

Report 99.395

19 October 2000

File: K/8/21/1

[Report 1999.395.MH:mm]

Report to the Environment Committee
from Mike Harkness, Resource Scientist

Predicting Rainfall Droughts on the Kapiti Coast Using the Southern Oscillation Index

1. Purpose

To inform the Committee of the results of an investigation into the links between the Southern Oscillation and seasonal rainfall on the Kapiti Coast.

2. Background

The year to year fluctuations in the various weather parameters, such as rainfall, are of great interest, particularly to those involved in agriculture. Once a closed book, some recognisable patterns are now emerging, allowing a certain amount of seasonal forecasting to be attempted. The most important of these patterns is the Southern Oscillation and its two components – El Nino and La Nina. (The Southern Oscillation is a weather pattern that is centred in the tropical Pacific but affects a large part of the world.) The intensity of the Southern Oscillation is measured as the Southern Oscillation Index (SOI).

3. Report Summary

This report defines the Southern Oscillation and the effects that El Nino and La Nina have on the Region's weather.

Rainfall data collected by the Council and NIWA at six sites on the Kapiti Coast are used in the study to investigate linkages between the prevailing weather pattern (El Nino or La Nina) and seasonal rainfall.

Using statistical analyses a number of forecasts have been prepared to predict low rainfall on the Kapiti Coast.

4. **Major Findings**

The case studies highlighted the fact that both an individually high monthly value of SOI (either La Nina or El Nino) and persistent and consistent high seasonal values can affect rainfall on the Kapiti Coast.

Results for Otaki rainfall show that both El Nino and La Nina events have an effect on seasonal rainfall. Significant La Nina events during spring and summer resulted in high probabilities of low rainfall in summer and autumn respectively. While in contrast, El Nino conditions during autumn and winter lead to high probabilities for low winter and spring rainfalls respectively at Otaki.

For all the rainfall stations on the Kapiti Coast a La Nina during spring results in a higher than normal chance of a two-year return period low rainfall in summer

Significant La Nina conditions have the greatest impact when they occur in summer and influence autumn rainfall. All sites, except Waikanae, have high probabilities for low autumn rainfall when preceded by La Nina conditions during summer.

Overall, El Nino seems to have the greatest influence on drought rainfall. In particular, El Nino conditions during spring lead to high probabilities of low rainfall in summer at all sites with the exception of Otaki.

The report produces a number of forecast scenarios for each rainfall station on the Kapiti Coast. For example, if El Nino conditions have persisted during spring then a forecast for summer rainfall at Te Horo is as follows:

There is a 70 percent chance of a two year return period summer rainfall, a 33 percent chance of a 5 year return period summer rainfall, and a 30 percent chance of a 10 year return period summer rainfall

The probabilities and significance of the majority of forecasts derived are not high. This should not detract from the fact that SOI forecasts, while errors may be high, are one of the earliest possible methods of forecast that can be given of an impending drought.

5. **Quarterly Forecasts**

The findings of this report will be used as the basis for preparing quarterly forecasts of rainfall on the Kapiti Coast. At the end of each season the average seasonal SOI value will be calculated and a rainfall forecast will be prepared.

These forecasts should provide an early warning of possible water shortages and should therefore help the water conservation actions taken by KCDC.

6. **Communications**

Copies of the report have been distributed to KCDC as well as to public libraries and college libraries on the Kapiti Coast.

A press release will be issued to inform the wider community of the results of the report. Quarterly forecasts will be sent to KCDC and distributed to other WRC Departments. Press releases will also be issued when quarterly seasonal forecasts are made.

7. Recommendation

That this report be received and its contents noted.

Report prepared by:

Approved for submission:

MIKE HARKNESS
Resource Scientist
Surface Water Hydrology

JOHN SHERRIFF
Manager
Resource Investigations

JANE BRADBURY
Divisional Manager, Environment