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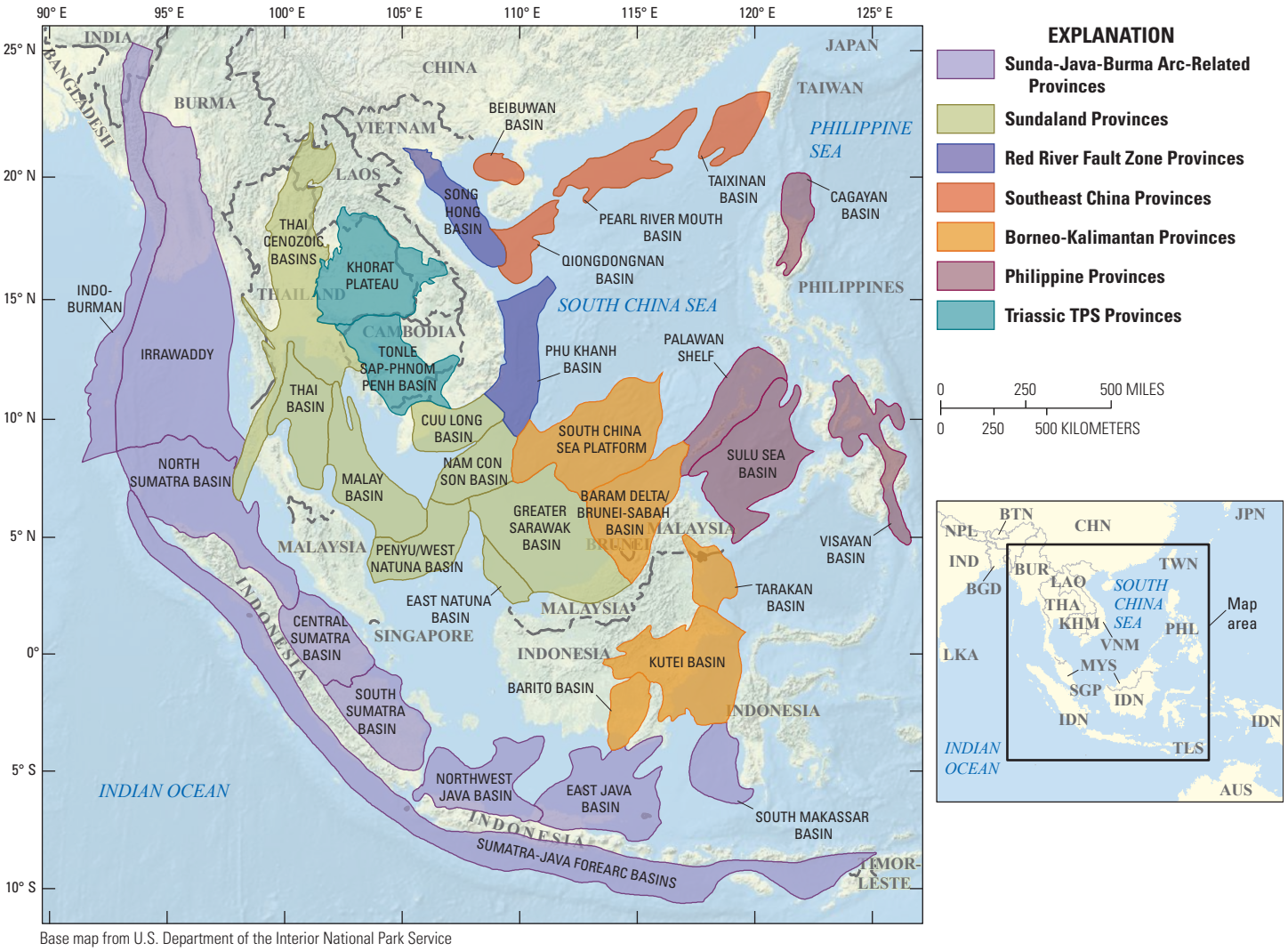
# Assessment of Undiscovered Conventional Oil and Gas Resources of Southeast Asia, 2020

Using a geology-based assessment methodology, the U.S. Geological Survey estimated undiscovered, technically recoverable mean resources of 10.5 billion barrels of oil and 271.5 trillion cubic feet of gas within 33 geologic provinces of Southeast Asia.

## Introduction

The U.S. Geological Survey (USGS) quantitatively assessed the potential for undiscovered, technically recoverable conventional oil and gas resources in Southeast Asia (fig. 1). This assessment encompasses 33 geologic provinces, with 48 geologically defined assessment units (AUs) in 34 total petroleum systems (TPSs). Each of the 48 units were assessed for undiscovered conventional resources of oil, gas, and natural gas liquids.

Most of the geologic provinces assessed in this study have a long history of exploration, discovery, and production. In the 10 years since the previous USGS assessment (Schenk and others, 2010), exploration successes and failures and a reevaluation of the geology of TPSs and AUs led to an overall decrease in undiscovered conventional oil and gas resources, an anticipated result given the level of exploration maturity in many of these provinces. However, the assessment summary suggests that high potential for undiscovered oil and gas resources remains in Southeast Asia, particularly for conventional gas resources. Continuous (unconventional) oil and gas resources, including shale oil, shale gas, tight gas, and coal bed gas, have been assessed in several geologic provinces of Southeast Asia, but the unconventional resources are substantially less than those of conventional resources (Schenk and others, 2015, 2016, 2017).




Base map from U.S. Department of the Interior National Park Service

**Figure 1.** Map showing the location of 33 geologic provinces and 7 province groups in Southeast Asia that were included in this assessment. TPS, total petroleum system.

**Table 1.** Summary of assessment results for 33 geologic provinces in 7 province groups in Southeast Asia.

[Results shown are fully risked estimates. F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. Shading indicates not applicable. MMBO, million barrels of oil; BCFG, billion cubic feet of gas; NGL, natural gas liquids; MMBNGL, million barrels of natural gas liquids]

| Province groups | Accumulation types | Total undiscovered resources | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Oil (MMBO) | | | | Gas (BCFG) | | | | NGL (MMBNGL) | | | |
| | | F95 | F50 | F5 | Mean | F95 | F50 | F5 | Mean | F95 | F50 | F5 | Mean |
| Sunda-Java-Burma Arc-Related Provinces | Oil and gas | 1,998 | 3,421 | 5,810 | 3,601 | 35,069 | 67,380 | 121,912 | 71,471 | 560 | 997 | 1,697 | 1,045 |
| Sundaland Provinces | Oil and gas | 1,163 | 1,793 | 2,825 | 1,866 | 33,062 | 55,725 | 90,558 | 57,961 | 508 | 850 | 1,377 | 883 |
| Red River Fault Zone Provinces | Oil and gas | 124 | 219 | 382 | 231 | 12,865 | 24,539 | 44,582 | 26,085 | 167 | 317 | 579 | 339 |
| Southeast China Provinces | Oil and gas | 1,038 | 1,693 | 2,734 | 1,765 | 10,619 | 18,144 | 30,324 | 18,999 | 184 | 304 | 494 | 316 |
| Borneo-Kalimantan Provinces | Oil and gas | 660 | 2,683 | 5,769 | 2,906 | 27,398 | 69,380 | 142,004 | 75,259 | 332 | 1,187 | 2,517 | 1,285 |
| Philippine Provinces | Oil and gas | 15 | 128 | 213 | 127 | 9,745 | 18,536 | 30,704 | 19,207 | 218 | 394 | 652 | 408 |
| Triassic TPS Provinces | Oil and gas | 0 | 34 | 69 | 35 | 285 | 2,310 | 5,093 | 2,479 | 1 | 9 | 21 | 9 |
| **Total undiscovered conventional resources** | | **4,998** | **9,971** | **17,802** | **10,531** | **129,043** | **256,014** | **465,177** | **271,461** | **1,970** | **4,058** | **7,337** | **4,285** |

The basins of Southeast Asia have complex tectonic histories (Hall, 2009; Morley, 2013) and petroleum system evolutions (Doust and Sumner, 2007) that affect the assessment of undiscovered resources. For this report, the 33 geologic provinces of Southeast Asia were placed within 7 province groups based upon overall geomorphic characteristics, rather than a strict geologic classification, to provide granularity in the assessment results. The assessed provinces of Southeast Asia (fig. 1) were grouped as follows for this report.

*Sunda-Java-Burma Arc-Related Provinces.*—Irrawaddy, Indo-Burman, North Sumatra Basin, Central Sumatra Basin, South Sumatra Basin, Northwest Java Basin, East Java Basin, South Makassar Basin, and Sumatra-Java Forearc Basins.

*Sundaland Provinces.*—Thai Cenozoic Basins, Thai Basin, Malay Basin, Cuu Long Basin, Nam Con Son Basin, Greater Sarawak Basin, East Natuna Basin, and Penyu/West Natuna Basin.

*Red River Fault Zone Provinces.*—Song Hong Basin and Phu Khanh Basin.

*Southeast China Provinces.*—Pearl River Mouth Basin, Qiongdongnan Basin, Taixinan Basin, and Beibuwan Basin.

*Borneo-Kalimantan Provinces.*—South China Sea Platform, Baram Delta/Brunei-Sabah Basin, Tarakan Basin, Kutei Basin, and Barito Basin.

*Philippine Provinces.*—Palawan Shelf, Sulu Sea Basin, Cagayan Basin, and Visayan Basin.

*Triassic TPS Provinces.*—Khorat Plateau and Tonle Sap-Phnom Penh Basin.

## Undiscovered Resources Summary

The USGS quantitatively assessed undiscovered conventional oil, gas, and natural gas liquid resources within 33 geologic provinces of Southeast Asia (table 1). The fully risked, estimated mean totals for Southeast Asia are 10,531 million barrels of oil (MMBO), or 10.5 billion barrels of oil, with an F95–F5 fractile range from 4,998 to 17,802 MMBO; 271,461 billion cubic feet of gas (BCFG), or 271.5 trillion cubic feet, with an F95–F5 range from 129,043 to 465,177 BCFG; and 4,285 million barrels of natural gas liquids (MMBNGL), or 4.3 billion barrels of natural gas liquids, with an F95–F5 range from 1,970 to 7,337 MMBNGL. The range of resource estimates reflects the geologic uncertainty in the assessment of conventional oil and gas resources.

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## For More Information

Assessment results are also available at the USGS Energy Resources Program website at https://energy.usgs.gov.

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