U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

TO ACCOMPANY MAP CP-40

EXPLANATORY NOTES FOR THE ENERGY-RESOURCES MAP OF THE CIRCUM-PACIFIC REGION NORTHWEST QUADRANT

1:10,000,000

CIRCUM-PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES

1992

CIRCUM-PACIFIC COUNCIL FOR ENERGY AND MINERAL RESOURCES
Michel T. Halbouty, Chairman

CIRCUM-PACIFIC MAP PROJECT
John A. Reinemund, Director
George Gryc, General Chairman

EXPLANATORY NOTES FOR THE ENERGY-RESOURCES MAP OF THE CIRCUM-PACIFIC REGION NORTHWEST QUADRANT

Scale: 1:10,000,000

By

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1992

Explanatory Notes to Supplement the

ENERGY-RESOURCES MAP OF THE CIRCUM-PACIFIC REGION NORTHWEST QUADRANT

Tomoyuki Moritani, Chairman
Northwest Quadrant Panel

PETROLEUM RESOURCES

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INTRODUCTION

CIRCUM-PACIFIC MAP PROJECT

By
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The Circum-Pacific Map Project is a cooperative international effort designed to show the relation of known energy and mineral resources to the major geologic features of the Pacific basin and surrounding continental areas. Available geologic, mineral, and energy-resource data are being integrated with new project-developed data sets such as magnetic lineations, seafloor mineral deposits, and seafloor sediment. Earth scientists representing some 180 organizations from more than 40 Pacific-region countries are involved in this work.

Six overlapping equal-area regional maps at a scale of 1:10,000,000 form the cartographic base for the project: the four Circum-Pacific quadrants (Northwest, Southwest, Southeast, and Northeast), and the Antarctic and Arctic regions. There is also a Pacific Basin Sheet at a scale of 1:17,000,000. Published series include the Base (published from 1977 to 1989), Geographic (published from 1977 to 1990), and Geodynamic (published from 1984 to 1990) Map Series; all of them include seven map sheets. Thematic map series in the process of completing publication include the Plate-Tectonic (publication initiated in 1981), Geologic (publication initiated in 1983), Tectonic (publication initiated in 1991), Energy-Resources (publication initiated in 1986), and Mineral-Resources (publication initiated in 1984) Map Series. Altogether, 60 map sheets are planned. The maps are prepared cooperatively by the Circum-Pacific Council for Energy and Mineral Resources and the U.S. Geological Survey. Maps published prior to mid-1990 are distributed by the American Association of Petroleum Geologists (AAPG) Bookstore, P.O. Box 979, Tulsa, Oklahoma 74101, U.S.A.; maps published from mid-1990 onward are available from Map Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, Colorado 80225, U.S.A.

The Circum-Pacific Map Project is organized under six panels of geoscientists representing national earth-science organizations, universities, and natural-resource companies. The regional panels correspond to the basic map areas. Current panel chairmen are Tomoyuki Moritani (Northwest Quadrant), R. Wallace Johnson (Southwest Quadrant), Ian W. D. Dalziel (Antarctic Region), José Corvalán D. (Southeast Quadrant), Kenneth J. Drummond (Northeast Quadrant), and George W. Moore (Arctic Region).

Project coordination and final cartography are being carried out through the cooperation of the Office of International Geology of the U.S. Geological Survey under the direction of Map Project General Chairman George Gryc of Menlo Park, California, with the assistance of Warren O. Addicott, consultant. Project headquarters are located at 345 Middlefield Road, MS 952, Menlo Park, California 94025, U.S.A. The project has been overseen from its inception by John A. Reinemund, Director of the Project since 1982.

The framework for the Circum-Pacific Map Project was developed in 1973 by a specially convened group of 12 North American geoscientists meeting in California. The project was officially launched at the First Circum-Pacific Conference on Energy and Mineral Resources, held in Honolulu, Hawaii, in August 1974. Sponsors of the conference were the American Association of Petroleum Geologists (AAPG), Pacific Science Association (PSA), and the Committee for Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas (CCOP). The Circum-Pacific Map Project operates as an activity of the Circum-Pacific Council for Energy and Mineral Resources, a nonprofit organization that promotes cooperation among Circum-Pacific countries in the study of energy and mineral resources of the Pacific basin. Founded by Michel T. Halbouty in 1972, the Council also sponsors quadrennial conferences, topical symposia, scientific training seminars, and the Earth Science Series of publications.

Published thematic maps of the Northwest Quadrant include the Plate-Tectonic Map (Nishiwaki, 1981; revised by Inoue, 1987), the Geodynamic Map (Nishiwaki, 1985), and the Geologic Map (Inoue, 1988). The Mineral-Resources Map is now in proof stage, and the Tectonic Map is being compiled by the Northwest Quadrant Panel.

ENERGY-RESOURCES MAP OF THE NORTHWEST QUADRANT

By
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Geological Survey of Japan

The Energy-Resources Map of the Northwest Quadrant of the Circum-Pacific Region is the third published in a series of six overlapping 1:10,000,000-scale Energy-Resources Map sheets. The Northeast Quadrant sheet was published in 1986 (Drummond, 1986), and the Southeast Quadrant sheet was published in 1991 (Yrigoyen and others, 1991). Other maps in this series will be the Southwest Quadrant, and the Antarctic, Arctic, and Pacific Basin sheets.

The Energy-Resources Map Series is designed to be as factual as possible, with a minimum of interpretation. The small scale of the equal-area maps, 1:10,000,000 (100 km/cm or 10,000 km^2/cm^2), requires great simplification of both the background information and the energy-resource data; hence, this map can only give a general impression of the distribution, character, and geologic environment of these resources. Nevertheless, it does provide a unified overview of the energy resources of the northwest Pacific region.

Information depicted on the Energy-Resources Map of the Northwest Quadrant includes a generalized geologic background, oil and gas fields, oil shale, coal deposits, geothermal energy sites, hot springs, onshore basin isopachs, and sediment isopachs in ocean areas. Also depicted are generalized stratigraphic columns for many of the major or typical basins of the Northwest Quadrant.

The geologic background for the Energy-Resources Map is designed to show the relevance of the "economic basement" to the sedimentary-basin areas. Depicted in a generalized format are ultramafic rocks, Precambrian basement, igneous intrusive rocks, volcanic rocks, and deformed sedimentary fold belts. Bathymetry and sediment isopachs form the background for the oceanic areas. Active plate boundaries shown in red are taken from the Plate-Tectonic Map of the Circum-Pacific Region, Northwest Quadrant (Nishiwaki, 1981; revised by Inoue, 1987). Spreading axes on this map are depicted as lines of uniform width (1 mm) rather than by lines of varying width to represent spreading rates, as on the Plate-Tectonic Map.

The Energy-Resources Map of the Northwest Quadrant was prepared under the direction of the present Panel Chairman Tomoyuki Moritani, formerly of the Geological Survey of Japan, and the previous chairman Eiji Inoue, formerly of the Geological Survey of Japan. The final compilation of the map was coordinated by Tomoaki Sumii, Geological Survey of Japan. The major compilation was completed by Tomoaki Sumii, Koji Wakita, Osamu Matsubayashi, and Keizo Fujii, all of the Geological Survey of Japan, with the assistance and advice of past and present Northwest Quadrant panel members and the staff of the Geological Survey of Japan, notably by Yoshiaki Sato, Kazuo Hoshino, Eiichi Honza, Manabu Tanahashi, Koichi Nakamura, Yasufumi Ishiwada, Yutaka Ikebe, and Shunichi Sano. The contributions of Zhai Guangming of the Research Institute of Petroleum Exploration and Development, People's Republic of China, and Chong Su Kim of the Korean Institute of Energy Resources are acknowledged with appreciation. Kenneth J. Drummond, Mobil Oil Company of Canada, contributed to Table 2 of these notes, and Theresa R. Swint-Iki, U. S. Geological Survey, contributed to the index maps and tables in these notes. Other principal investigators and sources of data are indicated in the references section on the map sheet and in the bibliographic references that follow. Affiliations are at time of compilation.

The Northwest Quadrant Panel is composed of the following members: Tomoyuki Moritani (Chairman), Yuji Endo, Keizo Fujii, Jiro Hirayama, Eiichi Honza, Masaharu Kamitani, Osamu Matsubayashi, Hiro'o Natori, Tamotsu Nozawa, Tadashi Sato, Yoshihiko Shimazaki, Tomoaki Sumii, Kensaku Tamaki, Yoji Teraoka, Koji Wakita, and Takashi Yoshida, Japan; Kim Dong Hak and Hyen-Il Choi, Korea; Wang Daxiong and Feng Zhigien, People's Republic of China; Raymundo S. Punongbayan, Philippines; Tran Van Tri, Le Van Cu, and Nguyen Khac Vinh, Vietnam; Sivavong Changkasiri and Saengathit Chuaviroj, Thailand; Yin Ee Heng and Khoo Hang Peng, Malaysia; H.M.S. Hartono, M. Untung, and Tohap Simanjuntak, Indonesia; Greg Anderson and Stevie Nion, Papua New Guinea; and Maurice J. Terman and Frank F. H. Wang, U.S.A.

GEOLOGIC BACKGROUND

GEOLOGIC SETTING

By
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The geologic background is generalized from the Geologic Map of the Circum-Pacific Region, Northwest Quadrant (Inoue, 1988). Significant tectonic and lithologic units have been combined into six major divisions; ultramafic rocks are shown in black. The classification system of this map is the same as the Energy-Resources Map of the Circum-Pacific Region, Northeast Quadrant (Drummond, 1986), with one exception. On the Northeast Quadrant Map continental-margin rocks are divided into two units; on this map continental-margin rocks are shown as one unit.

The continental part of the Northwest Quadrant Map area is an assemblage of continental blocks surrounded by Phanerozoic fold belts. The major continental blocks are parts of two Archean shields (Siberian Platform and North China Platform) and four major Proterozoic blocks (Yangtze Platform, Kontum Platform, Bureya Massif, and Kolyma Massif). The continental blocks are covered by essentially undeformed, younger sedimentary rocks. Phanerozoic fold belts are ancient accretionary complexes, including oceanic materials, microcontinents, and remnant island arcs. The fold belts contain the extrusive and intrusive rocks which are related to subduction. Subduction, collision, and accretion are the main cause of the geologic features in the Northwest Quadrant Map area (fig. 1).

The background units include ultramafic rocks; crystalline basement rocks; continental-margin rocks of Late Proterozoic to Phanerozoic age; metamorphic complexes; intrusive igneous rocks; volcanic rocks of Phanerozoic age; and major sedimentary basins, platform deposits, and surficial deposits.

Crystalline Basement Rocks. The rocks classified as basement rocks are Precambrian in age and include marine sedimentary rocks, metamorphic rocks, felsic intrusive and extrusive rocks, ultramafic to mafic intrusive rocks, and anorthosite.

Continental-Margin Rocks of Late Proterozoic and Phanerozoic Age. Continental-margin rocks include two types of rocks: ancient accretionary complexes characterized by the occurrence of melange and covered sedimentary sequences on platforms which were deformed by later tectonism. The ancient accretionary complexes consist of sedimentary and slightly metamorphosed rocks, including melange, turbidites, fragments of microcontinents, and remnant island arcs that are found along existing continental margins, on island arcs, and between ancient continental blocks. These complexes have been intensely deformed by faulting and folding. The covered sedimentary rocks are distributed on the margins of ancient continental blocks such as the Siberian, North China, and Yangtze Platforms. The platform deposits consist of nonmarine and marine sediments which are folded to various degrees.

Metamorphic Complexes. The areas shown as metamorphic complexes include a variety of rocks ranging in age from Late Proterozoic to Tertiary that are highly deformed, metamorphosed, and in places intruded by granitic rocks. They range from greenschist facies up to gneiss. Some of them have metamorphic affinity with the ancient accretionary complexes.

Intrusive Igneous Rocks. Intrusive igneous rocks range in age from Paleozoic to Tertiary, and in composition from gabbro to granite. Most ages of major batholiths are Mesozoic to Paleogene.

Volcanic Rocks. Paleozoic to Quaternary volcanic rocks, ranging in composition from basalt to rhyolite, are widely distributed in the Northwest Quadrant area. Major distribution of Quaternary volcanic rocks is parallel to the present trench systems. Large amounts of felsic extrusive igneous rocks of Cretaceous to Paleogene age are extensively distributed along the continental margin of East Asia.

Major Sedimentary Basins, Platform Deposits, and Surficial Deposits. Thickness of sedimentary rock and sedimentary basins is shown by sediment isopachs, colored to indicate the age of the oldest major sedimentary unit above the basement. The age and lithology of the basement are generally indicated by the surrounding bedrock geology. Lithostratigraphy of the representative 47 basins and 1 oceanic rise is presented by the schematic columnar sections. The data sources for the columnar sections are included in the References. In oceanic regions, sediment isopachs are colored to indicate the age of the underlying oceanic crust in accordance with the Plate-Tectonic Map of the Circum-Pacific Region, Northwest Quadrant (Nishiwaki, 1981; revised by Inoue, 1987). The data sources for the isopachs are shown in figure 2.

TECTONIC SETTING

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Figure 3 shows the major plates and major active plate boundaries in the northwest Pacific region. The major plates are the North America Plate, the Eurasia Plate, the Philippine Plate, the Pacific Plate, and the Australia-India Plate. In addition, some minor plates are subdivided and identified. Several models have been proposed for the plate boundary between the North America Plate and the Eurasia Plate, but none have been fully accepted.

Along the east margin of the Asian continent and the Philippine Sea, where the Pacific Plate converges with the Eurasia and Philippine Plates, lie a series of trench-island arc-marginal sea systems. The Himalaya Orogenic Belt and the Sunda Arc constitute the convergent belt between the Eurasia Plate and the Australia-India Plate. Around the Banda Sea, three major plates converge: the southeast tip of the Eurasia Plate, the south tip of the Philippine Plate, and the Australia-India Plate. The interaction between these three plates has created the complicated island-arc systems in this region (fig. 1). The Pacific Plate converges onto the Australia-India Plate along the New Guinea Fold Belt and Bismarck Archipelago, and along the Solomon Islands.

The Eurasia continent is composed of several continental blocks made up of platforms and massifs amalgamated along suture zones or fold belts. These suture zones are interpreted as the ancient plate boundaries. The development of sedimentary basins in this region is controlled by the interaction of these continental blocks

SEDIMENTARY BASINS

By
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Figure 4 shows 197 sedimentary basins in this map area (listed in table 1). Stratigraphic columnar sections are shown on the map for the representative 47 sedimentary basins and 1 oceanic rise. On this map, a sedimentary province that has undeformed sediments more than 1,000-m thick is identified as a sedimentary basin. Almost all sedimentary basin boundaries coincide with the 1,000 m isopach line, or with main tectonic lines which control the tectonic development of the basins. Most oil and gas fields are located within sedimentary basins (figs. 5, 6). Many coal fields, however, tend to be located outside of the sedimentary basins.

The 197 main sedimentary basins of the Northwest Quadrant can be classified according to their geographic distribution and geologic characteristics, as follows:

1. Arctic Sea, northern area of the North American and Asian continents.
2. Pacific coast of the North American continent.
3. Along the Aleutian Islands arc, between the Pacific and the North America Plates.
4. Over the cratons of the Asian continent.
5. Along the suture zone between the cratonic blocks within the Asian continent.
6. Along the east margin of the east Asian continent.
7. In and along the trench-island arc-marginal sea systems of the northwest Pacific Ocean.
8. Along the continental margin of the Southeast Asian continent, including the Sunda Shelf.
9. Inside the Sunda Shelf-Indochina region tectonically controlled by Cenozoic wrench tectonics related to the collision of the Australia-India Plate to the Eurasia Plate.
10. Along the islands around the Banda Sea.
11. In and around New Guinea.
12. Along the Solomon Islands Arc.

Each basin within a geographic group has common geologic characteristics, such as initiation age, lithofacies variation, and tectonic development. This implies that the generation and evolution of sedimentary basins have been strongly affected by the regional geologic evolution, or by the movement of the multiple plates.

From the viewpoint of petroleum geology, these geologic characteristics affect the basic characteristics of the oil and gas fields, source rock, reservoir facies, thermal and diagenetic histories, and oil and gas potential.

The sedimentary basins of type 4, distributed over the cratons of the Asian continent, Eerdosi Basin (074, fig. 5 and table 2) and Shichuan Basin (085, fig. 5 and table 2), for example, have the following general characteristics:

1. Developed in a nonmarine environment.
2. Basin initiation in the Precambrian or early Paleozoic.
3. Basins with round or square shapes, and diameter of several hundred kilometers.
4. Giant oil and gas fields present.

The sedimentary basins of type 6, distributed along the east margin of the east Asian continent, Songliao Basin (065, fig. 5 and table 2) and East China Sea Basin (081, fig. 5 and table 2), for example, have the following general characteristics:

1. Initiated in a nonmarine environment, and developed in a nonmarine environment or shallow-marine environment.
2. Basin initiation in the Mesozoic.
3. Basins elongated in a direction parallel to the trench system.
4. Development of these basins affected by rift tectonism related to the Pacific Plate subduction beneath the Eurasia Plate.
5. Giant oil and gas fields present.

The sedimentary basins of type 7 can be divided from their geographic position in the trench-island arc-marginal sea systems into forearc basins, backarc basins, and intra-arc basins, and are distributed in and along the trench-island arc-marginal sea systems of the northwest Pacific Ocean. Niigata-Akita Basin (048, fig. 5 and table 2), Shimajiri Basin (061, fig. 4 and table 1), and Visayan Sea Basin (126, fig. 4 and table 1), for example, have the following general characteristics:

1. Initiated in a nonmarine environment; almost all initiated and developed in a marine environment.
2. Significant variations of lithofacies and depositional environments in the lateral and vertical dimension.
3. Basin initiation in the Cenozoic.
4. Basins elongated in a direction parallel to the island arc.
5. Giant oil and gas fields not present.

PETROLEUM RESOURCES

OIL AND NATURAL GAS

By
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The main oil and gas fields of the Energy-Resources Map of the Circum-Pacific Region, Northwest Quadrant, are plotted as close to true scale and location as possible. Some of the smaller fields have been enlarged slightly for discrimination purposes, and in some areas several small fields in close proximity have been grouped as one.

Giant oil and gas fields have been included in table 2 (indicated by italics) and figure 6, and are considered to be those for which the estimate of ultimately recoverable oil is 500 million barrels of oil or gas equivalent (Carmalt and St. John, 1986). Gas is converted to oil at a ratio of 6000 cubic feet per barrel. Some fields reach this classification only because their combined amounts of oil and gas-equivalent total at least 500 million barrels.

Index maps of selected oil and gas fields for the Northwest Quadrant are shown on figures 5 and 6. Data such as the year of discovery, reservoir age, lithology for each field, and cumulative production are included in table 2.

OIL SHALE

By
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The principal environments in which oil shale was deposited were shallow seas on continental platforms and continental shelves, in areas where the circulation of water near the sea floor was restricted, and in small lakes, bogs, and lagoons associated with coal-producing swamps. Large marine oil-shale deposits of Early and Middle Cambrian age occur on the northeastern Siberian Platform around Anabar, Olenek, and the Lena Rivers. Oil-shale deposits of Jurassic and Cretaceous age in northern China and Mongolia are mostly associated with coal-bearing rocks. Oil-shale deposits of Tertiary age in China, Thailand, and Myanmar (Burma) are associated with coal-bearing rocks and occur in marginal regions where major orogenic movements produced folded and faulted mountains (Duncan and Swanson, 1965; Duncan, 1976).

COAL DEPOSITS

By
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The economically workable coal seams are mostly produced in intracratonic basins and platforms and orogenic regions and are in formations of the Upper Carboniferous-Permian, the Upper Triassic-Jurassic, and the Upper Cretaceous-middle Tertiary (fig. 7 and table 3).

In orogenic regions, for example, collisional sutures, island arcs, and coal-bearing basins may have been exposed to rapid differential uplift and subsidence and as a result the basins tend to be limited both in extent and in coal properties. Coal-bearing formations are likely to be deeply buried, often in an area of high geothermal gradient due to regional and local volcanic activity, which produces relatively high but variable ranks of coal.

In stable cratonic regions, relatively extensive deltaic coal-bearing basins are usually formed. Usually transgression and regression extend over a wide area, then laterally persistent coal seams are formed in coastal environments. Such areas are seldom intensely deformed. Therefore, the range in the rank of coal is often relatively narrow, and coal-bearing basins have no definite structural control.

From north to south, this quadrant is composed of the Angaraian paleoplate, Cathaysian paleoplate, and fragments of Gondwana. The Angaraian paleoplate contains the Siberian Platform. The Cathaysian paleoplate contains the Bureya Massif, Tarim Platform, North China Platform, and Yangtze Platform (fig. 1).

The suture between the Siberian Platform and the Tarim Platform-Bureya Massif was the main ocean separating the Angaraian and Cathaysian paleoplates during Paleozoic and early Mesozoic time. The collisional suture separating the Bureya Massif and the North China Platform is of Permian-Triassic age. The collisional suture separating the North China and Yangtze Platforms is of Late Triassic-Early Jurassic age. The next collisional suture to the south, separating the Yangtze Platform from North Tibet-Malaysia and from Indonesia, is of Jurassic age. The continuous area from northern Tibet through Malaysia and Indonesia is considered as a separate plate that extends under the Gulf of Thailand to southwestern Borneo.

By Late Triassic time, the core of Southeast Asia was largely consolidated. Thereafter, the additional fragments of south Tibet and Burma Myanmar)-northwest Sumatra were accreted during Cretaceous time. Finally, India arrived, and during the Eocene collided and drove into the pre-existing mosaic of plates in southern Asia. On the Angaraian paleoplate, extensive deltaic coal-bearing strata of Carboniferous, Permian, Early and Middle Jurassic, Late Cretaceous, and Neogene ages developed. On the North China and Yangtze Platforms, extensive deltaic coal-bearing strata formed from the Middle Carboniferous to Early Permian, and in Korea, Jurassic coal is well developed. In the collisional suture separating the Tarim-North China Platform and the Yangtze Platform, Jurassic and Cretaceous coal is well developed.

In Vietnam, the Permian to Triassic basins which occupy collisional suture zones have been interpreted as basins which subsequently opened as a result of wrench faulting. These basins are commonly characterized by rhyolitic volcanism and important coal deposits.

A major orogenic event during the Late Cretaceous was the collision of the Burma microplate with the southwest margin of Eurasia: this was a major cause of the development of coal-bearing basins. In the early Tertiary, the Burma microplate was moved northward, and important transform motion began in Thailand, the Malaya Peninsula, and Sumatra. Slight extension on strike-slip faults led to important Tertiary graben-like coal basins along and adjacent to the line of these faults. In eastern Kalimantan, extensive deltaic coal-bearing strata were developed in the continental-margin basins. In Taiwan and Japan, the Pacific Plate convergence caused strike-slip faulting and differential uplift and subsidence, thereby resulting in the formation of coal-bearing basins.

The collision between the Australia-India Plate and the Eurasia Plate and the subduction of the Pacific Plate under the Eurasia Plate during the

Eocene led to the formation of coal basins caused by intracratonic strike-slip faulting in China, Burma, and Thailand, and also to the formation of the volcanic inner-arc intramontane coal basins in Japan, Taiwan, and the Philippines (Tapponnier and Molnar, 1977; Tatsch, 1980; Zhang and others, 1984; Parker and Gealey, 1985; Taira and Tashiro, 1987; Hutchison, 1989).

GEOTHERMAL RESOURCES

By
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Two kinds of data on geothermal resources are shown on this Energy-Resources Map: geothermal fields that have already been developed to generate electricity (fig. 8) and major hot springs that have been documented.

Developed geothermal fields are classified into two types, vapor-dominated fields and liquid-dominated fields. More detailed classification is not made due to the difficulty in collecting standardized information on basic reservoir characteristics, including temperature. Hot-spring data for Japan are so numerous that only those springs with a surface temperature greater than 90°C are shown, with each circle representing a group of hot springs. For areas outside of Japan, data were collected from various published sources. Data for Thailand came from the Geological Survey of Japan (1987), and data for the Philippines are based on Alcaraz (1974). Hot-spring data for other Southeast Asian countries are from Waring (1965) and Gupta (1980).

JAPAN

In Asia geothermal power generation was introduced earliest in Japan, but development in the 1970s and 1980s was very slow, mainly due to environmental concerns. As of 1990, the total installed capacity amounts to 283 megawatts, composed of eight large plants and two small plants for local use at hotels. Throughout Japan, exploration and resource assessment for newly surveyed high-temperature geothermal reservoirs have been and are now very active. By 1995 at least three more geothermal power plants will be on line in northeastern Japan and Kyushu. A great variety of opinion exists on the geologic control of the distribution of geothermal resources on the Japanese Islands, and it has been recently reviewed by Kimbara (1988).

THE PHILIPPINES

The Philippines is the largest producer of geothermal power in Asia, and second largest in the world, with a total installed geothermal power generation capacity as high as 894 megawatts for the four geothermal fields: Mak-Ban on Laguna; Tiwi on Luzon; Tongonan on Leyte; and Palimpinon on southern Negros. Besides these four sites, exploration is in progress in six prospective areas on Luzon, three on Visayan, and one on eastern Mindanao. A target total capacity of 1554 megawatts nationwide has been mentioned in a review paper by Datuin and Troncales (1986). Geographically, these geothermal resource areas are associated with the three major belts of Pliocene to Quaternary volcanoes of the Philippine Island Arc: the western volcanic belt faces the South China Sea and includes geothermal resource areas of northern and central Luzon and Mindoro Island; the eastern volcanic front facing the Pacific parallel to the Philippine Fault, including the very active geothermal fields of southern Luzon, Leyte, and Mindanao; and the volcanic belt made up of geothermal areas aligned through Sulu Archipelago and toward its northeastern extension.

THAILAND

On the basis of cooperative surveys by several national and international institutes, two geothermal resource areas have been selected for intensive assessment: the San Kampaeng area and the Fang area in the northwestern part of Thailand. A 300-kilowatt binary-cycle pilot plant is being built in the Fang area using geothermal fluids at 150-200 °C. Geothermal fields of northern Thailand are located at the easternmost tip of the Himalayan Orogenic Belt.

INDONESIA

According to a nationwide assessment of geothermal resources in Indonesia by Alzwar (1986), total resource potential is estimated to be 13,000-14,000 megawatts, which comprises 3,550 megawatts for Java, 4,900 megawatts for Sumatra, 3,000 megawatts for Sulawesi, and the rest for other islands. However, installed capacity at present is only 140 megawatts at Kamojang and 2 megawatts at Dieng, both on Java. The Darajat geothermal field, located 10 km to the southwest of Kamojang, and the Salak geothermal field, also in Java, are now under final tests for development at the 110-megawatt level. The Lahendong field in the northern part of Sulawesi is expected to produce 15 megawatts by 1993. The distribution of potential geothermal resource areas is clearly controlled by the prominent trend of volcanic zones that parallel active trenches, such as the volcanic zones of Sumatra, Sunda Strait, Java, Bali, and Nusatenggara, corresponding to the Sunda Trench; and those of Halmahera and Sulawesi, also caused by strong interaction between adjacent plates.

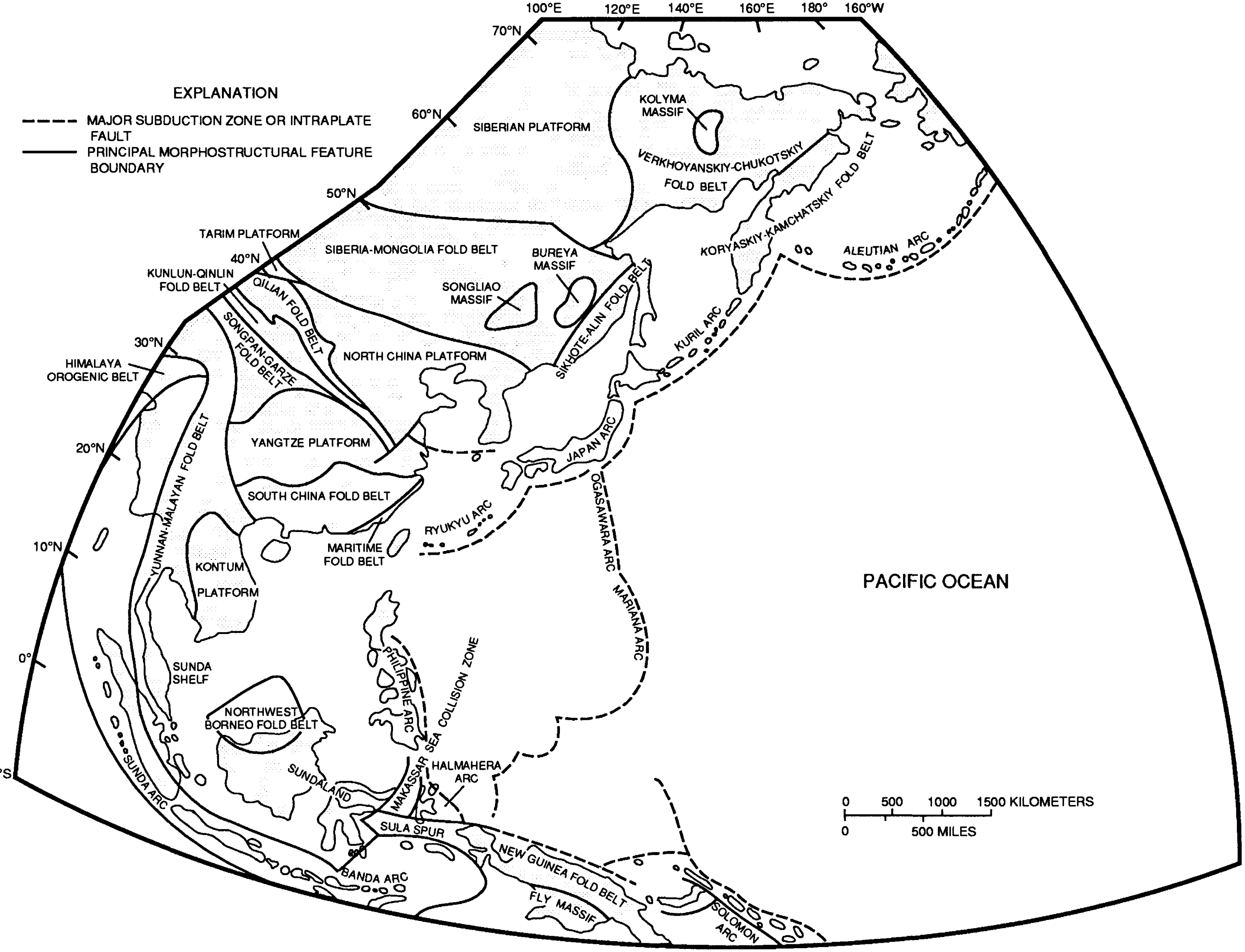
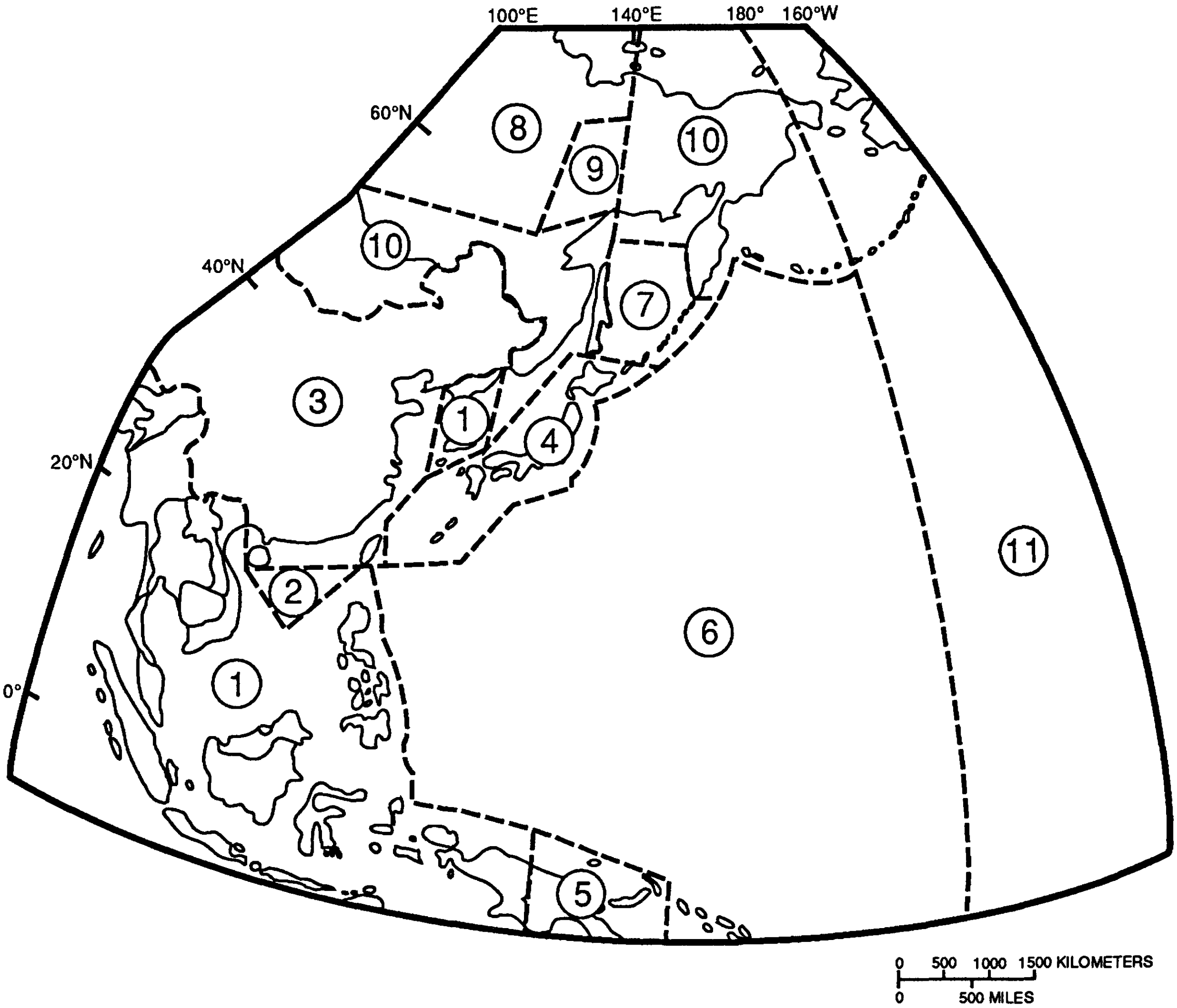


Figure 1. Index map showing principal morphostructural features of Northwest Quadrant of Circum-Pacific region (after Inoue, 1988). Other geographic and structural features included.



EXPLANATION

1. United Nations Economic and Social Commission for Asia and the Pacific, 1985
2. United Nations Economic and Social Commission for Asia and the Pacific, 1985, and Institute of Geomechanics, Chinese Academy of Geological Science, 1984
3. Institute of Geomechanics, Chinese Academy of Geological Science, 1984
4. Hirayama and others, 1989 MS
5. Bickel, 1976; Grund, 1976; Ridd, 1976; and Wise; 1976
6. Ludwig and Houtz, 1979
7. Gnibidenko, 1985
8. Khain, 1985
9. Khain, 1985; and Eremenko and others, 1978
10. Eremenko and others, 1978
11. Drummond, 1986

Figure 2. Data sources for sediment isopachs.

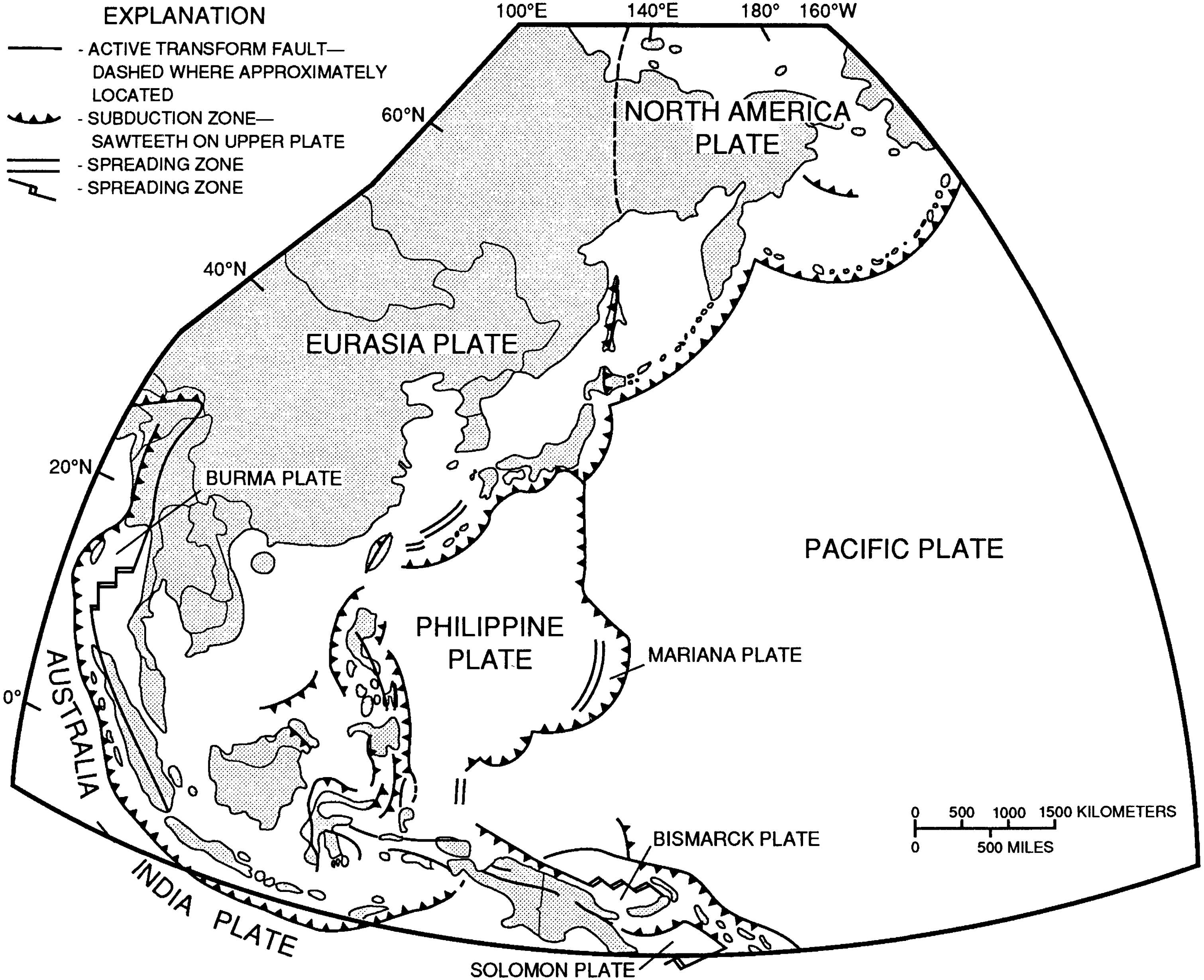


Figure 3. Index map showing major and minor plates of Northwest Quadrant of Circum-Pacific region

Figure 4. Index map showing location of sedimentary basins (shaded) in Northwest Quadrant of Circum-Pacific region (numbers refer to table 1).

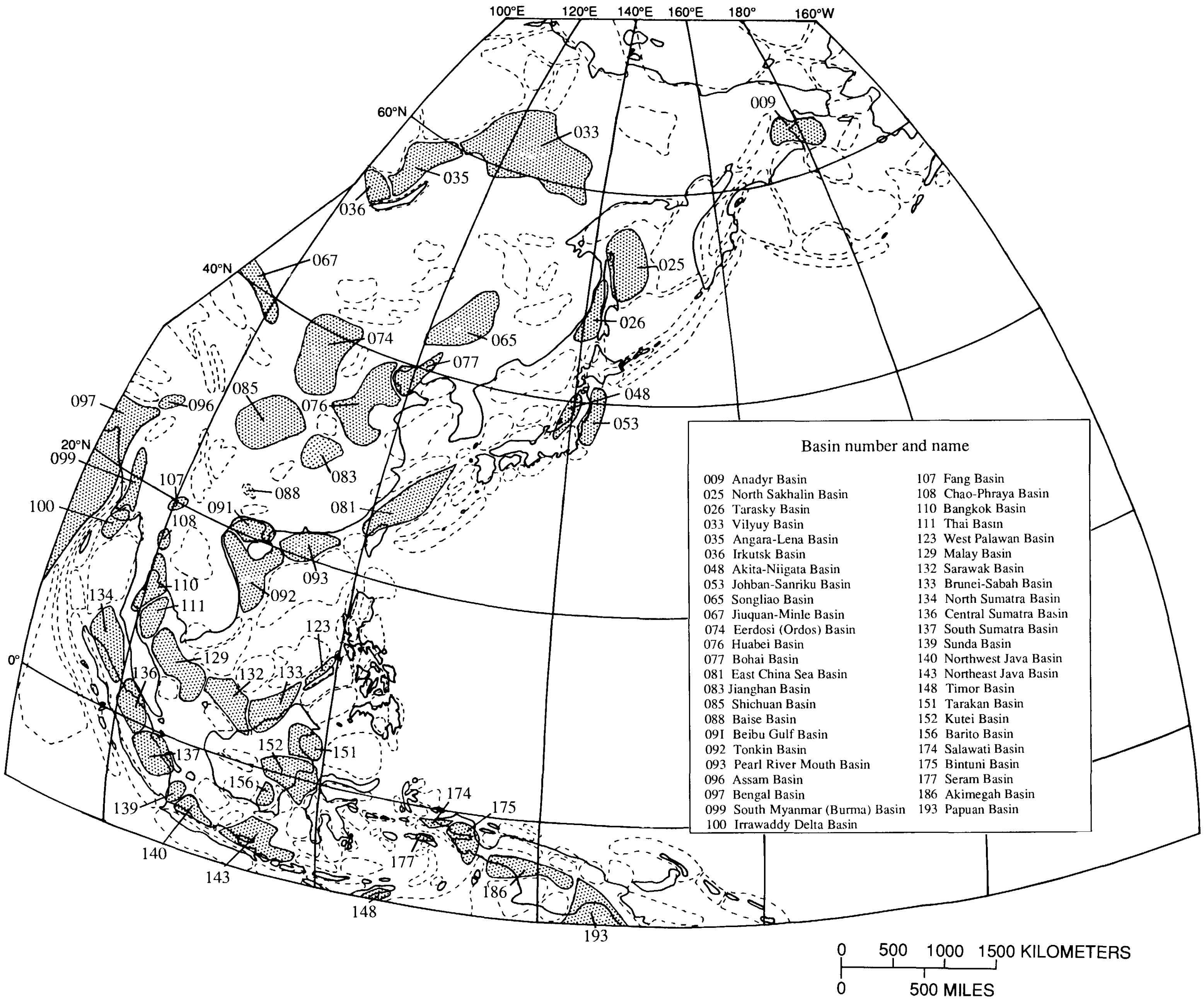


Figure 5. Index map showing location of sedimentary basins that contain selected oil and (or) gas fields in Northwest Quadrant of Circum-Pacific region (numbers refer to table 2). Dashed lines show sedimentary basin boundaries, shaded areas show oil- and (or) gas-bearing sedimentary basins.

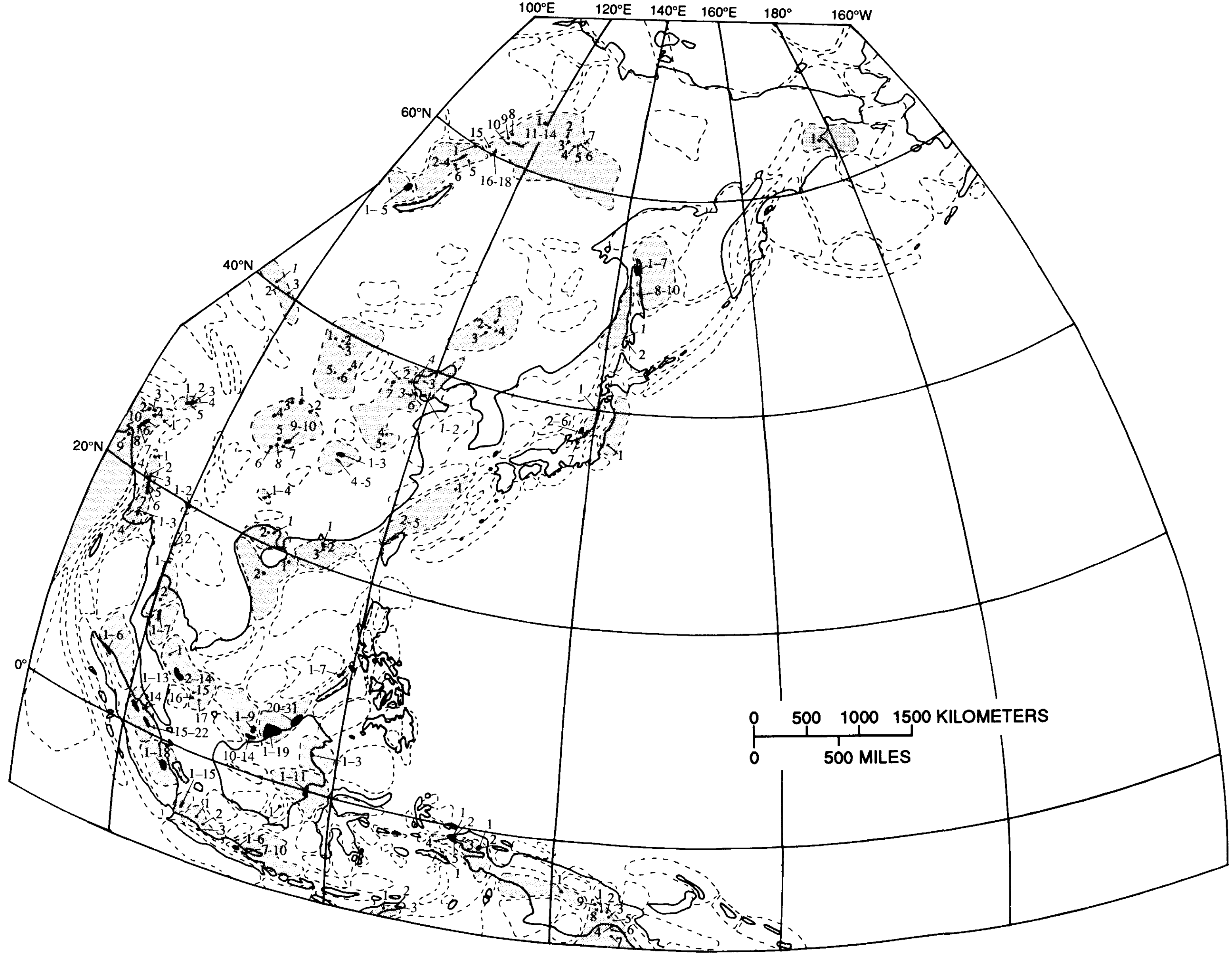


Figure 6. Index map showing location of selected oil and (or) gas fields in Northwest Quadrant of Circum-Pacific region (numbers refer to table 2; see figure 5 for basin numbers). Dashed lines show sedimentary basin boundaries; shaded areas show oil- and (or) gas-bearing sedimentary basins; blackened areas represent oil and gas fields.

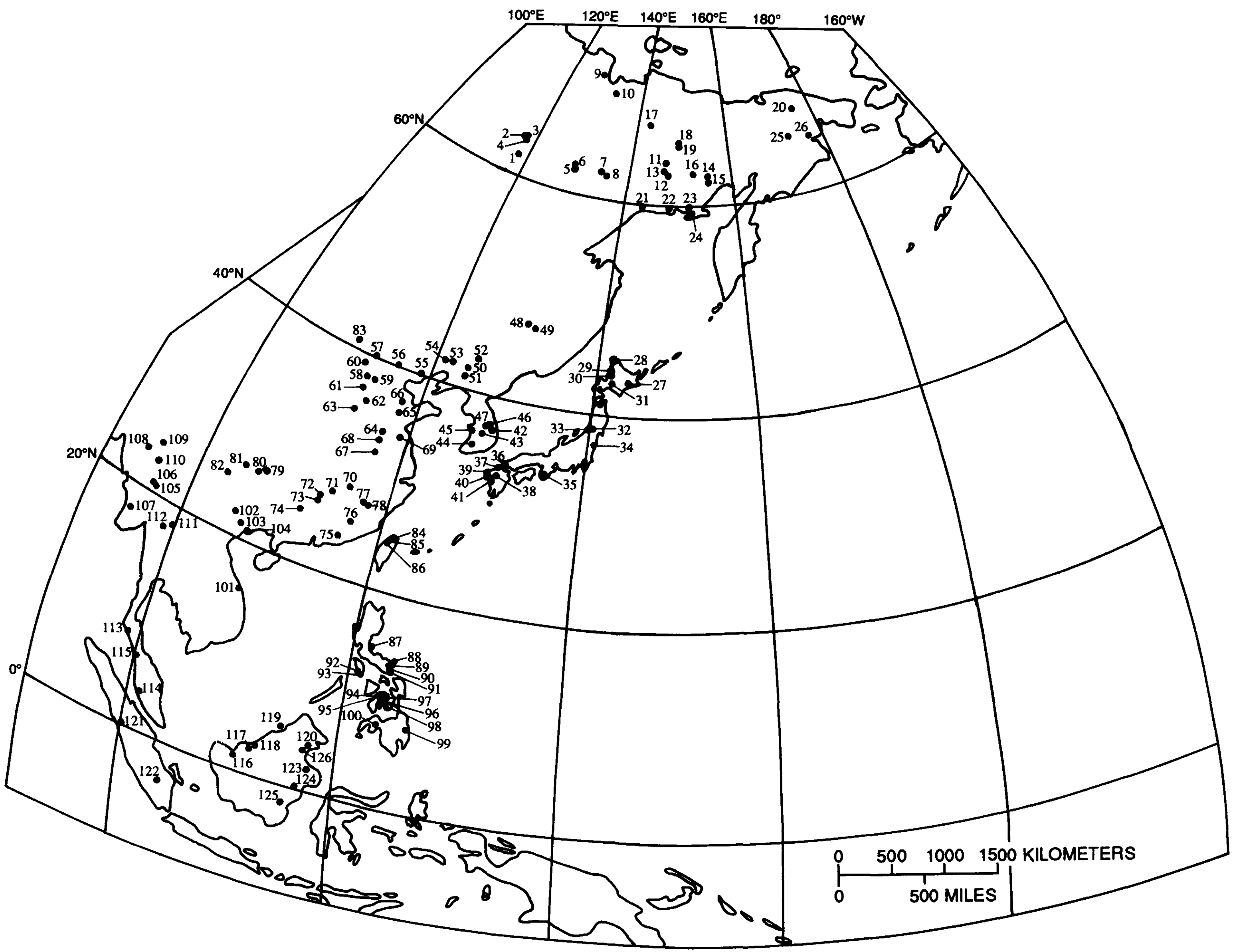


Figure 7. Index map showing location of major coal fields in Northwest Quadrant of Circum-Pacific region (numbers refer to table 3).

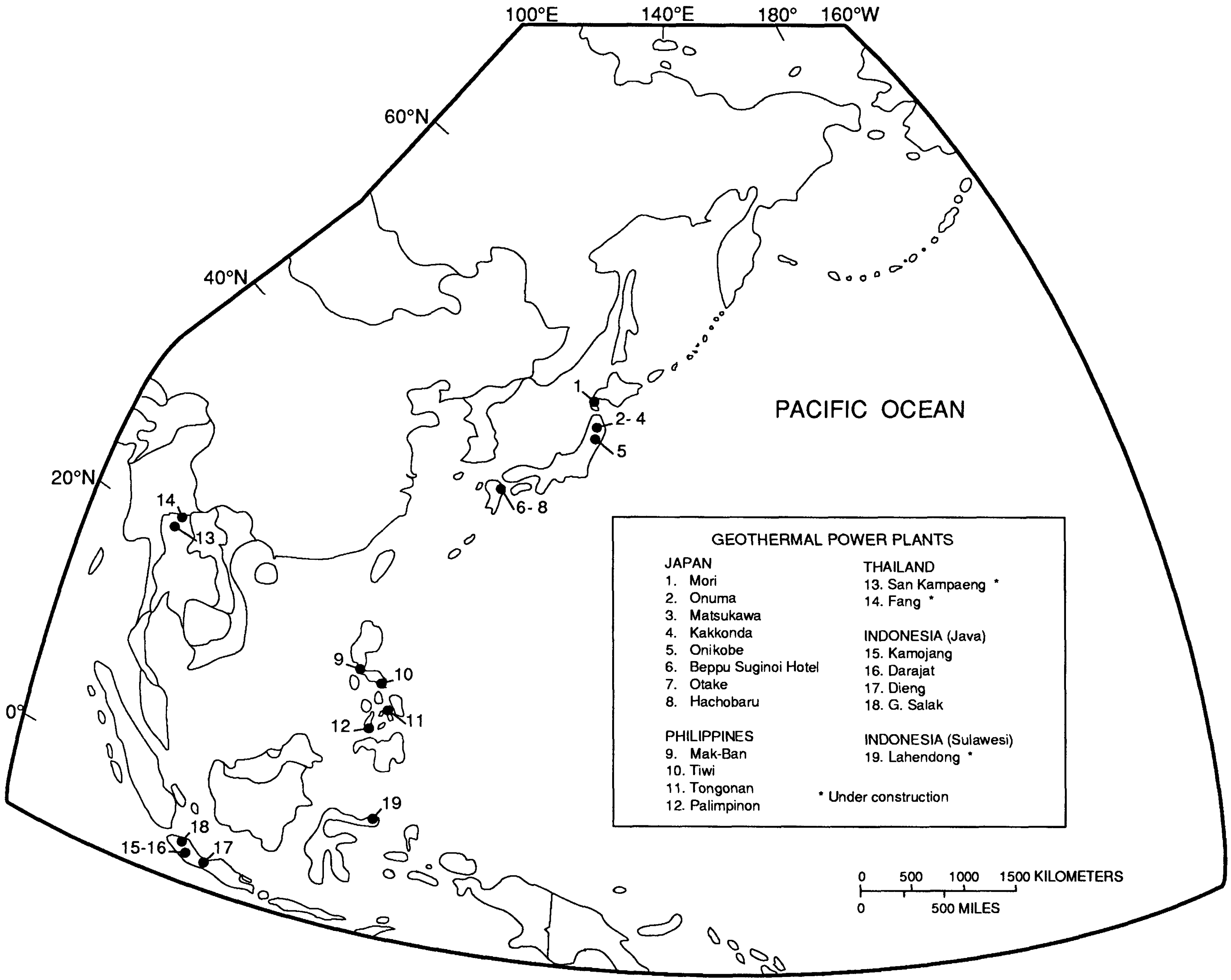


Figure 8. Index map showing location of geothermal power plants in the Northwest Quadrant of Circum-Pacific region.

Table 1. List of sedimentary basins in the Northwest Quadrant, Circum-Pacific region (numbers refer to figure 4)

001	North Chukchi Basin
002	Colville Basin
003	Hope Basin
004	Norton Sound Basin
005	St. Lawrence Basin
006	Bristol Basin
007	St. George Basin
008	Sanak Basin
009	Anadyr Basin
010	Navarin Basin
011	Aleutian Basin
012	Komandrasky Basin
013	Bowers Basin
014	Aleutian Trench Basin
015	Laptev Basin
016	East Siberia Basin
017	Mochigmen Basin
018	Penzhina Basin
019	West Kamchatka Basin
020	Central Kamchatka Basin
021	East Kamchatka Basin
022	Kuril–Kamchatka Trench Basin
023	North Okhotsk Basin
024	South Okhotsk Basin
025	North Sakhalin Basin
026	Tarasky Basin
027	Yenisey–Khatanga Basin
028	Anabar–Lena Basin
029	Tunguska Basin
030	Olenek Basin
031	Verkhoyansk Basin
032	Indigirka–Zyranka Basin
033	Vilyuy Basin
034	Kansk Basin
035	Angara–Lena Basin
036	Irkutsk Basin
037	Lake Baikal Basin
038	Aginskiy Basin
039	Zeya Bureya Basin
040	Uda Basin
041	Upper Bureya Basin
042	Etorufu Basin
043	Japan Sea Basin
044	Tsushima Basin
045	Yamato Basin
046	San'in–Hokuriku Basin
047	Toyama Basin
048	Niigata–Akita Basin
049	Oshima Basin
050	Teshio Basin
051	Ishikari Basin
052	Tokachi Basin
053	Joban–Sanriku Basin
054	Kanto Basin
055	Tokai–Kumano Basin
056	Tosa Basin
057	Miyazaki Basin
058	Fukue Basin
059	Danjo Basin
060	Okinawa Trough Basin
061	Shimajiri Basin
062	Gobi Basin
063	Hailar Basin
064	Erlian Basin
065	Songliao Basin
066	Sanjiang Basin
067	Jiuquan–Minle Basin
068	Chaidamu Basin
069	Minghe Basin
070	North Tibet Basin
071	Heime Basin
072	Chagpu Basin
073	Himalaya Basin
074	Eerdosi (Ordos) Basin
075	Fenhe Basin
076	Huabei Basin
077	Bohai Basin
078	Korea Bay Basin
079	Yellow Sea Basin
080	Shanghai Basin
081	East China Sea Basin
082	Nanxiang Basin
083	Jianghan Basin
084	Yuanma Basin
085	Shichuan Basin
086	Chuxiong Basin
087	Lamping–Simao Basin
088	Baise Basin
089	Shiwandashan Basin
090	West Taiwan Basin
091	Beibu Gulf Basin
092	Tonkin Basin
093	Pearl River Mouth Basin
094	South China Sea Basin
095	Ganges Basin
096	Assam Basin
097	Bengal Basin
098	North Myanmar (Burma) Basin
099	South Myanmar (Burma) Basin
100	Irrawaddy Delta Basin
101	Gulf of Martaban Basin
102	Andaman Basin
103	Nicobar Basin
104	Andaman Sea Basin
105	Nicobar Trench Basin
106	Nicobar Fan Basin
107	Fang Basin
108	Chao–Phraya Basin
109	Khorat Basin
110	Bangkok Basin
111	Thai Basin
112	Mekong Basin
113	Saigon Basin
114	Spratly Basin
115	Cagayan Basin
116	Lingayen Basin
117	Ilocos Basin
118	Zambales Basin
119	Southern Luzon Basin
120	Mindoro Basin
121	Iloilo Basin
122	Reed Bank Basin
123	West Palawan Basin
124	Balabac Basin
125	Sulu Basin
126	Visayan Sea Basin
127	Cotabato Basin
128	Agusan–Davao Basin
129	Malay Basin
130	Penyu Basin
131	Sokang Basin
132	Sarawak Basin
133	Brunei–Sabah Basin
134	North Sumatra Basin
135	Sibolga Basin
136	Central Sumatra Basin
137	South Sumatra Basin
138	Bengkulu Basin
139	Sunda Basin
140	Northwest Java Basin
141	South Java Basin
142	Pati Basin
143	Northeast Java Basin
144	Lombom Bali Basin
145	Flores Basin
146	Sawu Basin
147	Tukangbesi Basin
148	Timor Basin
149	Ketungau Basin
150	Melawi Basin
151	Tarakan Basin
152	Kutei Basin
153	Minasa Basin
154	Belitung Basin
155	Pembuang Basin
156	Barito Basin
157	Asem–Asem Basin
158	Gorontalo Basin
159	Larian Basin
160	Makasar Basin
161	Spermonde Basin
162	Bone Basin
163	Banggai Basin
164	Manhui Basin
165	Buton Basin
166	Sula Basin
167	South Sula Basin
168	Buru Basin
169	North Obi Basin
170	South Obi Basin
171	North Halmahera Basin
172	East Halmahera Basin
173	South Halmahera Basin
174	Salawati Basin
175	Bintuni Basin
176	Misool Basin
177	Seram Basin
178	South Seram Basin
179	West Weber Basin
180	Weber Basin
181	Tanimbar Basin
182	Palungaru Basin
183	Waropen Basin
184	Biak Basin
185	Waipoga Basin
186	Akimegah Basin
187	Sahul Basin
188	Wewak Basin
189	Sepik Basin
190	Ramu Basin
191	Madan Basin
192	Morehead Basin
193	Papuan Basin
194	Cape Vogel Basin
195	New Ireland Basin
196	Bougainville Basin
197	Solomon Basin

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	Basin–Field name	Year discovered	Reservoir age	Lithology	Cumulative production[1]
009		**Anadyr Basin**				
1	G	Anadyr	–	–	–	–
025		**North Sakhalin Basin**				
1	O	Kolenda	1963	Miocene–Pliocene	Sandstone	–
2	O	Giljako	1949	Miocene–Pliocene	Sandstone	–
3	G	Nizhnie Dagi	–	Miocene–Pliocene	Sandstone	–
4	O	Nekrasovka	1967	Miocene–Pliocene	Sandstone	–
5	O	Odoptu	1965	Miocene–Pliocene	Sandstone	–
6	O	Sabo	–	Miocene–Pliocene	Sandstone	–
7	O	Mukhta	1959	Miocene–Pliocene	Sandstone	–
8	O	Paromai	1929	Miocene–Pliocene	Sandstone	–
9	O	Katangli	1929	Miocene–Pliocene	Sandstone	–
10	O	Pogranichnoye	–	Miocene–Pliocene	Sandstone	–
026		**Tarasky Basin**				
1	O	Nevelsk	–	–	–	–
2	G	Aniva	–	–	–	–
033		**Vilyuy Basin**				
1	G	Sredne–Tyungskoye	1976	Triassic–Jurassic	Sandstone	–
†2	*G*	*Sredne–Vilyuiskoye*	*1963*	*Triassic–Jurassic*	*Sandstone*	–
3	*G*	*Tolon–Mastakhskoye (Maastakh)*	*1967*	*Triassic–Jurassic*	*Sandstone*	–
4	G	Sobolokh–Nedzhelinskoye	–	Triassic–Jurassic	Sandstone	–
5	G	Badaranskoye	1963	Triassic–Jurassic	Sandstone	–
6	G	Nizhne–Vilyuiskoye	–	Triassic–Jurassic	Sandstone	–
7	G	Ust–Vilyuskoye	1956	Triassic–Jurassic	Sandstone	–
8	O/G	Irelyakhshoye	1961	Triassic–Jurassic	Sandstone	–
9	O/G	Machchobinskoye	–	Triassic–Jurassic	Sandstone	–
10	*O/G*	*Sredne–Botuobinskoye*	*1970*	*Precambrian–Cambrian*	*Sandstone–carbonate*	–
11	O/G	Tas–Yurakhskoye	1981	Triassic–Jurassic	Sandstone	–
12	G	Iktekhskoye	–	Triassic–Jurassic	Sandstone	–
13	*O/G*	*Verhne–Vilyuchanskoye*	*1975*	*Triassic–Jurassic*	*Sandstone*	–
14	O/G	Vilyuisko–Dzherbinskoye	1977	Triassic–Jurassic	Sandstone	–
15	O/G	Verkhne–Chopskoye	–	Triassic–Jurassic	Sandstone	–
16	G	Ozernoye	1963	Triassic–Jurassic	Sandstone	–
17	G	Nizhne–Khamakinskoye	–	Triassic–Jurassic	Sandstone	–
18	G	Talakanskoye	–	Triassic–Jurassic	Sandstone	–
035		**Angara–Lena Basin**				
1	O/G	Danilovskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–
2	O/G	Dilisminskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–
3	O	Yarakinskoye	1971	Proterozoic	Sandstone	–
4	O/G	Ayanskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–
5	O/G	Markovo	1962	Proterozoic–Cambrian	Sandstone–carbonate	–
6	O	Pilyudinskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–
036		**Irkutsk Basin**				
1	G	Atovskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–
2	G	Bilchirskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–
3	G	Yuzhno–Raduiskoye	–	Cambrian	Carbonate	–
4	G	Khristoforovskoye	1968	Cambrian	Carbonate	–
5	G	Balukhtinsko–Tuptinskoye	–	Proterozoic–Cambrian	Sandstone–carbonate	–

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	Basin–Field name	Year discovered	Reservoir age	Lithology	Cumulative production[1]
048		**Niigata–Akita Basin**				
1	O	Yabase	1933	Miocene–Pliocene	Sandstone	33,216,000
2	G	Aga–oki	1972	Miocene–Pliocene	Sandstone	6,069,000
3	O/G	Niitu–Minami Aga	1899	Miocene–Pliocene	Sandstone	13,824
4	O/G	Higashi Niigata–Matsuzaki	1959	Miocene–Pliocene	Sandstone	9,871,000
5	G	Nakajo–Shin Tainai	1961	Miocene–Pliocene	Sandstone	6,924,000
6	G	Yoshii–Higashi Kashiwazaki	1968	Miocene	Volcanics	16,982,000
7	O/G	Kubiki	1959	Miocene–Pliocene	Sandstone	13,162,000
053		**Joban–Sanriku Basin**				
1	G	Iwaki	1973	Miocene	Sandstone	167,000
065		**Songliao Basin**				
1	*O*	*Daqing*	*1959*	*Cretaceous*	*Sandstone*	*7,094,000,000*
2	O	Tengluku	1958	Cretaceous	Sandstone	–
3	O	Kongchuling	1958	Cretaceous	Sandstone	–
4	O	Chinshankou	1958	Cretaceous	Sandstone	–
067		**Jiuquan–Minle Basin**				
1	O	Yaerhxia	–	Miocene, Cretaceous, Silurian	Sandstone	–
2	*O*	*Laojumiao*	*1938*	*Miocene*	*Sandstone*	–
3	O	Shiyougou	1928	Miocene	Sandstone	–
074		**Eerdosi (Ordos) Basin**				
1	O	Chingtuching	–	–	–	–
2	O	Machiatan	1951	Triassic–Jurassic	Sandstone–carbonate	–
3	O	Shatingtzu	1950	Triassic–Cretaceous	Sandstone–carbonate	–
4	O	Yungping	1930	Triassic	Sandstone	–
5	O	Tsaoyuan	1952	Triassic	Sandstone	–
6	O	Yenchang	1957	Jurassic	Sandstone	–
076		**Huabei Basin**				
1	*O*	*Renqiu*	*1975*	*Precambrian–Ordovician*	*Carbonate*	*970,380*
2	O	Dagang	1964	Cenozoic	Sandstone–carbonate	408,000,000
3	O	Lin–i	1976	Precambrian	Carbonate	–
4	O	Sha–yen	–	–	–	–
5	O	Qianjiang	1966	–	–	192,590
6	*O*	*Zhongyuan*	*1975*	*Paleogene*	*Sandstone*	–
7	G	Guxinzhuang	–	–	–	–
077		**Bohai Basin**				
1	O	Shengli	1962	Paleogene	Sandstone	2,623,000
2	*O*	*Gudao*	*1968*	*Miocene*	*Sandstone*	–
3	O	Chengbei	1972	–	–	11,000,000
4	O	Haishi	1970	–	–	10,000,000
081		**East China Sea Basin**				
1	G	Longjing	1981	–	–	–
2	G	Chingtzaohu	1967	Miocene	Sandstone	–
3	G	Tiehchenshan	1959	Miocene	Sandstone	105,000,000
4	G	Chinshui–Yunghoshan	1971	Oligocene–Miocene	Sandstone	–
5	G	Chuhuangkeng	1904	Oligocene–Miocene	Sandstone	3,000,000
083		**Jianghan Basin**				
1	O	Wangchang	1965	Paleogene	Sandstone	–
2	O	Zhongshi	1965	Paleogene	Sandstone	–
3	O	Xijakou	–	Paleogene	Sandstone	–
4	O	Huayuan	–	Paleogene	Sandstone	–

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	Basin–Field name	Year discovered	Reservoir age	Lithology	Cumulative production[1]
5	O	Xingou	–	Paleogene	Sandstone	–
085		**Shichuan Basin**				
1	*O*	*Lungnussu*	*1956*	*Jurassic*	*Sandstone*	–
2	O	Loutuhsi	1956	Jurassic	Sandstone	–
3	O	Penglaichen	1954	Jurassic	Sandstone	–
4	G	Chiliuing	200 B.C.	Triassic	Carbonate	–
5	G	Shengdengshan	1938	Triassic	Carbonate	–
6	G	Yenkaoxi	1955	Permian	Carbonate	–
7	G	Chanyuanpa	1955	Permian–Triassic	Carbonate	–
8	G	Nashi	1955	Permian–Triassic	Carbonate	–
9	*O/G*	*Shiyoukou-Tungchi*	*1955*	*Triassic*	*Carbonate*	–
10	*O/G*	*Huangkuanshan*	*1955*	*Triassic*	*Carbonate*	–
088		**Baise Basin**				
1	O	Lunxu	–	Eocene	Sandstone	–
2	O	Xinzhou	1961	Eocene	Sandstone	–
3	O	Naman	1961	Eocene	Sandstone	–
4	O	Linpeng	1961	Eocene	Sandstone	–
091		**Beibu Gulf Basin**				
1	O	Wan	1977	–	–	–
2	O	Wushi	1981	–	–	–
092		**Tonkin Basin**				
1	G	Wenchang	1984	–	–	–
2	G	Yacheng	1983	–	–	–
093		**Pearl River Mouth Basin**				
1	O	Xijiong	1985	Oligocene–Miocene	Sandstone–carbonate	–
2	O	Huizhou	1985	Oligocene–Miocene	Sandstone–carbonate	–
3	O	Zhu 5	1979	–	–	–
096		**Assam Basin**				
1	*O*	*Nahorkatiya–Hugrijan*	*1953*	*Oligocene–Miocene*	*Sandstone*	*303,880*
2	O	Digboi	1980	Miocene	Sandstone	74,250
3	O	Makum	–	–	–	–
4	*O/G*	*Moran*	*1956*	*Oligocene–Miocene*	*Sandstone*	*93,900*
5	O	Rudrasagar	1960	–	–	33,806,000
097		**Bengal Basin**				
1	G	Badarpur	–	Oligocene	Sandstone	–
2	G	Chhatak	1959	Miocene–Pliocene	Sandstone	–
3	G	Sylhet	1955	Miocene	Sandstone	–
4	G	Kailas Tila	1961	Miocene	Sandstone	–
5	G	Rashidpur	1960	Miocene	Sandstone	–
6	G	Habiganj	1963	Miocene	Sandstone	–
7	G	Titas	1962	Miocene	Sandstone	–
8	G	Bakhrabad	1968	Miocene	Sandstone	–
9	G	Kutubdia	1974	Miocene–Pliocene	Siltstone	–
10	*O/G*	*Feni*	*1980*	*Pliocene*	*Sandstone*	–
099		**South Myanmar (Burma) Basin**				
1	O	Indaw	1918	Miocene	Sandstone	1,000,000
2	O	Lanywa	1927	–	–	
3	O	Chauk	1902	Oligocene	Sandstone	128,000,000
4	O	Mann	1960	–	–	19,000,000

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	**Basin–Field name**	Year discovered	Reservoir age	Lithology	Cumulative production[1]
5	O	Yenangyaung	1800	Oligocene–Miocene	Sandstone	192,000,000
6	O	Minbu	1910	Miocene	Sandstone	–
7	O	Htaukshabin	1960	–	–	88,000,000
100		**Irrawaddy Delta Basin**				
1	O	Prome	1965	Miocene	Sandstone	7,000,000
2	O	Myanaung	1964	Miocene	Sandstone	21,000,000
3	O	Shwepyitha	1966	–	–	–
4	G	Payagon	–	Miocene	Sandstone	–
107		**Fang Basin**				
1	O	Mae Fang	1953	Miocene–Pliocene	Sandstone	–
2	O	Mae Suhn	1963	Miocene–Pliocene	Sandstone	3,000,000
108		**Chao–Phraya Basin**				
1	O	Sirikit	1981	–	–	34,100,000
2	O	Pru Krathiam	1984	–	–	17,000
110		**Bangkok Basin**				
1	G	Bung Ya	1984	Oligocene–Miocene	Sandstone	–
2	G	Platong	1976	Oligocene–Miocene	Sandstone	5,523,200
111		**Thai Basin**				
1	G	Trat	1981	–	–	–
2	G	Pakarang	1982	–	–	–
3	*O/G*	*Satun*	*1980*	*Pliocene*	*Sandstone*	*6,010,500*
4	G	Erawan	1973	–	–	16,736,700
5	G	Jakrawan	1976	–	–	–
6	G	Baanpot	1974	–	–	2,018,300
7	G	Funan	1981	–	–	–
123		**West Palawan Basin**				
1	O	Nido	1977	Oligocene-Miocene	Carbonate	15,797,886
2	O	Matinloc	1978	Miocene	Carbonate	9,448,230
3	O	Cadlao	1977	Miocene	Carbonate	9,919,265
4	O	Pandan	1980	–	–	–
5	O	Libro	1980	–	–	–
6	O	Galoc	1981	Miocene	Sandstone	383,460
7	O	Tara	1987	–	–	145,885
129		**Malay Basin**				
1	G	Pilong	1971	Oligocene–Miocene	Sandstone	–
2	G	Tekok–Telok Barat	1979	–	–	–
3	O	Guntong	1978	–	Sandstone	17,000,000
4	O	Tabu	1978	–	Sandstone	7,000,000
5	O	Tapis	1975	Miocene	Sandstone	201,000,000
6	O	Kepong Tinggi	1979	Miocene	Sandstone	72,000,000
7	O	Tiong	1978	Miocene	Sandstone	102,000,000
8	O	Pulai	1973	Miocene	Sandstone	54,596,000
9	O	Bekok	1976	Miocene	Sandstone	91,000,000
10	O	Sotong	1973	–	–	–
11	O	Malong	1983	–	Sandstone	–
12	G	Belumut	1971	–	Sandstone	–
13	G	Duyong	1974	–	Sandstone	54815.8*
14	G	Angsi	1974	–	Sandstone	–
15	O	Trerebuk	–	–	–	–

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	Basin–Field name	Year discovered	Reservoir age	Lithology	Cumulative production[1]
16	O	Belanak	–	–	–	–
17	O	Udang	1974	Oligocene–Miocene	Sandstone	–
132		**Sarawak Basin**				
1	G	M–3–1X	1980	Miocene	Carbonate	–
2	*G*	*F–6–1X (Central Luconia)*	*1969*	*Miocene*	*Carbonate*	–
3	G	F–13–1X	1969	Miocene	Carbonate	–
4	G	E–11	1974	Miocene	Carbonate	2302834*
5	G	B–11–1	1980	Miocene	Carbonate	–
6	G	D–12–1	1980	Miocene	Carbonate	–
7	G	F–29–1	1980	Miocene	Carbonate	–
8	G	M4–1	1980	Miocene	Carbonate	–
9	G	M5–1X	1980	Miocene	Carbonate	–
10	O	Acis South	1962	Miocene	Sandstone	–
11	O	J–4–1 X	1978	Miocene	Sandstone	–
12	O	J–12–1	1980	Miocene	Sandstone	–
13	O	Temana	1972	Miocene	Sandstone	–
14	O	C–8–1	1981	Miocene	Sandstone	–
133		**Brunei-Sabah Basin**				
1	O	Miri	1910	Miocene–Pliocene	Sandstone	79,727,300
2	O	Tukau	1966	Miocene–Pliocene	Sandstone	91,749,000
3	O	W. Lutong	1966	Miocene–Pliocene	Sandstone	121,690,000
4	O	Bakau	1967	Miocene–Pliocene	Sandstone	7,047,000
5	O	Bokor	1971	Miocene–Pliocene	Sandstone	34,011,000
6	O	Betty	1968	Miocene–Pliocene	Sandstone	62,327,000
7	O	Baram	1964	Miocene–Pliocene	Sandstone	135,989,000
8	O	Baronia	1967	Miocene–Pliocene	Sandstone	148,770,000
9	O	Fairley–Baram	1973	Miocene–Pliocene	Sandstone	5,845,000
10	O	Salbian	1979	Miocene–Pliocene	Sandstone	–
11	G	Beryl	1969	Miocene–Pliocene	Sandstone	–
12	G	Fatimah	1980	Miocene–Pliocene	Sandstone	–
13	O	Fairley	1969	Miocene	Sandstone	111,299,000
14	O	Ampa	1963	Miocene	Sandstone	–
15	*O/G*	*S.W. Ampa*	*1963*	*Miocene*	*Sandstone*	*529,598,000*
16	*O/G*	*Seria*	*1929*	*Miocene*	*Sandstone*	*981,198,000*
17	O	Tali	–	Miocene	Sandstone	–
18	O/G	Magpie	1975	Miocene	Sandstone	73,499,000
19	*O*	*Champion*	*1970*	*Miocene*	*Sandstone*	*299,701,000*
20	G	Samarang Kecil	1972	Miocene	Sandstone	–
21	G	Glayzer	1981	Miocene	Sandstone	–
22	O	Samarang	1972	Miocene	Sandstone	235,380,000
23	O	Ketam	1977	Miocene	Sandstone	901,000
24	O	Lokan	1979	Miocene	Sandstone	–
25	O	S.E. Collins	1981	Miocene	Sandstone	–
26	O	W. Erb	1977	Miocene	Sandstone	21,620,000
27	O	Tembungo	1971	Miocene	Sandstone	31,276,000
28	O	S.W. Emerald	1980	Miocene	Sandstone	–
29	O	St. Joseph	1975	Miocene	Sandstone	20,271,000
30	O	S. Furious	1974	Miocene	Sandstone	13,499,000
31	O	Barton	1971	Miocene	Sandstone	10,402,000

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	Basin–Field name	Year discovered	Reservoir age	Lithology	Cumulative production[1]
134		**North Sumatra Basin**				
1	*G*	*Arun*	*1971*	*Miocene*	*Carbonate*	*335,835,117*
2	O	Tualang	1973	Miocene	Sandstone	29,985,653
3	O	Iee Tabeue	1971	Miocene	Sandstone	11,897,472
4	O	Rantau	1929	Miocene–Pliocene	Sandstone	238,240,510
5	O	Serang Jaya	1926	Miocene–Pliocene	Sandstone	3,640,310
6	O	P. Tabuhan	1937	Miocene–Pliocene	Sandstone	26,553,070
136		**Central Sumatra Basin**				
1	*O*	*Bangko*	*1970*	*Miocene*	*Sandstone*	*346,229,390*
2	O	Balam South	1969	Miocene	Sandstone	98,472,165
3	O	Menggala	1968	Miocene	Sandstone	7,999,690
4	O	Sintong	1971	Miocene	Sandstone	54,655,550
5	O	Pematang	1959	Miocene	Sandstone	218,644,450
6	O	Petani	1964	Miocene	Sandstone	273,691,320
7	O	Kulin	1970	Miocene	Sandstone	31,524,395
8	O	Bekasap	1955	Miocene	Sandstone	406,933,685
9	*O*	*Duri*	*1941*	*Miocene*	*Sandstone*	*472,448,085*
10	O	Pungut	1951	Miocene	Sandstone	46,518,425
11	O	Petapahan	1971	Miocene–Pliocene	Sandstone	92,703,400
12	O	Kotabatak	1952	Miocene	Sandstone	136,355,390
13	*O/G*	*Minas*	*1944*	*Miocene–Pliocene*	*Sandstone*	*3,332,145,345*
14	O	Go Tam	1980	Miocene–Pliocene	Sandstone	–
15	O	Beruk	1974	Miocene–Pliocene	Sandstone	47,694,545
16	O	Zamrud	1975	Miocene–Pliocene	Sandstone	64,899,790
17	O	N. Pulai	1941	Miocene–Pliocene	Sandstone	37,199,610
18	O	S. Pulai	1941	Miocene–Pliocene	Sandstone	4,949,860
19	O	Lirik	1939	Miocene	Sandstone	38,146,330
20	O	Sago	1940	Miocene	Sandstone	122,391,750
21	O	Molek	1956	Miocene–Pliocene	Sandstone	11,724,530
22	O	Binio	1972	Miocene–Pliocene	Sandstone	11,820,840
137		**South Sumatra Basin**				
1	O	Kenali Asam	1931	–	–	93,495,150
2	O	Tempino	1931	–	–	86,285,370
3	O	Mangundjaja	1934	–	–	23,010,846
4	O	Kluang	1913	–	–	33,853,017
5	O	Ramba	1982	Oligocene–Miocene	Sandstone	44,790,645
6	O	Tanjung Laban	1982	–	–	6,258,109
7	O	Benakat	1932	Miocene	Sandstone–carbonate	133,729,970
8	O	Rambutan	1972	–	–	3,222,896
9	O	Abab	1951	Oligocene–Miocene	Sandstone	38,589,560
10	O	Benuang	1942	Oligocene–Miocene	Sandstone	7,626,590
11	O	G. Kemala	1938	–	–	27,235,250
12	O	T. Jimar	1937	Miocene	Sandstone	171,283,970
13	O	Limau	1928	Miocene	Sandstone	188,056,910
14	O	Ogan	1943	–	–	3,935,790
15	O	T. Tiga	1948	Miocene	Carbonate	53,956,521
16	O	T. Miring	1935	–	Sandstone	11,379,770
17	O	Belimbing	1965	Oligocene–Miocene	Sandstone	20,834,860
18	*O*	*Kuang*	*1940*	*Oligocene–Miocene*	*Sandstone*	*7,120,130*

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

Basin number Field number	Type Field	**Basin**–Field name	Year discovered	Reservoir age	Lithology	Cumulative production[1]
139		**Sunda Basin**				
1	O	Sundari	1982	–	–	10,782,195
2	O	Karmila	1983	–	–	29,728,296
3	O	Farida	1982	–	–	11,632,953
4	O	Yvonne	1980	–	–	12,621,026
5	O	Krisna	1976	–	–	59,655,016
6	O	Titi	1982	–	–	1,654,547
7	O	Zelda	1971	Oligocene–Miocene	Sandstone–carbonate	36,647,449
8	O	Wanda	1984	–	–	1,585,811
9	O	Cinta	1970	Miocene	Sandstone–carbonate	175,971,048
10	O	Kitty	1971	Miocene	Sandstone–carbonate	13,973,095
11	O	Selatan	1971	–	–	20,797,606
12	O	Gita	1972	Miocene	Sandstone–carbonate	7,504,813
13	O	Duma	1983	–	–	698,312
14	O/G	Rama	1974	Oligocene–Miocene	Carbonate	91,186,520
15	O	Nora	1973	Miocene	Carbonate	8,807,389
140		**Northwest Java Basin**				
1	*O/G*	*Ardjuna*	*1969*	*Miocene*	*Sandstone–carbonate*	*683,283,000*
2	O	Arimbi	1972	Miocene	Carbonate	26,331,000
3	O/G	Jatibarang	1969	Oligocene	Volcanics–carbonate	86,509,260
143		**Northeast Java Basin**				
1	O	Todanan	–	–	–	–
2	O	Tjepu	–	–	–	–
3	O	Blora	–	–	–	–
4	O	Rembang	–	–	–	–
5	O	Tanjungan	–	–	–	–
6	O	Kalitidu	–	–	–	–
7	O	Gresik	–	–	–	–
8	O	Redco	–	–	–	–
9	O	Surabaja	–	–	–	–
10	O	Waron	–	–	–	–
148		**Timor Basin**				
1	O	Matai	1961	Triassic	–	–
2	O	Ossulan	–	–	–	–
3	O	Aliambata	–	–	–	–
151		**Tarakan Basin**				
1	O	Mengatal	1974	Miocene	Sandstone	–
2	O	Bunju	1922	–	–	–
3	O	Pamusian	1905	Pliocene	Sandstone	–
152		**Kutei Basin**				
1	O	Kerindingan	1972	Pliocene	Sandstone	4,940,230
2	O	Melahin	1972	Pliocene	Sandstone	6,513,220
3	*O*	*Attaka*	*1970*	*Pliocene*	*Sandstone*	*451,865,821*
4	*O*	*Nilam*	*1974*	–	–	*20,347,122*
5	*O*	*Handil*	*1974*	*Pliocene*	*Sandstone*	*654,495,230*
6	O	Pamaguan	1974	Miocene	Sandstone	6,622,202
7	O	Sanga–Sanga	1897	Miocene–Pliocene	Sandstone	267,623,502
8	O	Sambodja	1909	Miocene–Pliocene	Sandstone	64,542,145
9	O	Sepinggan	1973	Pliocene	Sandstone	43,703,543
10	O	Bekapai	1972	Miocene–Pliocene	Sandstone	156,640,170

Table 2. General characteristics of selected oil and gas fields in the Northwest Quadrant, Circum-Pacific region (refer to figures 5 and 6)—Continued

[Basin number refers to figure 5; field number refers to figure 6; O=Oil, G=Gas, O/G=Oil and Gas; –, data not available]

11	*O/G*	*Badak*	*1972*	*Miocene–Pliocene*	*Sandstone*	*39,600,000*
156		**Barito Basin**				
1	O	Tanjung	1938	Eocene	Sandstone	102,463,940
174		**Salawati Basin**				
1	O	Kasim	1972	Miocene	Carbonate	47,242,198
2	O	Jaya	1973	Miocene	Carbonate	25,802,223
3	O	Klamono	1936	Miocene	Carbonate	34,910,590
4	O	Walio	1972	Miocene	Carbonate	152,075,105
5	O	Sele	1954	Miocene	Carbonate	1,421,940
175		**Bintuni Basin**				
1	O	Wasian	1939	Miocene	Carbonate	–
2	O	Mogo	1941	Miocene	Carbonate	–
177		**Seram Basin**				
1	O	Bula	1897	Pliocene–Pleistocene	Sandstone–carbonate	15,090,196
186		**Akimegah Basin**				
1	G	Juha	1983	Jurassic–Cretaceous	Sandstone	–
193		**Papuan Basin**				
1	G	Iehi	1960	Jurassic–Cretaceous	Sandstone	–
2	G	Bwata	1960	Miocene	Carbonate	–
3	G	Kuru	1956	Miocene	Carbonate	–
4	G	Uramu	1968	Miocene	Carbonate	–
5	G	Puri	1958	Miocene	Carbonate	–
6	O/G	Pasca	1968	Miocene	Carbonate	–
7	G	Pandora	1988	Miocene	Carbonate	–
8	O/G	Hedinia	1987	Jurassic–Cretaceous	Sandstone	–
9	O/G	Iagifu	1986	Jurassic–Cretaceous	Sandstone	–

[1]As of December 31, 1988, in barrels.

* Million cubic feet of gas.

† *Italics indicate giant oil fields (more than 500 million barrels and (or) 3 trillion cubic feet of gas estimated ultimate recovery). Source:* Carmalt, S.W., and St. John, Bill, 1986, Giant oil and gas fields, *in* Halbouty, M. T., ed., Future petroleum provinces of the world, Proceedings of the Wallace E. Pratt Memorial Conference, Phoenix, Arizona, December 1984: AAPG Memoir 40, p. 11-53.

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Table 3. General characteristics of selected major coal fields in the Northwest Quadrant, Circum-Pacific region (numbers refer to figure 7)

Country Field number	Field name	Age	Rank	Number of beds	Coking[1]	Hypothetical resources[2]	Sulfur(%)	Ash(%)
Russia								
1	Kempendgeisk	Jurassic-Cretaceous	Subbituminous	1	N	M	<1	<9
2	Spoln	Jurassic	Bituminous	1	N	M	-	>5
3	Kilofsk	Cretaceous	-	-	N	L	<1	<12
4	Mamontofsk	Cretaceous	-	-	-	M	<1	>11
5	Kirdgemsk	Jurassic	Bituminous	11	N	L	<1	<20
6	Kangarask	Cretaceous	Bituminous	10	N	L	<2	<32
7	Harabarahsk	Jurassic	Bituminous	-	-	M	<1	<11
8	Nadeginsk	Jurassic	Bituminous	4	-	M	<1	<19
9	Soginsk	-	Bituminous	2	-	M	<1	<8
10	Kyralsk	-	Bituminous	3	-	M	<1	>12
11	Dalpilsk	Cretaceous	Bituminous	Numerous	-	L	<1	<14
12	Velhunealkaganinsk	Cretaceous	Bituminous	2	-	L	<1	<10
13	Nidgnealkagarinsk	-	Bituminous	Numerous	-	L	<1	>9
14	Kenofsk	Cretaceous	Bituminous	3	-	M	<1	<10
15	Garimofsk	Cretaceous	Subbituminous	12	-	M	<1	<14
16	Ergensk	-	Subbituminous-bituminous	Numerous	-	M	<2	<10
17	Klasnoletchensk	Cretaceous	Bituminous	Numerous	-	M	<1	<10
18	Elogion	Cretaceous	Bituminous	Numerous	-	M	<1	<5
19	Biolkemyusk	Cretaceous	Bituminous	Numerous	-	M	<1	<5
20	Darn	Triassic	Bituminous	3	-	M	<2	>13
21	Kyhtyisk	Tertiary	Bituminous	Numerous	-	S	<1	>13
22	Kovensk	Tertiary	Subbituminous-bituminous	Numerous	-	-	<1	<4
23	Rankofsk	Tertiary	Bituminous	Numerous	-	L	<1	10
24	Merkovodnensk	-	Subbituminous	Several	-	L	<1	>20
25	Erigenyilsk	Tertiary	Bituminous	2	-	S	<4	<4
26	Anadyilsk	Tertiary	Bituminous	Numerous	-	M	-	<18
Japan								
27	Kushiro	Tertiary	Subbituminous	Numerous	N	L	<1	<10
28	Tempoku	Tertiary	Subbituminous	Numerous	N	M	<1	<10
29	Rumoi	Tertiary	Subbituminous-bituminous	Numerous	N-Y	M	-	<10
30	Kabato	Tertiary	Bituminous	Numerous	N	S	-	<5
31	Ishikari	Tertiary	Bituminous	Numerous	E	L	<1	<20
32	Mogami	Tertiary	Lignite	Numerous	N	M		<10
33	Nishitagawa	Tertiary	Subbituminous-bituminous	Numerous	Y	S	<1	>10
34	Johban	Tertiary	Subbituminous-bituminous	Numerous	N	L	<6	>10
35	Kumano	Tertiary	Anthracite	2	N	S	<3	>10
36	Omine &Ube	Triassic-Tertiary	Bituminous-anthracite	Numerous	N	L	-	<30
37	Chikuho	Tertiary	Bituminous	Numerous	N-Y	L	<1	>10
38	Miike	Tertiary	Bituminous	Numerous	E	L	-	-
39	Ikeshima	Tertiary	Bituminous	3	G	L	-	<10
40	Takashima	Tertiary	Bituminous	Numerous	E	L	<1	>10
41	Amakusa	Tertiary	Anthracite	3	N	M	-	<7
Korea								
42	Sanchok	Carboniferous-Permian	Anthracite	Numerous	N	M	<1	<20
43	Mungyong-Eunsong	Permian	Anthracite	-	N	S	-	-
44	Hwasan	Permian-Jurassic	Anthracite	-	N	M	-	<20
45	Chung Nam	Jurassic	Anthracite	Numerous	N	M	-	-
46	Ham Beak	Permian	Anthracite	-	N	M	-	>50
47	Tangyang	Permian	Anthracite	3	N	M	-	-
China								
48	Hegang	Jurassic	Bituminous	10	N-P	L	<1	>12
49	Shuang-ya-shan	Jurassic	Bituminous	3	N	L	<1	>12

Table 3. General characteristics of selected major coal fields in the Northwest Quadrant, Circum-Pacific region (numbers refer to figure 7)—Continued

Country Field number	Field name	Age	Rank	Number of beds	Coking[1]	Hypothetical resources[2]	Sulfur(%)	Ash(%)
50	Fuxun	Tertiary	Subbituminous-bituminous	Numerous	N-P	L	<1	>12
51	Benxi	Permian-Carboniferous	Bituminous-semianthracite	Numerous	E	L	<2	<10
52	Liaoyang	Jurassic	Bituminous	4	-	L	<1	<5
53	Fuxin	Jurassic	Bituminous	Numerous	-	L	-	<8
54	Beipiao	Jurassic	Bituminous	6	-	L	-	<11
55	Kailuan	Permian-Carboniferous	Bituminous	Numerous	E	L	<2	<18
56	Jingxi	Carboniferous	Anthracite	4	N	L	<1	<20
57	Datong	Carboniferous-Jurassic	Bituminous	6	P-G	-	L	<1
58	Yangchuang-Jingxing	Carboniferous-Permian	Bituminous	Several	G	L	<6	<20
59	Taiyuan	Carboniferous-Permian	Bituminous-semianthracite	5	N-P	L	<8	<14
60	Xuangang-chen	Carboniferous-Permian	Bituminous	5	-	L	<6	<7
61	Fujia-tan	Carboniferous-Permian	Bituminous	Numerous	E	M	<2	<7
62	Fengfeng	Carboniferous-Permian	Bituminous	Numerous	E	L	-	-
63	Jiaozuo	Carboniferous-Permian	Anthracite	1	N	L	<1	<8
64	Pingting-shan	Carboniferous-Permian	Bituminous	Numerous	E	M	-	-
65	Xintai	-	Bituminous	19	E	M	<1	<12
66	Zipo	Carboniferous-Permian	Bituminous	Numerous	N	M	<4	<25
67	Huaibei	Carboniferous-Permian	Anthracite	3	N	L	-	>5
68	Suchou-Huainan	Carboniferous-Permian	Bituminous	Numerous	-	L	-	<13
69	Huangshi	Jurassic	Anthracite	2	N	M	<3	<16
70	Fengcheng	Permian	-	2	-	L	-	13
71	Pingxiang	Carboniferous	Bituminous	-	-	L	<1	17
72	Xiangtan	Jurassic	Bituminous	2	-	M	2	7
73	Zixing	Permian	Anthracite	4	N	L	-	-
74	Qujiang	Permian	Semi-anthracite	Several	N	L	<1	<13
75	Mei-xian	Paleozoic	-	5	-	-	<2	20
76	Zhangping-Longyan	Carboniferous	Anthracite	2	N	L	-	16
77	Shaowu	Carboniferous	Anthracite		N	-	2	4
78	Chongan-Jianou	Mesozoic	Bituminous	3	Y	-	-	22
79	Guiyang	Permian	Bituminous	Several	Y	M	-	<7
80	Anshun-Liuzhi	Permian	Bituminous	6	-	M	-	19
81	Shuicheng-Panxian	Permian	Bituminous	-	Y	M	<1	10
82	Xuanliang-Pinglang	Permian	Bituminous	-	-	M	-	-
83	Baotou	Jurassic	Bituminous	25	P-G	M	<1	<5
Taiwan								
84	Chilung	Tertiary	Subbituminous-bituminous	-	-	L	<3	<10
85	Taipei	Tertiary	Subbituminous-bituminous	-	-	M	<3	<10
86	Hsinchu-Nangchung	Tertiary	Subbituminous	-	-	M	<2	<10
Philippines								
87	Polillo	Tertiary	Bituminous	4	Y	S	<1	<4
88	Panganiban	Tertiary	Bituminous-semianthracite	4	Y	S	<1	16
89	Liguan	Tertiany	Subbituminous	2	N	S	<1	5
90	Calanga & Eastern Batan	Tertiary	Subbituminous	2	N	S	<3	6
91	Gatbo	Tertiary	Subbituminous	1	N	S	<2	4

Table 3. General characteristics of selected major coal fields in the Northwest Quadrant, Circum-Pacific region (numbers refer to figure 7)—Continued

Country Field number	Field name	Age	Rank	Number of beds	Coking[1]	Hypothetical resources[2]	Sulfur(%)	Ash(%)
92	Bulalacao	Tertiary	Subbituminous	Several	N	S	5	<4
93	Semirara	Tertiary	Subbituminous	Numerous	N	S	<1	<4
94	Cajumayjumayan	Tertiary	Subbituminous	Numerous	N	-	-	-
95	Escalante	Tertiary	Subbituminous-bituminous	4	Y	S	<5	5-7
96	Camansi-Licos	Tertiary	Subbituminous	Several	N	S	<1	<10
97	Toledo-Uling	Tertiary	Subbituminous-bituminous	Several	N-P	S	<5	<10
98	Argo-Dalagnete Mantalongon	Tertiary	Subbituminous-bituminous	Several	N-P	S	<1	<10
99	Lingig-Bislig	Tertiary	Bituminous-subbituminous	Numerous	N-P	S	<1	<14
100	Lalat-Lumbang	Tertiary	Bituminous	Numerous	-	S	-	<6
Vietnam								
101	Nong Son	Triassic	Bituminous	-	-	S	<2	<10
102	Phan Me	Triassic	Bituminous	Numerous	N	-	1	<18
103	Bo Ha	Triassic	Anthracite	Numerous	N	-	-	-
Myanmar (Burma)								
104	Qung Yen	Triassic	Anthracite	-	N	L	<1	<7
105	Lo-an	Cretaceous	Bituminous	-	Y	S	-	<12
106	Panlaung	Cretaceous	Bituminous	-	-	-	-	13
107	Hlemauk-Kywezim	Cretaceous	Bituminous	-	-	-	-	<7
108	Kalewa	Tertiary	Lignite	3	N	-	<1	<3
109	Kyobin	Tertiary	Lignite	-	-	-	-	7
110	Shwebo	Tertiary	Lignite	-	-	-	-	<15
Thailand								
111	Mae Mo	Tertiary	Lignite	2	N	M	3	16
112	Li	Tertiary	Subbituminous	2	N	M	<2	11
113	Krabi	Tertiary	Subbituminous	1	N	M	<3	9
Malaysia								
114	Batu Anang	Tertiary	Subbituminous	2	N	S	<0.5	9
115	Enggor	Tertiary	Subbituminous	1	N	S	-	9
116	Silantek	Tertiary	Anthracite	Numerous	N	S	<0.9	11
117	Merit-Pila	Tertiary	Subbituminous	Numerous	N	M	<0.1	1
118	Bintula	Tertiary	Bituminous	2	-	M	<3	<7
119	Labuan	Tertiary	Subbituminous	4	N	S	<2	<6
120	Silimpopon	Tertiary	Bituminous	4	N-P	M	2.5	<12
Indonesia								
121	Onbilin	Tertiary	Bituminous	7	Y	L	<1	1-2
122	Bukit Asam	Tertiary	Lignite-bituminous	6-7	N-P	M	-	<1.5
123	Berau	Tertiary	Bituminous	4	P	M	<1	3
124	Kaltin Prima	Tertiary	Bituminous	4	P	S	<1	1
125	Kideco Jaya Agung	Tertiary	Subbituminous	Numerous	N	M	<1	2
126	Utah	Tertiary	Bituminous	3	N-P	M	3	20

[1]Coking: E, excellent; G, good; P, poor; -, unknown; N, no; Y, yes.

[2]Hypothetical resources: S = $<10\times10^{6}$ short tons; M = $<100\times10^{6}$ short tons; L = $>100\times10^{6}$ short tons.

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