

SOUTH EASTERN AUSTRALIAN CLIMATE INITIATIVE – LIST OF PROJECTS

Theme 1: Characterisation and Attribution of Current Climate

Milestone	Description	Deliverable	Research Org.
Documentation and detection of climate change			
1.1.1	Document changes in south-eastern Australian rainfall, temperature, surface humidity, pan evaporation	Recent decadal changes in these important climate variables documented.	BoM
1.1.2	Compare documented climate changes with those attributable to specific causes (eg., enhanced greenhouse effect, ozone depletion, volcanoes, aerosol, Southern Annular Mode)	Recent national and international research relevant to determining the causes of recent changes in the shaded region shown in Figure 1 of the collaborative proposal documented, along with attribution, where possible, of specific causes of observed regiona	BoM
Understanding oceanic causes of change			
1.2.1	Identify Indian Ocean mechanisms that affect change and validate the simulation in prediction models	Assess the accuracy of IPCC climate change simulations by validating sub-surface dynamics modulating global warming processes in the tropical Indo-Pacific Ocean.	CMAR
Development of downscaling model(s)			
1.3.1	Analogue downscaling technique is developed, for rainfall, temperature and pan evaporation.	Downscaling technique developed and described.	BoM
1.3.2	Determine station networks for statistical downscaling models and obtain and assess quality of historical at-site, daily data	Station networks identified for south-east corner of MDB. Quality of historical at-site, daily data quantified and documented.	CLW
1.3.3	Apply rigorous atmospheric predictor selection and comparison for the selected station networks	Selection described.	CLW
1.3.4	Fit statistical downscaling models and assess performance and deficiencies	Data will be downscaled to regional scales and also to individual station points for the period 1960s to the present in order to facilitate a detailed comparison between the simulated and observed climate. Performance and deficiencies of downscaling model	CLW
1.3.5	As required, initiate further development of statistical downscaling methodology to address deficiencies identified	Activity documented.	CLW
1.3.6	Dynamically downscale rainfall and temperature over the past 50 yrs using NCEP reanalysis.	Downscaling at 20km resolution from 1951-2000 at six-hourly intervals. Examination of trends and variability of rainfall temperature and potential evaporation.	CMAR
Application of downscaling models to re-analyses to attribute climate change			
1.4.1	Report written on application of downscaling model (from 1.3.1) to re-analyses and implications for attribution.	Report completed.	BoM
1.4.2	Extract, from available re-analyses archives, required atmospheric variables	Activity documented.	CLW
1.4.3	Drive fitted statistical downscaling models with re-analyses derived predictors and compare downscaled precipitation and weather state time-series with observed	Document analysis of observed versus re-analyses downscaled at-site precipitation and weather state trends and changes	CLW

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Milestone	Description	Deliverable	Org.
Application of downscaling models to coupled climate model historical runs			
1.5.1	Report written on application of downscaling model (from 1.3.1) to coupled climate model historical runs and implications for attribution	Report completed.	BoM
1.5.2	Extract atmospheric fields from coupled climate model historical runs	Fields extracted.	CLW
1.5.3	Drive fitted statistical downscaling models with coupled climate model historical run predictors and compare downscaled precipitation and weather state time-series with re-analyses downscaled and observed	Report completed on manner in which climate model downscaled precipitation and weather state series reproduce re-analyses downscaled and observed data.	CLW
1.5.4	Perform a downscaling experiment using CCAM forced by outputs of coupled model historical runs	Downscaling at 20km resolution from 1951-2000 at six-hourly interval. Comparison with NCEP downscaling of trends and variability of rainfall temperature and potential evaporation.	CMAR
1.5.5	Physical-statistical models using Bayesian Hierarchical methods are a recent innovation in the literature. They combine both physical and statistical elements in one model. Building on these ideas we will develop a hierarchical framework linking suitable	Brief SEACI on physical-statistical models at initial workshop; Develop and document methodological framework, including input from other research providers on physical processes and key users on preferred forecast outputs; Benchmark available algorithms	CMIS

Theme 2: High-resolution climate projections and impacts

Milestone	Description	Deliverable	Org.
Produce downscaled climate change scenarios for hydrologic impact assessment			
2.1.1	Obtain GCM output from three GCMs and four emission scenarios each stabilised at specified levels at current, 2030 and 2070	GCM output obtained.	CLW
2.1.2	Extract statistical downscaling predictors and assess GCMs' ability to reproduce them for current climate	Statistical downscaling predictors extracted and GCMs ability to reproduce them for current climate documented.	CLW
2.1.3	Drive statistical downscaling models with GCM predictor sets to produce projected daily, multi-site co-related 110-year-long time series climate data suitable for hydrological and crop and pasture models for four emission scenarios, each stabilised at spe	Daily, multi-site data generated.	CLW
2.1.4	Compare and assess the at-site, daily and seasonal properties of the statistically downscaled projections from the three GCMs and four emission scenarios for each stabilised at specified levels at current, 2030 and 2070	Comparison and assessment documented.	CLW
2.1.5a	Analyse climate change experiments with a range of four projected emission scenarios selected from three GCMs. The focus is the MDB, and current, 2030 and 2070 climates, and on daily data potentially suitable for forcing high resolution downscaling models	Examination of statistical properties temperature, rainfall, potential evaporation, and explore the dynamical drivers of synoptical scale events.	CMAR
2.1.5b	Use CCAM in a MDB domain to downscale solutions from the four climate projections emission scenarios selected from three GCMs each stabilised at specified level at current, 2030 and 2070 with daily outputs suitable for forcing high-resolution RAMS.	Two projections, A2 and B1, produced by June 2007. The resolution for CCAM is 20km.	CMAR
2.1.5c	Use RAMS in the southern MDB in specified catchments to further downscale to selected rain gauges, meteorological station scale, with daily output suitable for hydrological and other impact models (two projections per year).	Downscaling to selected regions (5km) completed and documented. Results communicated with key users.	CMAR

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Milestone	Description	Deliverable	Org.
	Produce updated, high resolution rainfall, temperature, evaporation, and water balance projections		
2.2.1	Develop alternative approaches (different modelling approaches, different hydrologic models and nonparametric elasticity estimators that are model independent) for assessing hydrologic sensitivity to rainfall, temperature and PET.	Alternative approaches and their advantages and disadvantages described and documented. Findings documented.	UM
2.2.2	Develop projections of water availability for the CMA regions of Victoria and south-east corner of MDB, taking into account alternative modelling approaches and uncertainties in climate projections for a greenhouse-enhanced environment.	Projections of water availability for Victoria and south-east corner of MDB prepared, in conjunction with users and the Victorian Government.	UM
2.2.3a	Develop improved regional projection techniques for MDB and the CMA regions of Victoria using multi-model weighted approach.	Projection techniques developed and documented in close collaboration with key stakeholders.	CMAR
2.2.3b	Apply the improved technique to projections of rainfall, temperature and potential evaporation for the MDB and the CMA regions of Victoria.	Production of projections.	CMAR
	Determine likely changes in behaviour of extreme rainfall events — southeast corner of MDB		
2.3.1a	Conduct two additional scenarios for 2030 with RAMS at a resolution of 5-10km for the southern MDB forced by climate change results of coupled climate models (see 2004-2005 AGO contract).	Using A2 and B1 scenarios, downscale extreme rainfall events for the future climate and compare with current climate.	CMAR
2.3.1b	Determine the sensitivity to a range of scenarios of the frequency of extreme rainfall events for year 2030 for the southern MDB.	Analyse results from 2.3.1a. The sensitivity documented.	CMAR

Theme 3: Seasonal forecasts

Milestone	Description	Deliverable	Org.
	Assess current forecasts		
3.1.5	Compare prediction skills of available global prediction models and establish a multi-model approach for the southeastern Australia region.	Multi-model approach for the shaded region shown in Figure 1 of the collaborative proposal prepared in collaboration with key users. Evaluate DEMETER and COCA hindcast for the region, in collaboration with CSIRO National Flagship Water for a Healthy Country	CMAR
3.2.2	Review methods to exploit statistical-dynamical techniques to improve rainfall and temperature forecasts from national dynamical forecast model.	Review documented.	BoM
	Develop new forecasts		
3.1.1	Develop statistical models for forecasting streamflow and reservoir inflow directly, as exceedance probabilities, by exploiting the streamflow-ENSO relationship and streamflow serial correlation (from several months to two years ahead).	Models developed and documented. The work to be undertaken in collaboration with key users.	UM
3.1.3	Report on simulation and potential predictability of rainfall and temperature from the national dynamical seasonal prediction model.	Report completed.	BoM

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Milestone	Description	Deliverable	Org.
3.2.7	Implement physical-statistical model to produce probabilistic forecasts of seasonal rainfall and temperature.	Write and test software implementing preferred approach, to be built on the open-source R platform to assist technology transfer; document results; assess and document available forecast skill; report on results at workshop and recommend future options fo	CMIS
Evaluate new forecasts			
3.1.2	Compare the performances of various types of seasonal forecast models (statistical, dynamical and hybrid models).	Documentation of the performances	BoM
3.1.4	Report on skill of direct rainfall and temperature forecasts from the new generation national dynamical operational forecast model.	Report completed.	BoM
3.2.3	Test, and document the skill obtainable from, selected statistical-dynamical technique.	Document completed.	BoM
Apply new forecasts			
3.1.6	Agricultural analysis for decision support tools	This project will develop and evaluate frameworks that enable agricultural decision makers to integrate the advances in climate science from SEACI into their planning and decision-making. A common method of integrating climate information with management	CSE
3.2.1 & 3.2.5	Incorporate advantageous features of statistical models into hybrid forecast models. Develop techniques of using forecasted hydrological fields to predict catchment inflows	Work completed.	UM & CMAR