The Bali Basin is a frontier basin located behind the mid-Sunda Arc, a chain of island arc volcanoes extending over 5,000 km throughout Southeast Asia. The depths of back arc basins in combination with complex tectonic motion along the Sunda Arc, can supply the conditions required for hydrocarbon generation and the creation of successful petroleum traps. For this reason, hydrocarbon bearing basins in the central and western Sunda Arc are responsible for Indonesia's high rate of oil production. Abundant oil and gas fields are found in the North, Central, and South Sumatra Basins, as well as the Northwest and Northeast Java Basins. Hydrocarbon production declines in the Bali Basin east of these areas and does not increase throughout the remainder of the eastern Sunda Arc. The Bali Basin has minimal production to date, but this basin has only a limited exploration history.

A model of the Bali Basin constructed in Petrel 2014 was used to correlate stratigraphic units between 26 wells. We interpret shales of the Ngimbang and Kujung III units to be the potential source of hydrocarbons in the Bali Basin. Studies on the Ngimbang Formation report total organic carbon levels of 0.40-71.88% with type II and III kerogen. These hydrocarbons are expected to have migrated directly into the overlying Kujung I and Kujung II limestone units. Gamma ray and sonic log records were used to calculate an average reservoir porosity of 34.2%. Carbonaceous shales of the Tuban Formation act as the sealing unit. Based on seismic interpretations off north-shore Madura and Bali, hydrocarbon plays are expected where inversion tectonics thrust low-lying strata above overlying layers. Additional Eocene shale plays could be found along structural closures and where stratigraphic wedges onlap basement rocks.

Source rock maturity could be affected by back arc subduction along the Lombok Thrust Zone. For this reason, the Bali Basin model was created in conjunction with a heat flow analysis. Bali Basin wells were found to have an average Q value of 81.9 and an average bottom hole temperature of 62.5 °C. This analysis was expanded to include a comprehensive heat flow map of Sundaland. We used thermal gradients calculated from total depths and bottom hole temperatures recorded from 857 wells across Indonesia and Malaysia, in combination with thermal conductivity values corresponding to bottom hole lithologies, in order to calculate the Q values for each well.

While depths to the sourcing interval in the Bali Basin are shallow, they are similar to source depths in producing wells found in the Northeast Java Basin. Additionally, the depositional and tectonic chronology of the Bali Basin supports the generation and entrapment of hydrocarbons. This data, in combination with quality source rock, reservoirs with ample porosity, and a laterally extensive sealing formation, shape promising hydrocarbon prospectivity for the Bali Basin, but this potential is not realized. Significant thrusting north and south of the basin may have uplifted the source formation from the oil window during the early stages of hydrocarbon generation, evidenced by shallow formation depths and low heat flow. The presence of gas discoveries, particularly those of the Pagerungan field, could be a product of kerogen type, rather than thermal maturity. Alternatively, fault reactivation during the current compressional regime could have facilitated the escape of previously trapped hydrocarbons. In this case, hydrocarbon plays could very well exist further from the source of deformation, toward the center of the basin. Seismic survey and exploratory well logging toward the center of the Bali Basin, south of this study area, would greatly benefit future studies.