Sedimentology of the Melawi and Kentungau Basins, West Kalimantan, Indonesia

Rachmat Heryanto Sutjipto

University of Wollongong

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SEDIMENTOLOGY OF THE MELAWI AND KETUNGAU BASINS, WEST KALIMANTAN, INDONESIA

VOLUME ONE

A thesis submitted in (partial) fulfilment of the requirements for the award of the degree of

DOCTOR OF PHILOSOPHY

from

THE UNIVERSITY OF

WOLLONGONG

by

RACHMAT HERYANTO SUTJIPTO

(Ir ITB Bandung, MSc Wollongong Uni.)

Department of Geology

1991
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The contents of this thesis are the results of original research and the material included has not been submitted for a higher degree to any other university or similar institution.

Rachmat Heryanto Sutjipto
ABSTRACT

The Melawi and Ketungau Basins are located in West Kalimantan, Indonesia. The Ketungau Basin developed between a Tertiary subduction complex (Lubuk Antu Melange) on the Kalimantan-Sarawak border and the Semitau High to the south. The basin is about 50 km wide, 150 km long and it continues eastward into the Mandai Basin. The Semitau High is a linear structural zone comprising submarine slope deposits, a belt of Cretaceous subduction complex (Boyan Melange) and Permian granitoid and metamorphic rocks. The Melawi Basin sequences were deposited between the Semitau High and the continental basement (Schwaner Zone) to the south. The basin is about 75 km wide and 300 km long.

The shallow marine to terrestrial sequences in the Melawi and Ketungau Basins were deposited during the Late Eocene to Oligocene. The Melawi Basin succession comprises four main units separated by periods of uplift and erosion: (1) Ingar Formation – a deep outer shelf marine mudstone; (2) Suwang Group – fluviatile sandstone and lagoonal to marine trough shale; (3) Melawi Group – fluviatile to shallow marine clastic deposits; and (4) Kapuas Group – fluviatile sandstone at the top of the succession. The Ketungau Basin consists of a conformable sequence (the Merakai Group) of shallow marine and floodplain deposits, overlain successively by fluviatile sandstone and floodplain to marginal marine mudstone. The alternation between marine and terrestrial sequences, and the presence of three unconformities in the Melawi Basin,
indicates tectonic instability during the depositional histories of the basins.

On the basis of sandstone petrology, diagenesis and depositional facies the Melawi Group and Alat Sandstone in the Melawi Basin can be correlated, respectively, with the Kantu Formation and Tutoop Sandstone in the Ketungau Basin. Both palaeocurrent and provenance studies indicate derivation of the Melawi and Ketungau Basin sequences from the north, mainly from uplifted recycled orogenic material in the Boyan and Lubok Antu Melanges. A few units in the Melawi Basin contain magmatic arc detritus derived from the Schwaner Mountains to the south.

Although both basins contain coal seams, the best quality coal is at the top of the Melawi Basin sequence. Organic maturation and vitrinite abundance indicate that both basins have potential for the generation and entrapment of petroleum.

Late Cretaceous subduction in northwestern Kalimantan deformed the Late Cretaceous marine sequence producing the Boyan Melange which incorporated Permian granitic microcontinental fragments. Uplift of the Simitau High (Boyan Melange) along backthrusts during the Paleocene and Early Eocene produced an accretionary prism flanked to the south by the forearc Melawi Basin. Periodic backthrusting resulted in folding, uplift and unconformities in the northern Melawi Basin. Northward migration of the Benioff Zone in the Late Eocene created the forearc Ketungau Basin between the old and new (Lubok Antu Melange) outer arc ridges.
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