Gippsland Falling Water Levels: Estimates of Aquifer Recovery Time and Implications for Coastal Subsidence

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Fluid extraction from the Latrobe Aquifer in the Gippsland Basin has been recognised as the cause of historic water level decline. Coal mine dewatering in the Latrobe Valley, agricultural and industrial water abstraction along the coastline, and off-shore hydrocarbon production have contributed to a deficit in the basin-wide water budget. The impact is geographically variable and is related to the structural architecture of the basin, location of withdrawals and the location of natural recharge.

With oil production nearing completion, the eventual decline in gas production, and allocations for agricultural and industrial abstraction, an estimate of aquifer recovery time is made using a simple mass balance. To simplify the problem, the mass balance is restricted to the onshore Seaspray depression and offshore central deep, assuming that the Rosedale and Foster Fault Systems are no-flow boundaries. A coupled fluid flow- geomechanical model is used to simulate the observed water level decline and projected recovery, and to determine its impact on coastal subsidence. While this model requires assumptions about several of the rock properties (measured data is not available and expensive to obtain), a sensitivity analysis was conducted on a typical range of values for each parameter. The geomechanical model predicts various degrees of consolidation and subsidence followed by recovery for each of the water level decline and recovery scenarios.

Results of this work identify coastal regions most at risk of subsidence, and it points to possible management strategies for fluid resources of the Latrobe Aquifer system in the Gippsland Basin.