USING SOUTHERN OSCILLATION INDICES TO PREDICT SEASONAL RAINFALL

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INTRODUCTION

The Southern Oscillation Index (SOI) is the atmospheric index used to characterize the El Niño – Southern Oscillation (ENSO) phenomenon in the Pacific Ocean. SOI values are available for each month since 1872 so it is quite easy to use them as a basis for any study of the effect of the ENSO phenomenon on specific events. The SOI is the anomaly of the difference in barometric pressure between Darwin in northern Australia and the island of Tahiti in the Pacific Ocean. Negative values of the SOI are associated with El Niño events and positive values with La Niña events. In Australia the SOI has been classified into five phases according to the value and trend of the SOI values:

Phase 1 - SOI consistently positive (El Niño)
Phase 2 - SOI consistently positive (La Niña)
Phase 3 - SOI rapidly falling
Phase 4 - SOI rapidly rising
Phase 5 - SOI near normal and not changing.

It was decided to see whether rainfall and SOI values could be meaningfully linked and the analysis done by Namibia Resource Consultants was used for this study.

RESULTS

During an analysis done for the Ministry by Namibia Resource Consultants, they calculated the probability of receiving more than median rainfall for the three months after the month being analyzed. Analysis was done only for those occasions that five of more occurrences happened of a particular phase for a particular month for the years 1960 to 1997. Since Namibia is basically a summer rainfall area, it was considered that the analysis for the months September to February would be useful. During the analysis it was found that enough data was only available for Phases 1, 2 and 5, hases 3 and 4 occurred to seldom to do a meaningful analysis. The following are the maps produced for the months September to February for phase 1, 2 and 5.

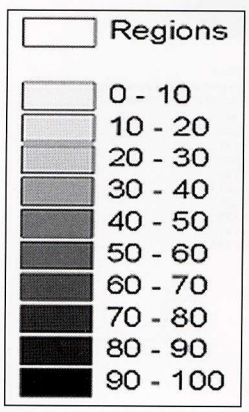
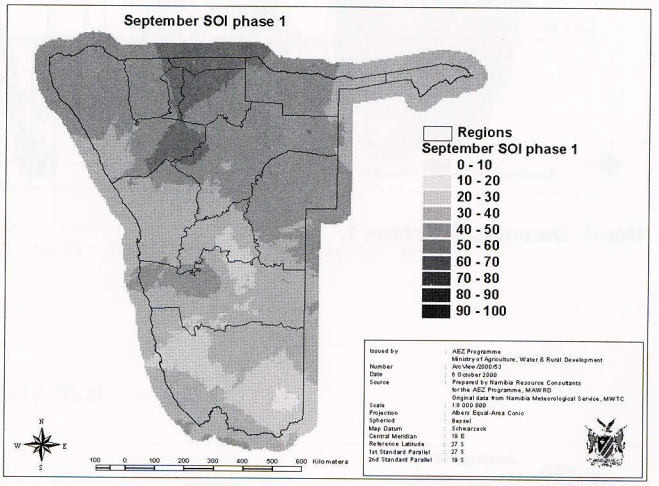
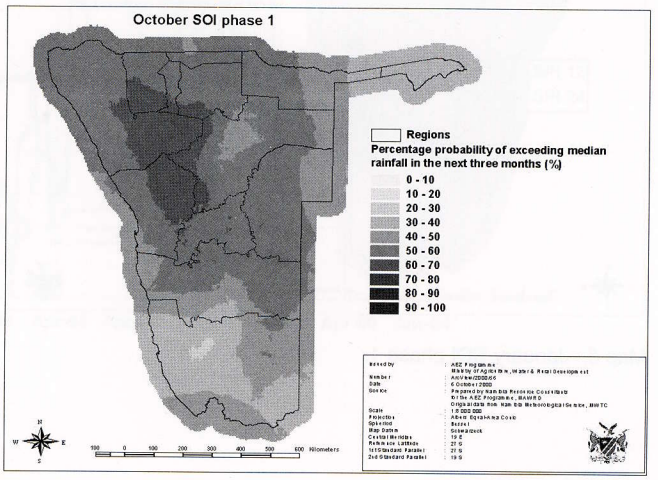


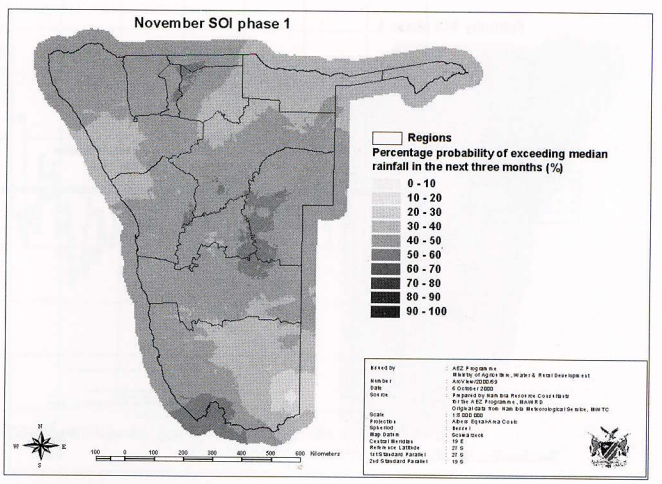
Figure 1. Legend for Maps 1-17, showing the percentage probability of exceeding median rainfall in the next three months (%).



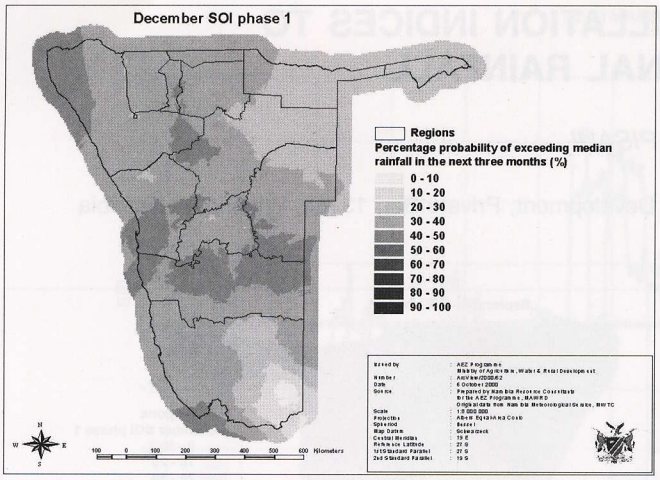
Map 1. September SOI phase 1.



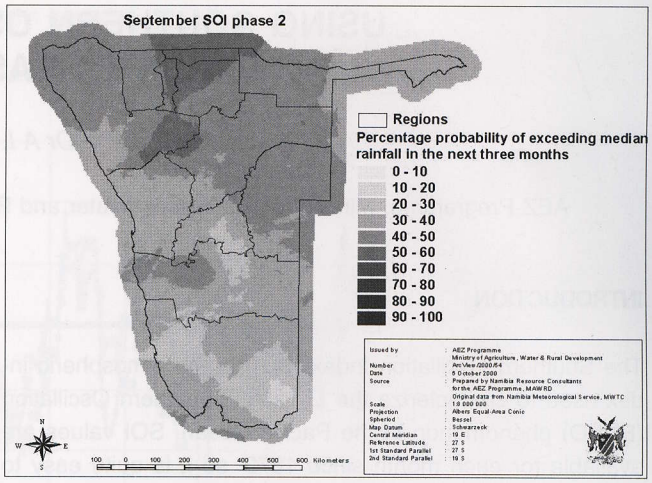
Map 2. October SOI phase 1.



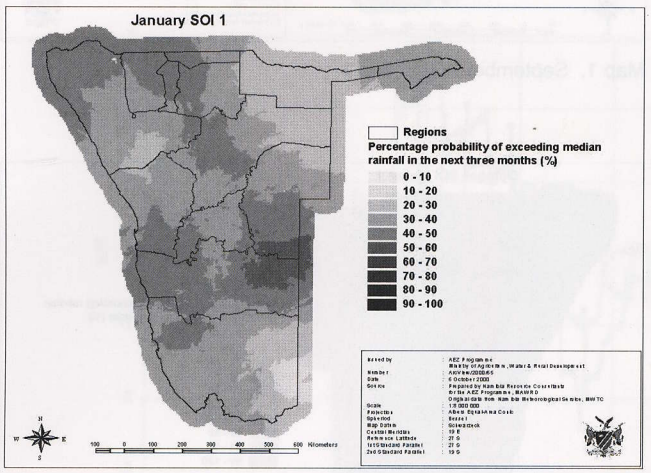
Map 3. November SOI phase 1.



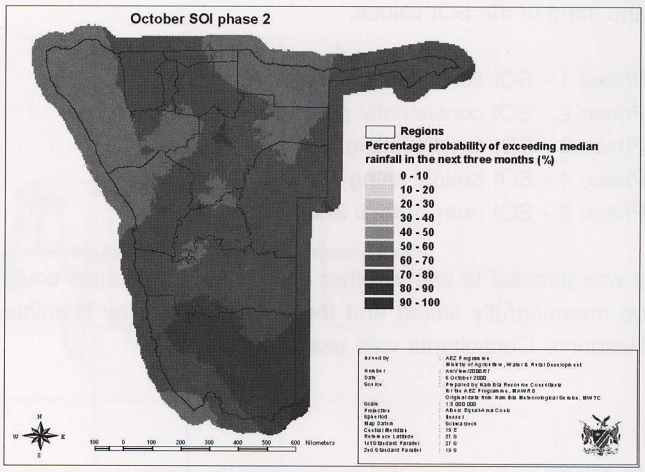
Map 4. December SOI phase 1.



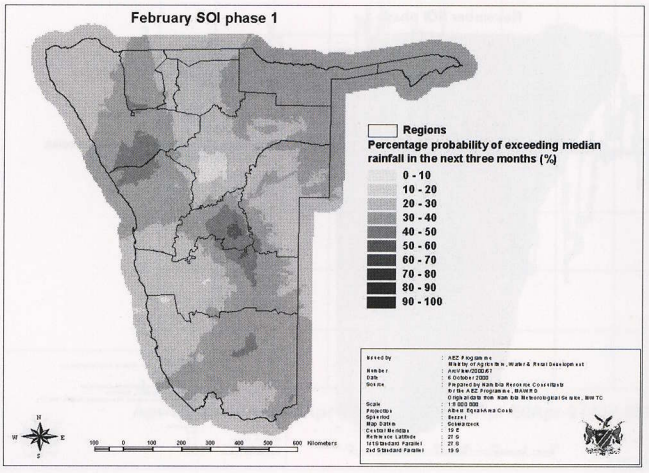
Map 7. September SOI phase 2.



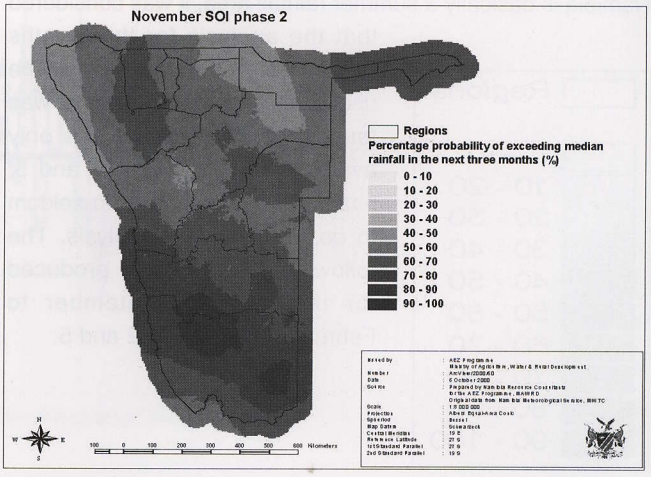
Map 5. January SOI phase 1.



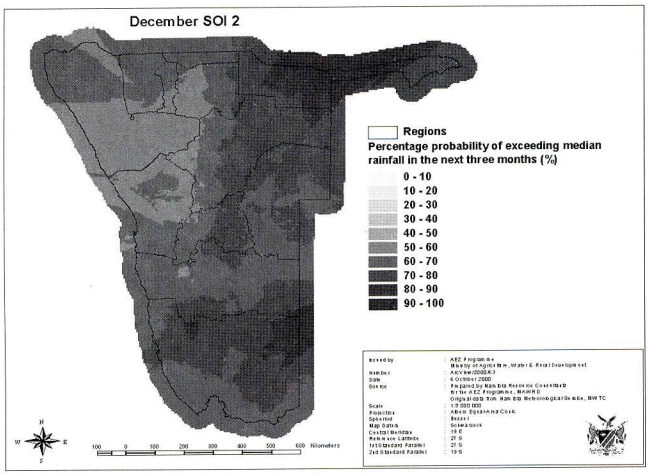
Map 8. October SOI phase 2.



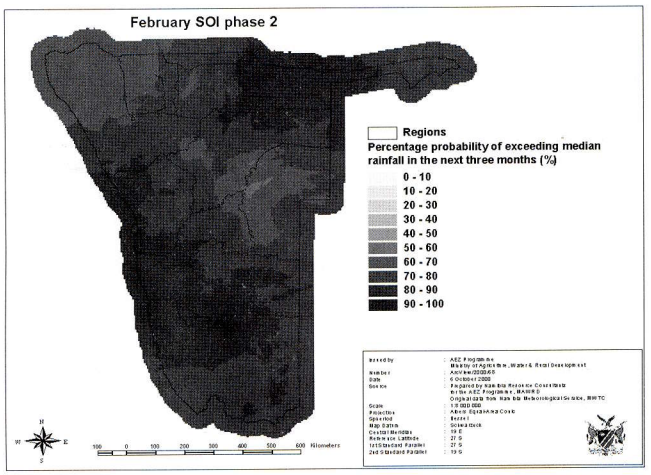
Map 6. February SOI phase 1.



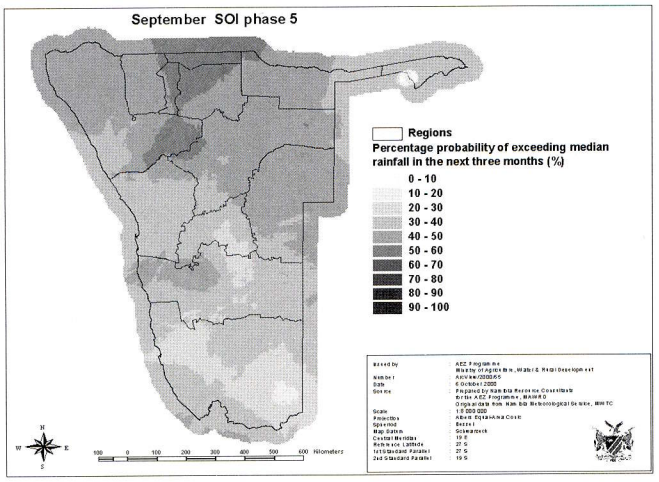
Map 9. November SOI phase 2.



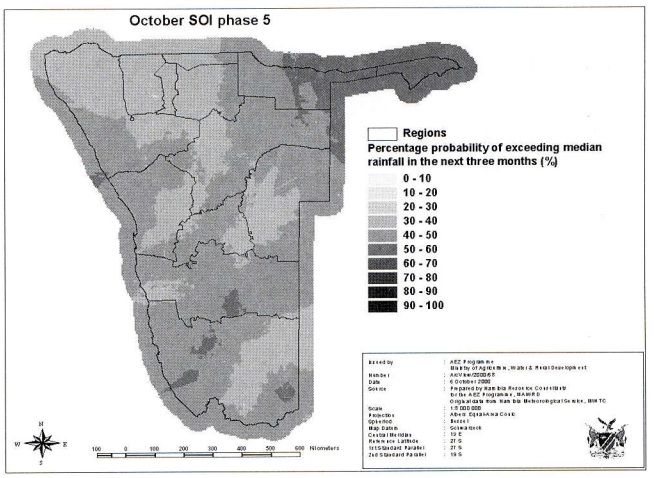
Map 10. December SOI phase 2.
(Not enough data for January SOI phase 2.)



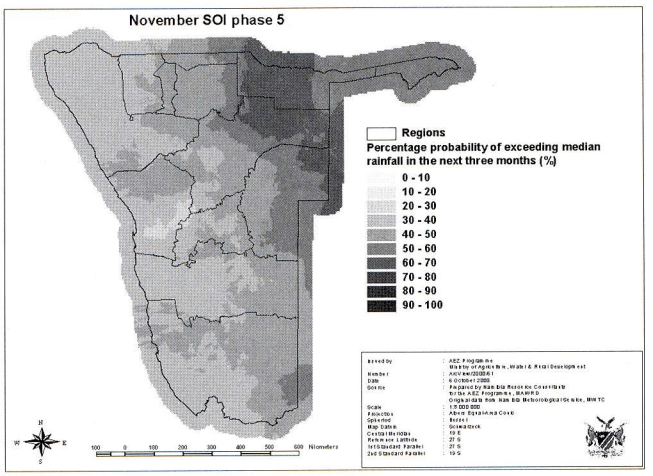
Map 11. February SOI phase 2.



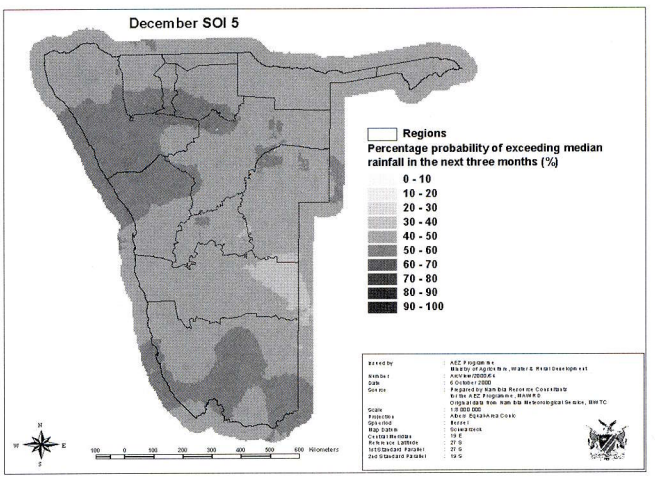
Map 12. September SOI phase 5.



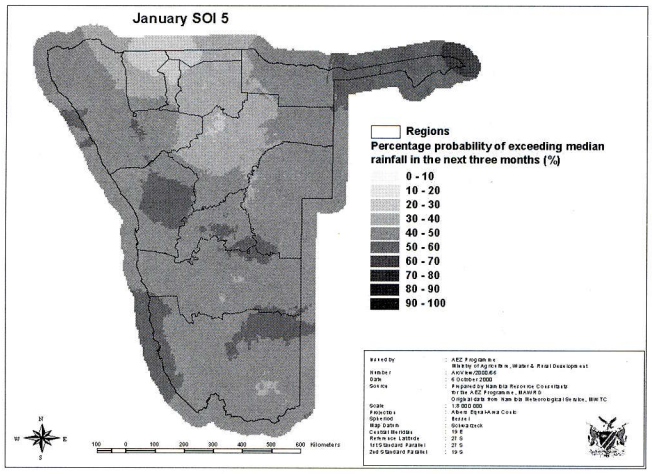
Map 13. October SOI phase 5.



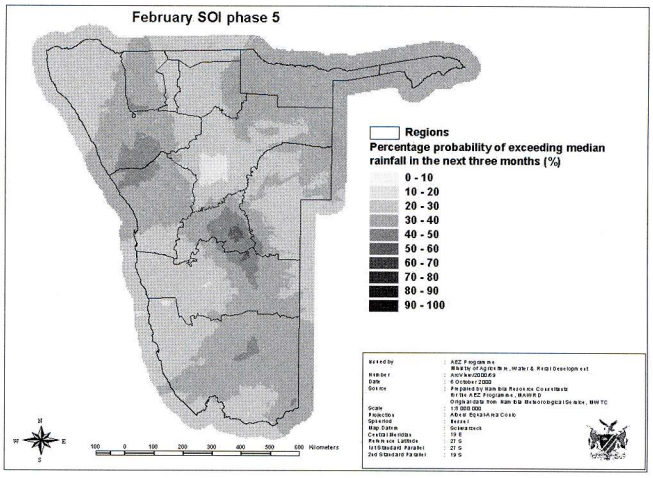
Map 14. November SOI phase 5.



Map 15. December SOI phase 5.



Map 16. January SOI phase 5.



Map 17. February SOI phase 5.

DISCUSSION

Phase 1 (El Niño) – Generally this is a phase where below-normal rainfall can be expected for most of the country, except for some early season positive anomalies in the north-central part (October to December) and middle season anomalies in the north (November to January). These conditions would tend to have a negative effect on total seasonal rainfall and sometimes also an early end to the rainfall season.

Phase 2 (La Niña) – This seems to have a positive effect on seasonal total rainfall, especially from November onwards, and also seems to last until at least April, or even May. Generally the best seasonal totals seem to coincide with La Niña conditions.

Phase 5 (Normal) – On the whole, this does not seem to have great positive or negative effects, thus one would expect a "normal" rainfall season.

CONCLUSION

SOI phases seem to have some skill in giving outlooks for seasonal totals, although the probabilities shown in the maps are generally not high enough to put complete faith in the outlook based on these phases. They should be used in conjunction with the outlooks prepared by specialist institutions, which give outlooks like SARCOF and the South African Weather Bureau's LOGIC office which all include the ENSO phenomenon in some form or another into their forecasting algorithm. Other factors like upper level winds, sea temperatures in the Pacific, Indian and Atlantic Oceans are all taken into consideration. It is thus best to stay informed of the latest LOGIC outlook, which appears on the 22nd of each month, and also to take cognisance of the SARCOF outlook, which is given during September each year and updated during December.

REFERENCES

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Du Pisani, A.L. 1999b. Using Namibian Data to Illustrate Vulnerability of an Area to Drought. Workshop on Drought Planning, Pretoria 16/17 September 1999.

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