

Mining, Oil & Gas

The Pacific Islands countries are wealthy in minerals, oil and gas and have a history of resource extraction from before independence.

The region continues to benefit from high levels of activity and huge investments in mining, oil and gas have proved extremely lucrative for the wider economy. Companies providing all manner of services in; supply, technical services, banking, logistics, human resources, shipping, training, security, plant and equipment have set up business or expanded capacity. Over the next two or three decades the outlook for the economy and opportunities in the extractive resources industry are very promising indeed.

Global prices of resources are at record highs, and whilst analysts expect prices to be volatile over the coming decade they should remain high.

World Prices of Selected Resources

| Year | Gold \$/oz | LNG \$/mmbtu | Nickel \$/mt | Copper \$/mt |
|------|------------|--------------|--------------|--------------|
| 2001 | 271 | 5 | 5945 | 1578 |
| 2010 | 1225 | 11 | 21809 | 7535 |

Source: World Bank

New Developments in Extractive Industries: Sea Bed Mining

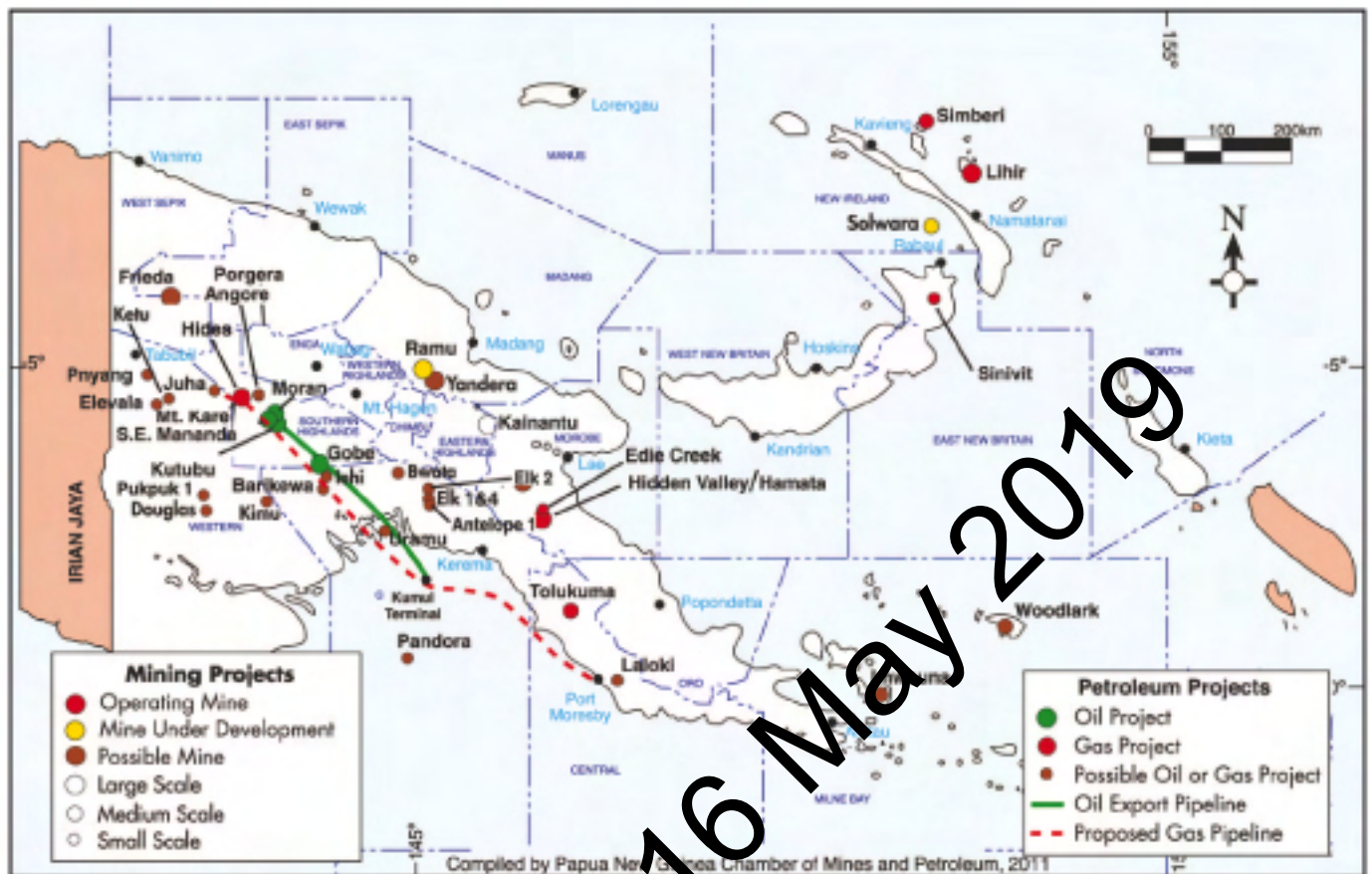
In PNG, a world first project to extract minerals from the seabed is being undertaken by Canadian company Nautilus. (See Case Study).

Rich mineral deposits and control of vast areas of the sea floor mean that the success of seabed mining could hold the potential for a new mining future for the Pacific Island nations. Apart from PNG, Nautilus also hold exploration licences in the Solomon Islands and Fiji. Other companies are also exploring seabed prospects in the region.



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Extractive Industry projects in Papua New Guinea



Papua New Guinea

Mining

With a record number of mines in addition to oil and gas projects, the extractive industries are the most important driver for continued growth in the country. The extractive industries have been PNG's major industry since independence and recent developments ensure this will remain the case. In terms of employment the resource industry is currently providing jobs for over 30,000 people an increase from 18,000 in 2003.¹

PNG has globally significant and commercially viable deposits of; gold, copper, nickel and iron. Large scale mines such as the gold/ copper combination mines of Ok Tedi, Porgera and Panguna have formed the backbone of the economy since independence. PNG ranks as the 11th largest gold producer in the world. In 2010 mine production was;

- Gold - 2,151,000 ounces
- Silver - 2,700,00 ounces
- Copper - 160,000 tonnes (as concentrate)²

PNG is in the middle of a mining boom. In the past five years the mining industry in PNG has doubled the number of large scale active mines and advanced prospects look to double that number again in the next five. These mines alone virtually guarantee a future of solid economic revenues. Looking further ahead with exploration currently running at very high levels and having doubled since 2006 there is every reason to expect further projects to be developed. The mining boom alone ensures a robust outlook for the next two to three decades. However, even this has been overshadowed by developments in oil and gas.

■ Small scale mining provides a living for 60 to 80 thousand grassroots alluvial miners.³

■ Mining provides around 82% of Papua New Guinea's export revenue.⁴

PNG Mining Projects

Active mines

| Project | Duration | Resource | Comments |
|---------------|----------------------|---------------|--|
| Ok Tedi | 1984 to 2013 (2022?) | Copper, Gold. | Output: 500,000 oz gold. 170,000 tns copper. One of the top ten copper mines in the world & 100% PNG owned it's expected that Ok Tedi will extend through to 2022 |
| Pogera | 1984-2020 | Gold, Silver | Output: 500,000 oz gold. 90,000 tns silver. Operated by Barrick gold, Pogera is one of the top ten gold mines in the world |
| Lihir | 1997-2030 | Gold | Output: over 1,000,000 oz gold Australian Newcrest owned mine expanded production recently. Lihir will complete a \$1.23 billion upgrade by the end of 2011 |
| Tolukuma | 1995 to 2016 | Gold | Output: 60,000 oz gold. Owned by PNG's Petromin |
| Simberi | 2008 to 2018 | Gold | Output: 72,000 oz gold. Australian Allied gold owned |
| Sinivit | 2007 to 2013 | Gold | Output: 5,000,000 oz gold |
| Hidden Valley | 2009 to 2019+ | Gold, Silver | Harmony Newcrest owned. Output: 200,000 oz gold |

Advanced prospects

| Project | Duration | Resource | Comments |
|--------------|---|--------------------|--|
| Solwara 1 | Start 2013 | Copper, Gold | The world's first seabed mining |
| Frieda River | Start 2016 to 2036 + | Copper, Gold | Top ten emerging copper, gold prospects in the world. Major shareholder is Xstrata (UK/ Swiss). Planning to build hydro power generation 160 MW. Output: 280,000 oz gold, 190,000 tns copper |
| Yandera | Feasibility Stage, 20 year life | Copper, Molybdenum | PNG government 30% stake. Owned by Australian mining company Marengo Mining. Resource: 100,000 tns of copper |
| Wafi/ Golpu | Pre Feasibility, Production expected 2017 | Copper, Gold | High grade deposits comparable to Ok Tedi & Pogera. Resource: Over 1 billion tns at 0.82% Gold. JV Harmony gold and Newcrest. Might have a mine life of 30 yrs |
| Makare | Pre Feasibility | Gold | Resource indicated at 743,000 ounces gold. Mine owned by Indochine Mining Ltd. |
| Woodlark | 2014 to 2021 (expected) | Gold | Output: 100,000 oz gold. Indicated resource 9.6m tns containing 770,000 oz |
| Ramu | 2012 to 2040 | Nickel- cobalt | Output: 31,500 tns nickel & 3,300 tns cobalt, owned by China Metallurgical Construction Company. PNG's first nickel mine & refinery. Commissioning of the US\$ 1.5 billion dollar is delayed pending a legal decision. |

Sources: IBBM Enterprise Centre, *Mining and Petroleum Industry Update*, Oct. 2011 & PNG Investors Guide, 2nd Edition. Port Moresby Chamber of Commerce and Industry, they sourced from Mining Petroleum Chamber PNG.

Panguna was once the largest copper mine in the world before being closed down by a landowner led movement in the early 1990's. There is speculation that this mine will once again reopen when stability on the island of Bougainville allows for reinvestment.

Oil and Gas

The PNG LNG project is the most important single development in the history of PNG. An Exxon Mobil led consortium is midway through a US\$ 19 billion dollar investment into what was a US\$ 10 billion dollar economy. Widely expected to have the effect of doubling PNG's GDP the project will extract a total of 9 trillion cubic feet of gas for export to Taiwan, China and Japan. (See Case Study)

With total gas reserves in PNG estimated at 35.7 trillion cubic feet there are further oil and gas projects in development and many more yet to be discovered.

Potential Future Projects

- **InterOil Condensate Liquid Stripping and LNG Project: US\$9 billion investment**

The resource has an estimated 8.6 trillion cubic feet of gas & 128.9 million barrels of natural gas condensate. Signed in 2009 InterOil (Canadian Company) are in negotiations with the PNG government to engage a world class operator. The viability of the project is not in question and resource extraction is expected to go ahead albeit perhaps under a changed structure.

- **Stanley Liquid Stripping/Gas Project in Western Province**

A joint venture between Talisman Energy (Canada) and Lion Oil (Australia). In November 2011 this project announced an upgrade of the resource to 361 billion cubic feet of gas (recoverable) and 11.5 million barrels of condensate. First production is expected in 2014.⁶

- **Talisman Energy's Western Province Gas Aggregation & Offshore Pandora Project**

This project is currently estimated at 1 trillion cubic feet of gas but drilling could expand this to 4 to 5 trillion feet.

There are currently a record number of 50 Petroleum Prospecting Licences (PPL's) active and in August 2011 Shell signed a Strategic Alliance with Petromin (PNG) to pursue upstream opportunities.⁸

State owned company **Petromin** has a stake in PNG LNG and the InterOil LNG project, it also owns the Tolukuma Gold Mine. Petromin will also hold the State's stake in Solwara 1 & the Nautilus sea bed projects.

The **National Petroleum Company** is a state owned company formed in 2010 which holds the majority of the PNG governments stake in the PNG LNG project. It is expected to take a role in further oil and gas projects.

Xstrata is listed on both the Swiss and UK stock exchanges, and is in development of a major copper project Frieda River.

■ PNG LNG Project will provide government revenues of more than USD \$31billion over 30 years from 2014.

■ PNG LNG will generate US\$150+ billion for the economy over a 30 year period.⁵



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Solomon Islands

Located astride the same island chain that hosts PNG's large scale mines such as Lihir, mining is seen by many as the next big industry for Solomon Islands.⁹

To date there is only one large scale mine in operation, the Gold Ridge Mine on Guadalcanal island.

The **Gold Ridge** mine is located just 40 kms from Honiara and was yielding 210,000 ounces per annum after it first opened in 1998. It was forced to close in 2000 as a result of the ethnic tensions.¹⁰ In 2011 an Australian company, Allied Gold invested US\$150 million to reopen the mine which has a stated potential of 2 million ounces.

The future of the **Isabel Island Nickel** project is currently being fought over in the courts with two companies claiming the right to develop, Axiom (Australia) and Sumitomo (Japan). According to Axiom the mine has world class Nickel deposits as well as smaller deposits of Cobalt. When it is developed, the mine is expected to have revenues three and a half times the size of the Gold Ridge mine.¹¹

Exploration in the Solomon Islands is in a positive territory and there should be many more opportunities. Officials from the Ministry of Mining, Energy and Rural Electrification, tell us of a significant increase in exploring licences since 2009.¹² Solomon Gold are also exploring a gold prospect on Futu island which they state has similar potential to the large scale gold mine Lihir in PNG.¹³

Fiji

This is a sector with great potential and large scale expansion can be expected over the coming years.

Vatukoula Gold Mine is a UK owned company and at present the only mine operating in Fiji of any great quantity. In 2010 the mine produced nearly 60,000 ounces of gold earning the company a profit of over twelve million pound sterling.

However there is a lot more mining potential in the country, the Fiji Mineral Resources Department say the sector is in the best shape it's ever been in and exploration is running high. Potential resources include; more gold, copper, zinc, bauxite, manganese, silver and iron sands. In addition, offshore exploration within Fiji's EEZ is also under consideration and some licenses have already been issued.

Advanced prospects include;

- **Namosi Joint Venture** is a large (over one billion tonnes) low grade copper/ gold prospect owned by Newmont (Australia) which is expected to go into production in 2015.¹⁴
- **Xinfa** is a Chinese investment in a Bauxite prospect with 1 million tonnes potential
- **Mt Kasi Gold** is a Newcrest (Australia) prospect with a resource of 240,000 ounces
- **Wainivesi Mine**, locally owned by Asia Pacific Resources, is expected to support an operation of about 250,000 tonnes per year. Mining has just started and the low grade ore is expected to produce a mixture of zinc, gold, silver, copper and lead.

>> At full production the Gold Ridge project can be expected to account for as much as 20% of Solomon Islands GDP <<

International Finance Corporation

In exploration;

- As of June 2011 there are 49 exploration licences current.
- KORDI (Korea) and Nautilus (Canada) are exploring seabed mining licences
- Amex resources have an advanced exploration of a Magnetite resource with an inferred resource of more than 150 million tonnes
- Lion one is in exploration with an inferred resource of 800,000 ounces of Gold.

Opportunities for UK Business

UK Mining, Oil and Gas companies have long term potential in the region. Whilst considerable projects have been started in the past few years the mineral exploration will continue to uncover prospects and the mining, oil and gas potential is expected to last for decades. To add to this investment in the Pacific is relatively safe and recent investments are testament to the viability of the long term future for the industry.

For companies whom service and supply the extractive resources industry a long and healthy outlook will provide many opportunities. For example banks such as ANZ have benefitted enormously with a presence in the country which have enabled them to position for finance for large scale mining, oil and gas projects such as the PNG LNG project. There is further demand for services that is not currently being met. A list of some of the service and support industries includes the following: aviation, drilling and supplies, seismic sales, analytical laboratories, technical services, transport and logistics, earth moving sales, fuel supply, machinery, catering, accounting, legal, engineering and other professional services, real estate and hotels, technical education and security.



Photos on this page courtesy Nautilus Minerals

Case Studies

PNG LNG is the single largest investment ever made in PNG

Contract : December 2009

The project is expected to produce nine trillion cubic feet of gas and generate US\$150+ billion for the economy over a 30 year period.

Process

Gas is extracted and treated at the Hides field in the Southern Highlands, then piped 700 km to a 6.6 million tonne LNG liquefaction and storage facility close to Port Moresby. From there it will be shipped to customers in Japan, China and Taiwan.

Quick Facts PNG LNG

Investors:

Exxon Mobil 33.2%, Oil Search 29%, *National Petroleum Company of PNG (NPC PNG) Government Owned)- 16.6%, Santos - 13.5%, Inpex Oil 4.7%, *Mineral Resources Development Company (representing PNG land owners) 2.8% and *Petromin 0.2%

*PNG owned

Investment (current estimate) : \$US15.5 billion

Total Gas Production : 9 trillion cubic feet

Production: Est. 2014 Delivery: Est. 2014. Taiwan, China, Japan

China's Sinopec is PNG LNG's single largest customer with a 2 million tonne per annum contract.

Projected Returns

- US\$2 billion (direct revenue to PNG Government and land owners)
- US\$152.5 billion (total over 30 years from 2014)
- GDP contribution LNG (expected): Doubling of PNG's GDP
- GDP Contribution of all Mining & Petroleum (current): Est. 15%

* Interfacing with suppliers and the public sector is the PNG LNG funded IBBM Enterprise Centre who maintain a supplier database of 1200+ companies.



Solwara 1

This is a world first project which utilises techniques developed from off shore oil and gas extraction to mine Seafloor Massive Sulphide (SMS) deposits with exceptional high grade copper, gold, zinc and silver.

Quick Facts Solwara 1

- Mining lease granted in 2011 for 20 year period
- Location: Solwara 1 sits at a depth of 1600m, 30 km off the coast of New Ireland province.
- Expecting per annum, 80,000 tonnes of copper and 150,000 to 200,000 ounces of gold
- High grades Copper, Gold, Zinc and Silver
- Over the next two years; est 180,000+ ounces of Gold and 80,000 tonnes of Copper per annum
- Government of PNG has exercised its option to take a 30% stake in the project in 2011
- Production will commence in 2013
- Capital cost of US\$380 million

UK Company SMD are a major supplier to the Nautilus project providing robotic underwater mining machinery.

Source: Nautilus Minerals website www.nautilusminerals.com, 2011



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