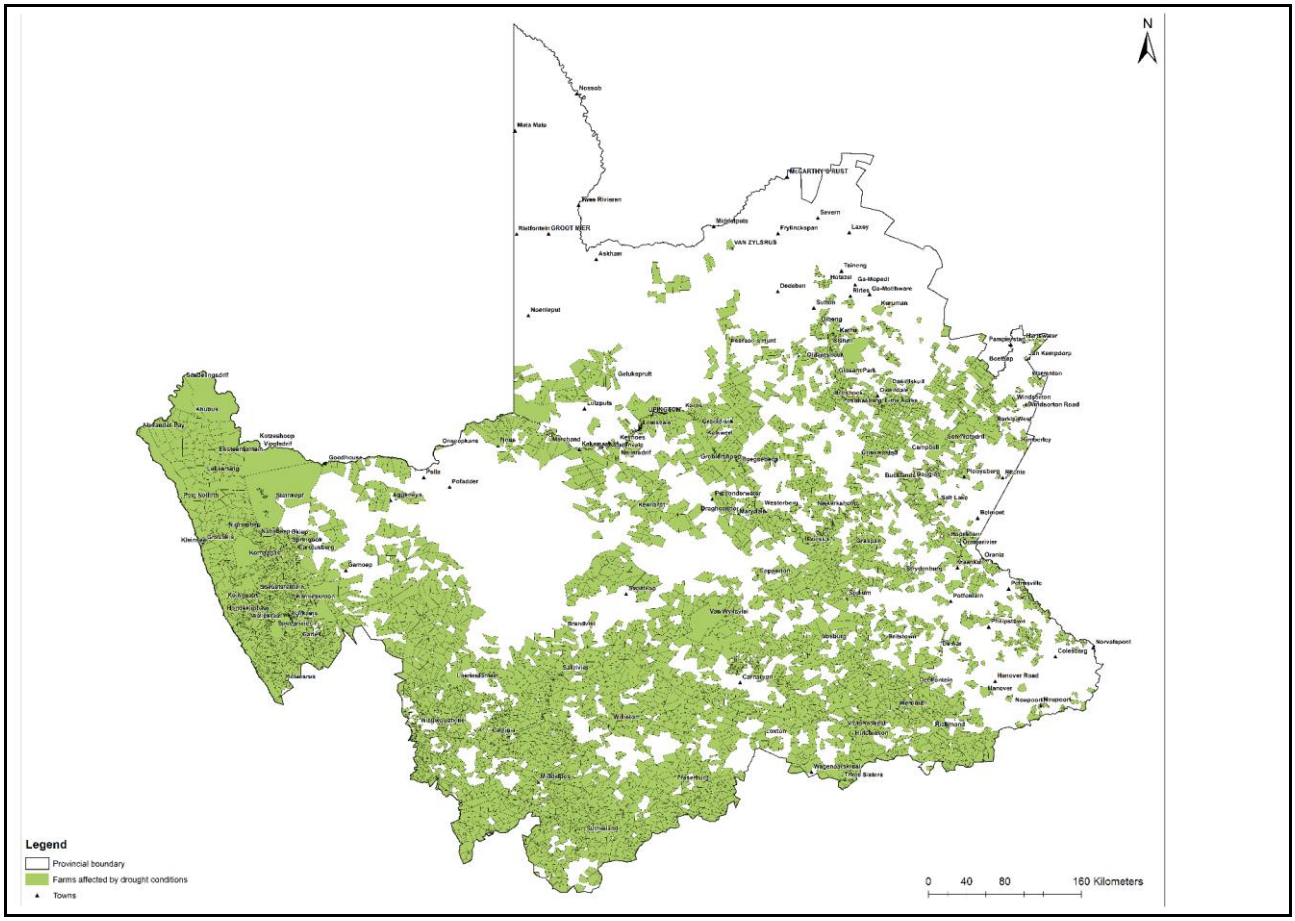
Animal numbers have been significantly reduced over almost the entire Province and in many instances only core herds are remaining. During the current season, late summer rainfall have resulted in a slow recovery of vegetation on drought stricken farms, and vegetation recovery will soon be halted with the onset of the cold winter season, when the first frost occurs. This will result in low grass biomass build up before the onset of the winter season. There are therefore little possibility for relief to extensive livestock farmer of the Northern Cape where severe drought conditions are expected to continue. The winter rain region of the Province is approaching their rain

season, but without significantly higher than average rainfall the effect of the previous four years will not be negated.

The total area affected by disaster drought currently in the Province is 5 823 885 ha and with a weighted grazing capacity norm of 35.1 ha/LSU. Given above assumptions, it means that 165 898 LSU is affected comprising of 33 178 LSU large stock (20%) and 132 720 LSU small stock (80%).

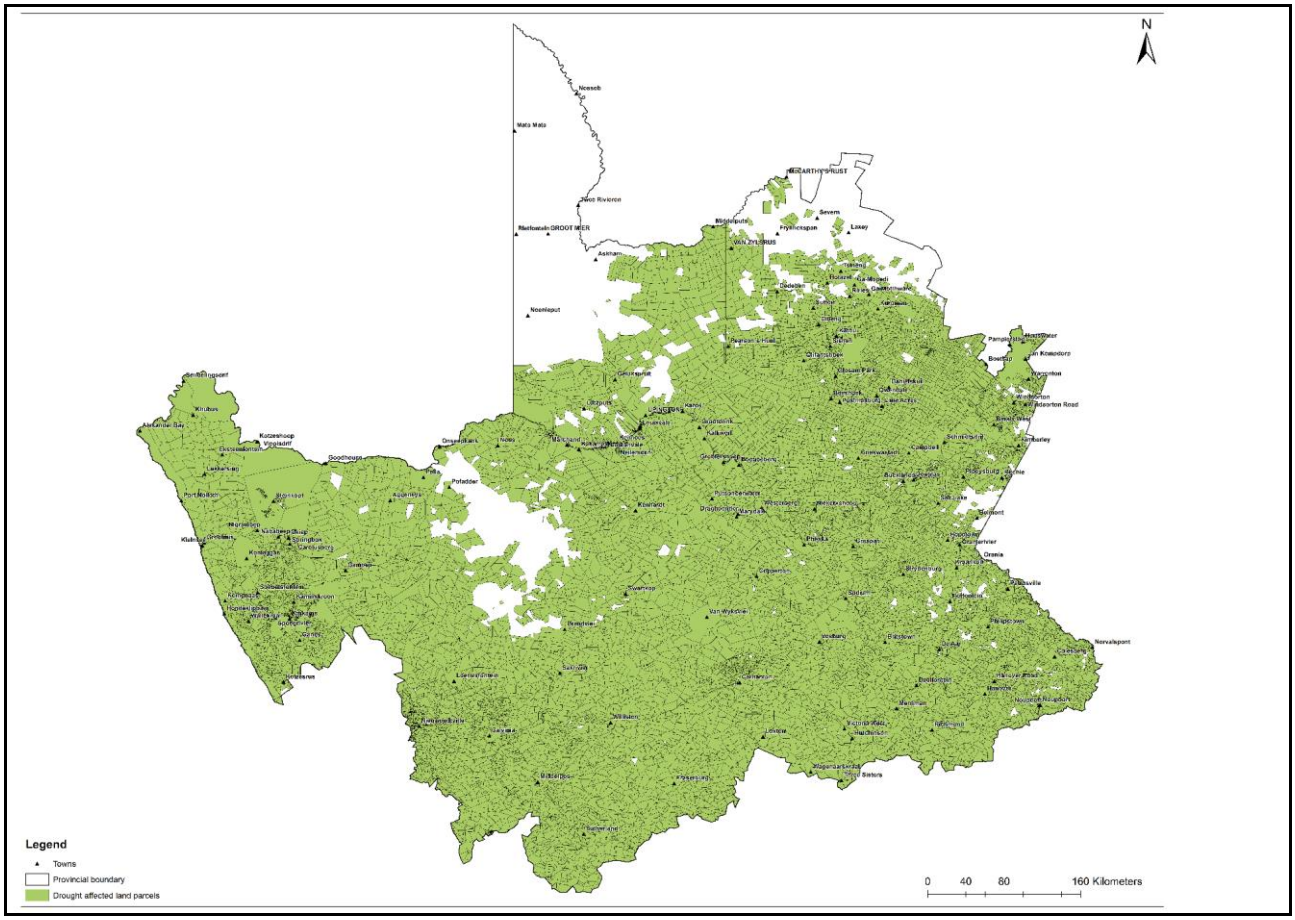
The total area affected by the potential disaster drought in the Province is 27 157 247 ha and with a weighted grazing capacity norm of 25.4 ha/LSU. Given above assumptions, it means that 1 068 408 LSU is affected comprising of 320 528 LSU large stock (30%) and 747 880 LSU small stock (70%).

Figure 9 depicts the area and number of farms currently experiencing long term drought and Figure 10 depicts a predicted scenario where the impact will increase from almost 166 000 LSU's to more than a 1 000 000 LSU's if higher than average rainfall does not occur in the winter as well as summer rainfall areas.



Total number of drought affected farms	Hectares	LSU
9 714	5 823 885	165 898

FIGURE 9: Current extent of severe drought



Total number of drought affected farms	Hectares	LSU
20 407	27 157 247	1 068 408

FIGURE 10: Predicted extent of severe drought by December 2019 in absence of higher than average rainfall.

The number of farmers and the cost of required relief over a three month period is tabulated in Table 1. This is on assumption that commercial farmers will be assisted with 10kg of feed per first 30 LSU's and emerging farmers will be assisted with on average 10 LSU's.

TABLE 1: Currently affected farmers and cost of relief.

Farmer Type	Number	LSU	Cost/Day	Days	Total
Commercial	700	30	R40	90	R75 600 000
Emerging	1 000	10	R40	90	R36 000 000
Total	**1 700**				**R111 600 000**

The predicted scenario for if the drought continues, is tabulated in table 2.

TABLE 2: Potential affected farmers and cost of relief if drought continues.

Farmer Type	Number	LSU	Cost/Day	Days	Total
Commercial	4 000	30	R40	90	R432 000 000
Emerging	5 000	10	R40	90	R180 000 000
Total	**9 000**				**R612 000 000**

5) MEDIUM TERM PREDICTIONS

The Northern Cape in general has experienced an extremely hot summer period where above average temperatures were regulary measured from September to end of December. This was preceded by a warmer than average 2018 winter with cold units less than average for that time of year. Cold fronts were less frequent and with lower intensity than normal and the winter rain areas of the Province were severely affected by below average rainfall. It is however expected that this situation will worsen as the day temperatures fall during mid July to August. Medium term predictions, by the National Oceanic and Atmospheric Administration (NOAA), tends towards neutral (figures 9 and 10). The probability for a higher than average rainfall for the early summer seems unlikely and therefore chances are slim that the drought will be broken before the early part of 2020. If lower than average rainfall persists, the area under investigation will definitely increase.

Early and mid winter forecasts by the South African Weather Service, are optimistic for above average rainfall in the winter rain areas and an increased number of rainfall days are expected.

Various simulation models by the European Centre for Medium Term Weather Forecasts confirm the weak tendency towards higher sea temperatures in the Pacific , but generally predictions are for neutral conditions and normal weather patterns are expected. Mostly higher than normal temperatures are expected for the summer rainfall area with average rainfall which is normally low during the winter season.

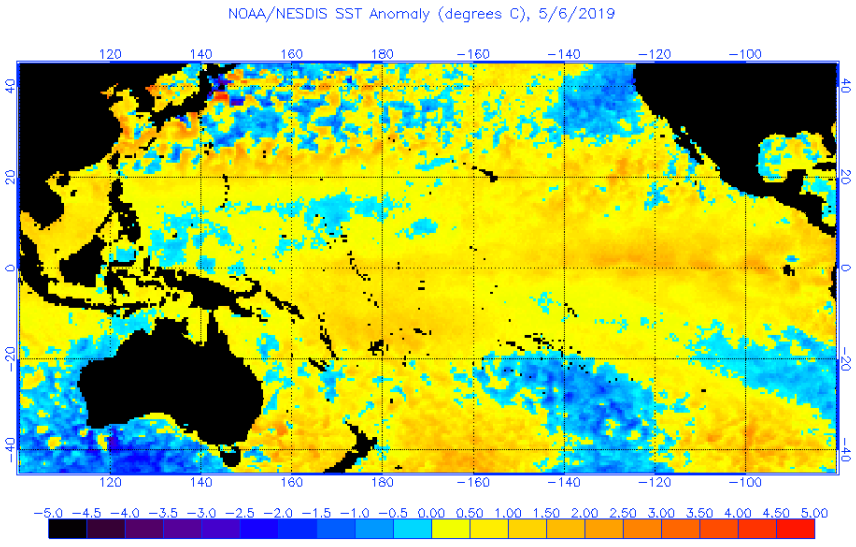


FIGURE 11: Average sea surface temperature (SST) anomalies (°C)

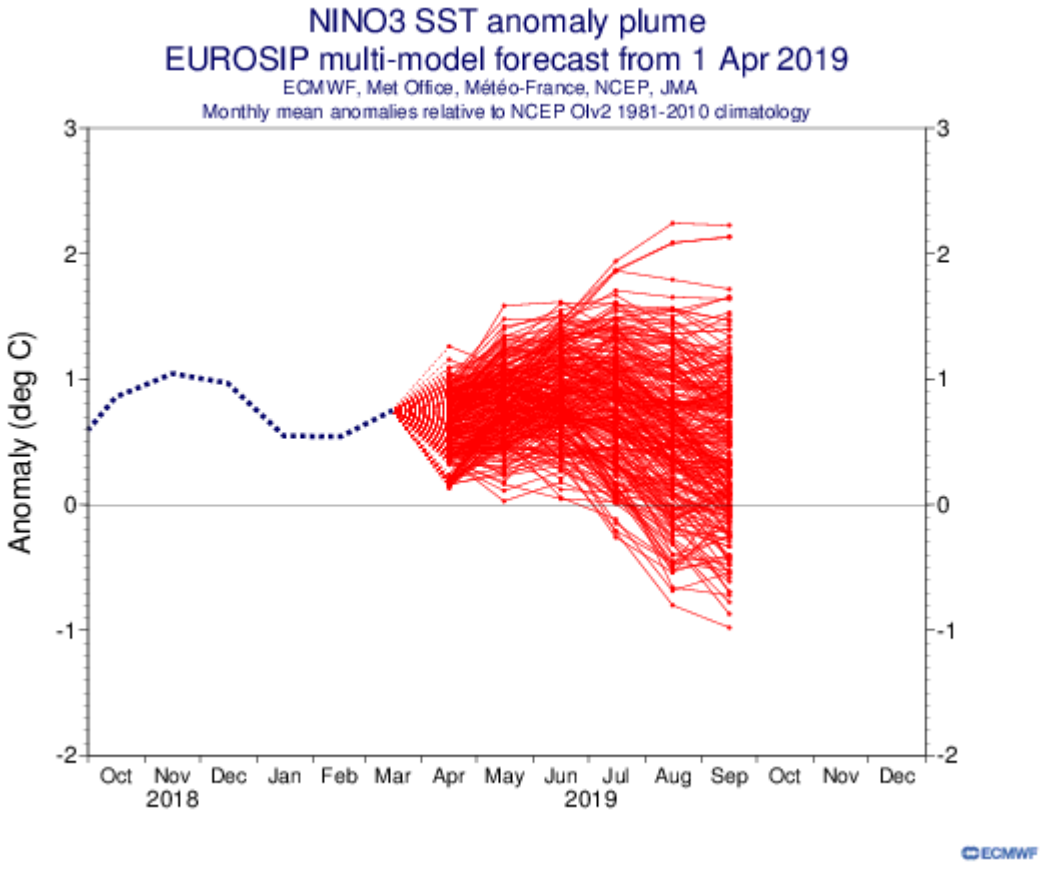


FIGURE 12: NINO3 SST anomaly plume for April 2019

6) RECOMMENDATION

Given the current situation and the fact that chances for summer rain is fast dissipating, together with the desperate situation in the winter rainfall area of the Province, it is recommended that the declaration of all five districts and therefore the entire province as disaster drought affected region, should be strongly considered by the disaster management structures.