

P09

Sedimentary Basins Prospective for Hydrocarbons

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Summary

Two abstracts on two different localities in Tanzania (Mandawa Basin in SE Tanzania and Ruvu-Tanga Sub-Basins in NE Tanzania) where the sedimentology and stratigraphy patterns are presented prospective for hydrocarbon potentials

The Mandawa Basin of South-eastern Tanzania is an important target for onshore hydrocarbon exploration. This conference contribution provides an overview of the basin development and stratigraphy by integrating sedimentological and biostratigraphic data from wells and outcrops with the regional geological context.

An important observation is that tectonic events had a major control on depositional environments and consequently on vertical and lateral facies changes within the basin. Failed Triassic - Middle Jurassic extension of Somali channel set the stage for marine depositional environments along the Tanzania Coastal Plain. The basin later was subjected into some cyclic depositional environments ranging from fluvial-Deltaic-shallow to deep water marine depositional environments.

Based on the observations, the basin is subdivided into three major spatial zones, each of which have different stratigraphic stacking patterns.

1. The E-W-trending Matandu transtensional fault separates the Northern Mandawa Sub-Basin from the Southern Sub-Basins. The stratigraphy in this area is a bit different from the rest. Middle Jurassic subsidence and related marine transgression, led to deposition of the Fossiliferous Mtumbei Formation, which unconformably overlies the metamorphic basement. The Upper Jurassic to Lower Cretaceous deposits are part of a deltaic-fluvial system comprising the Kipatimu Sandstone Formation, before changing into shallow to deep water marine depositional environments for Lower Cretaceous Kihuluhulu fossiliferous marls and the Upper Cretaceous deep to shallow marine Nangurukuru Formation. The Uppermost Cretaceous to Paleogene Kilwa Group (Kivinje, Kilwa and Pande formations) are the youngest in the section mainly and were deposited in shallow marine environments.
2. The Central Mandawa Sub-Basin is bounded to the north by the Southward dipping Matandu dip-slip (transtensional) fault and to the south by Mavuji Lineament. The stratigraphy of this area remains somewhat complicated, essentially giving rise to two stratigraphic sequence models, based on two profiles. The first profile runs from west to east, across Njinjo Fault into the Nangurukuru area. At the base of this profile, the Middle Jurassic Mtumbei Oolitic Limestone Formation is encountered. Successively, feldspathic sandstones of the Jurassic Mitole Formation and the Upper Cretaceous Nangurukuru Formation are recorded. Further eastward, the Paleogene (Eocene) Kilwa-Kivinje and Kilwa-Masoko Neomolitic Limestones are found. A series of roughly NW to NE trending normal faults predominate the area and where the north-westerly dipping Njinjo normal fault marks the boundary between Mtumbei Fm to the West and the Mitole Fm to the east. The Mitole Sandstone Fm. is found as traces to the west of this fault, indicating that the remainder was eroded and/or the fault was reversely reactivated.
The second W-E profile is characterized by the Lower Cretaceous shallow marine shelfal Kiturika Limestone Formation that corresponds to the coeval and coexisting fluvial-deltaic Makonde beds, followed by the Aptian-Albian deep marine fossiliferous marls of the Kihuluhulu Formation and last is the lower Cretaceous shallow marine Coralliferous Nalwehe Limestones which is being overlain by deltaic system.
3. The Southern Mandawa Sub-Basin is bounded by Mavuji lineament to the North and by the Ruvuma saddle to the South. Above the metamorphic basement, the clastics of the Mbuu Sandstone Formation (AGE?) were deposited prior to marine incursion. Successively, the Triassic-Lower Jurassic evaporites of the Nondwa Formation were deposited due to rapid subsidence of the central part of the Mandawa Basin whereas the adjacent areas (Kiswere, Kizimbani and Pande) as well as Ruvuma Saddle remained structurally high. Diapirism of the evaporites has complicated the structures at this sub-basin and well detectable in the field. Such diapirism appears to have truncated the overlying Middle Jurassic deposits (Mihambia Formation, Mtumbei, Mitole Formations). The Upper Jurassic to Lower Cretaceous Tendaguru Sandstone Formation is unconformably overlain by the Jurassic Mitole Formation in the west of southern Mandawa Basin, where it comprises deltaic to beach sequences. Then, the facies change eastward from shallow to deeper marine depositional environments. At the top of this sequence are turbidites are encountered. A series of younger NW-SE trending Intra-Basinal Normal faults created some rotational fault blocks in a graben-like manner that accommodated younger sediments.

The Basin is generally potential for hydrocarbon prospectivity where it is rich in potential petroleum elements.