



## PAPUA NEW GUINEA MINERAL SECTOR

Mineral commodity prices fell dramatically in 2011 and 2012 causing a major downturn in the global minerals industry that is still ongoing. Expenditure worldwide on exploration and development has significantly reduced and this has been very marked in PNG.

It is very difficult for small exploration companies without any mineral production (mines) to raise funds on the financial markets hence many of them have run out of money and disappeared or have severely reduced their exploration programs. Mining companies have instituted cost cutting measures and production optimisation and efficiency programs to decrease costs and improve output.

### MINERAL EXPLORATION

The number of Exploration Licences (ELs) has fallen steadily since the downturn in commodity prices commenced in 2011-12. This followed 10 years of very robust exploration in PNG from 2003-2012 which was underpinned by stability in the resource industry fiscal and regulatory regime.

At the end of 2012, Mineral Resources Authority (MRA) records show 177 granted ELs and 379 applications awaiting processing. By April 2017, this had dropped to 131 granted ELs and 81 applications.

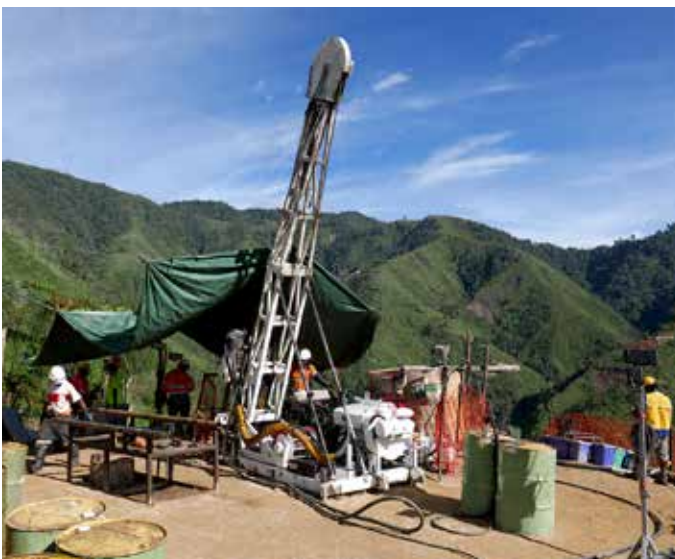
Parallel with this, mineral exploration expenditure also continues to decline in the face of depressed commodity prices. The Chamber's own survey covering the years 2012 to 2015 showed that mineral exploration expenditure has dropped markedly from a peak of K944.3 million in 2011 to K325.5 million in 2015 after a near decade of high activity from 2003 - 2011.

Feasibility studies for the Frieda River and Wafi-Golpu projects increased exploration expenditure by K69.3 million in 2015 (from 2014), but the overall expenditure was still well below 2013 levels.

Preliminary results from the Chamber's 2016 mineral exploration survey indicate that total exploration expenditure has again fallen markedly (to ~K170 million) and grassroots exploration again shows the greatest decline (to ~K20million).

Whilst it may not be so obvious at the national level, the direct impact of this decline is significant at the provincial and local level.

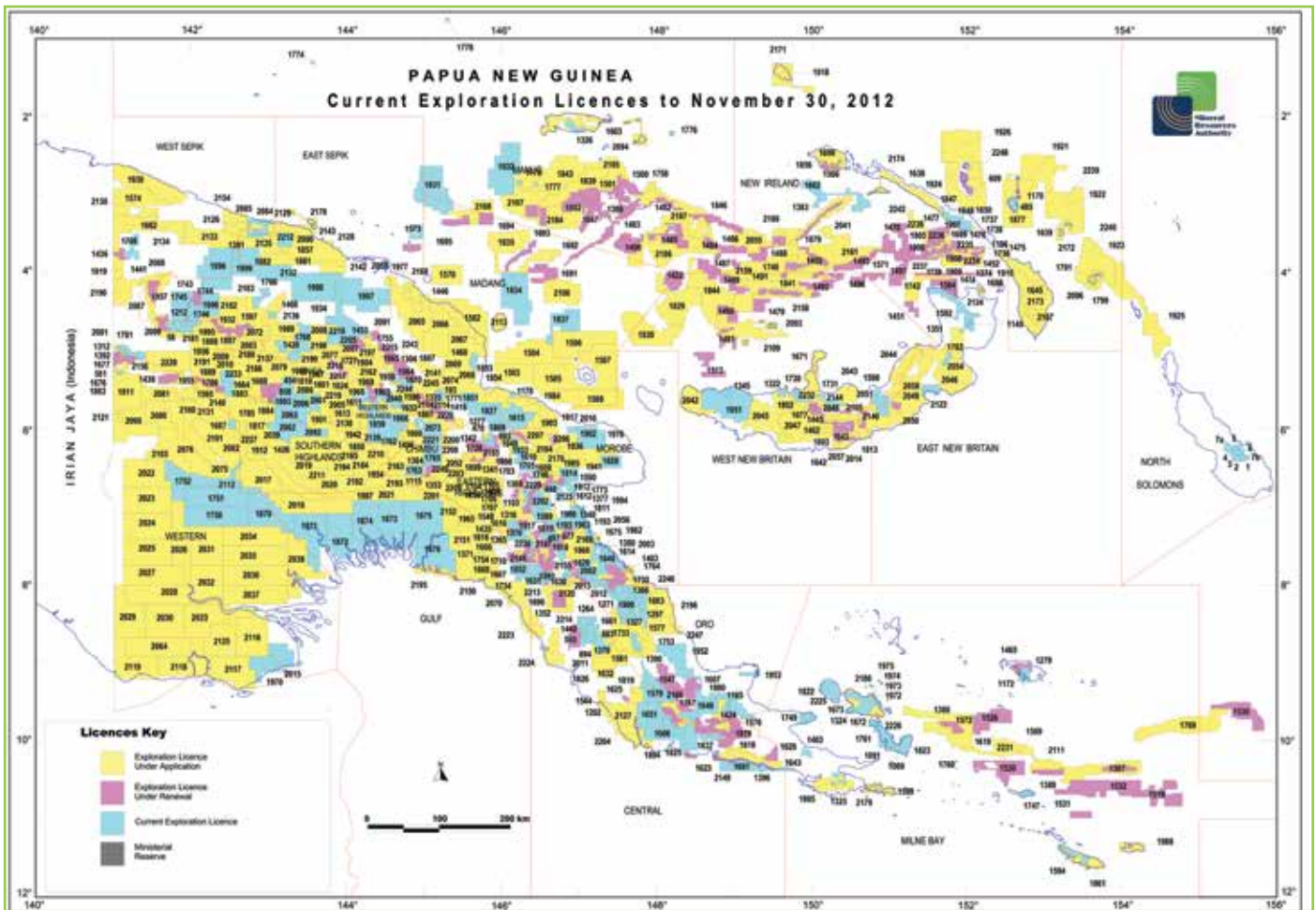
Mineral exploration work is labour intensive and utilises many local workers in remote parts of the country, so the drop in exploration activity has a ripple effect in provin-



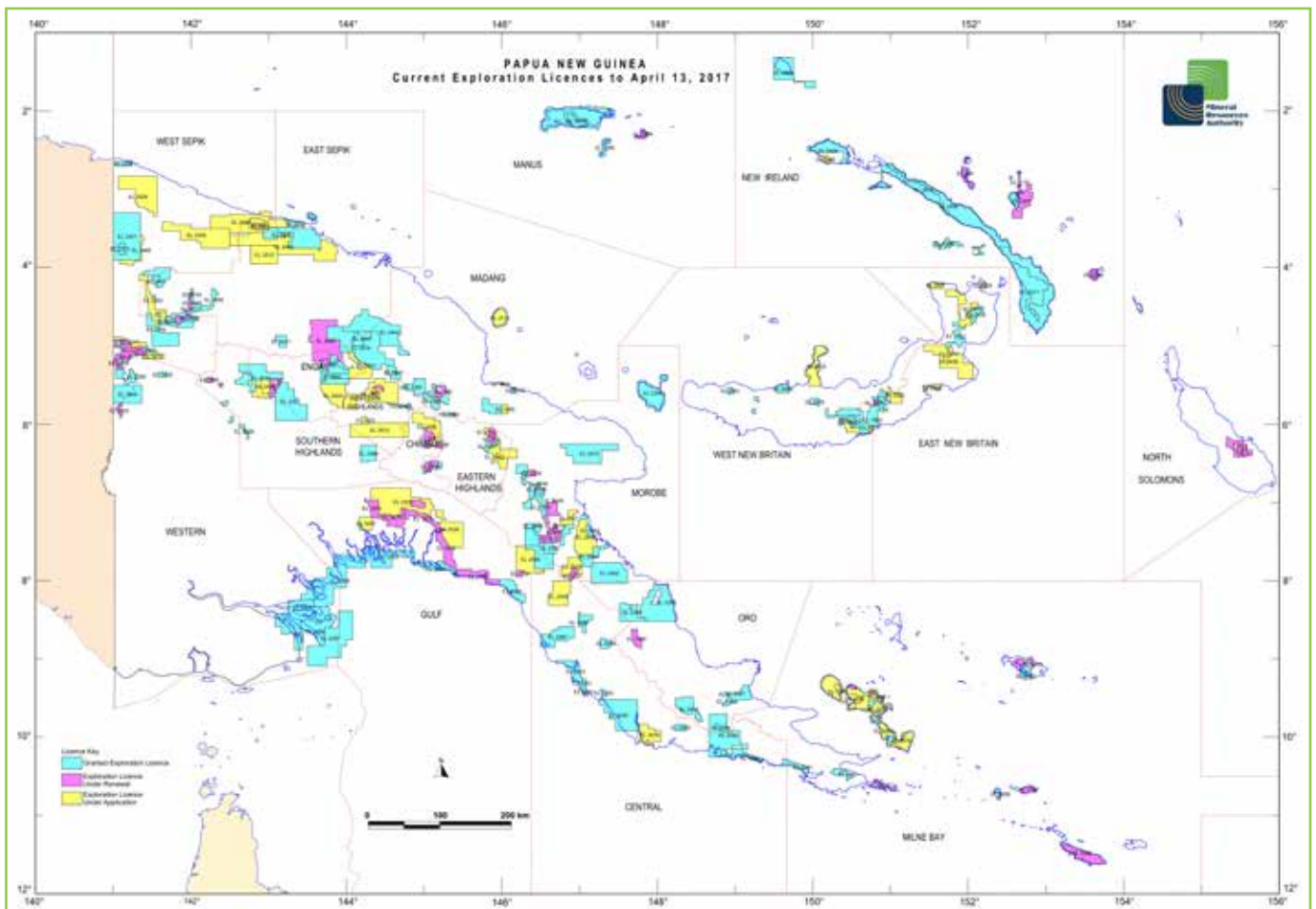
A drilling campaign at Yandera in the Madang Province in 2016.



Auger drilling at Orokolo Bay, Gulf Province by Mayur Resources.



Mineral Exploration Licences, November 2012



Mineral Exploration Licences, April 2017

cial and local level centres and significant impacts on the rural economy.

The losses are significant, coming especially at a time when the economy is facing a major slowdown. In PNG, exploration generally has a very long lead time and when exploration activities are constrained or reduced it sets off a string of events, often not felt in the near term, but with the potential to threaten the long-term sustainability of the mining sector.

Currently, the main focus for mineral exploration is:

- the Highlands Pacific-Anglo American JV work in the Star Mountains, about 20km north of Ok Tedi;
- drilling by Coppermoly at Nakru in West New Britain which is showing some good results;
- Harmony Gold's programme around the historic Wau gold mining center and areas surrounding the Hidden Valley mine;
- the Newcrest-St Barbara JV exploring Tabar Island in New Ireland Province, and
- ongoing appraisal of Yandera by Era Resources.

In addition to this, Ok Tedi has continued to record success at its Townsville prospect about 4km north of the mine. This copper-gold mineralisation, which extends to at least 600m from the surface, could provide substantial satellite ore reserves for Ok Tedi in the future.

Harmony Gold's Kili Teke greenfield porphyry copper-gold discovery in the Hela Province is one of the most significant exploration advances in recent years. Unfortunately, the drilling programme is on hold as work was disrupted by a landowner dispute in 2017.

## PROPOSED PROJECTS

Two applications were submitted to the Minerals Resources Authority (MRA) for Special Mining Lease approvals last year.

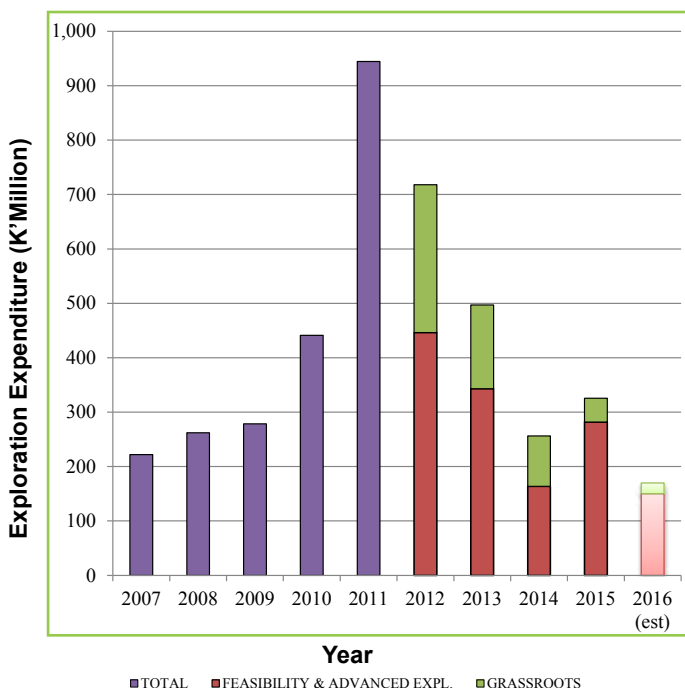
The Frieda River joint venture led by PanAust Ltd, the Australian managed miner owned by China's Guangdong Rising Assets Management, applied to the Mineral Resources Authority for a Special Mining Lease (SML) for the project in Sandaun in June last year, while the Wafi-Golpu Joint Venture made up of Newcrest and Harmony Gold applied for an SML for their Wafi-Golpu Project in Morobe Province in August 2016.

The Woodlark Island project has been granted a mining lease but the depressed gold price has made it impossible to raise capital for the project. The licensee, Kula Gold, has brought in a new partner and further drilling is underway with the aim of increasing the overall reserves and thus the mine life to make it more attractive to financiers.



An artists impression of the Frieda River Copper-Gold Project.

### Mineral Exploration Expenditure 2007 - 2016



### ECONOMIC IMPACTS OF THE FRIEDA RIVER PROJECT

The project will make a substantial positive economic contribution to PNG at both the national and provincial level. It will be the first major, large-scale natural resource project for Sandaun and East Sepik provinces.

Supporting infrastructure, including ocean and river ports, roads, airport, communication links, and power supply will assist other industries and open an array of economic opportunities for the region.

Development of the project would increase national gross domestic product and export earnings and provide a long-term boost to government revenues. The project also offers the potential to generate benefit streams to landowners and host communities, as well as create new employment and business development opportunities during construction and operation.

## OPERATING MINES

Two new mines, Ramu and Hidden Valley, were developed during the robust exploration period from 2003-12 and a third one, Solwara 1, commenced development which is still underway. Solwara 1 will be the world's first deep-sea mining project.

Rationalisation and productivity improvements implemented after the commodity downturn are now showing significant results for several of the mineral projects. Output at Lihir is now at the 900,000 oz gold per annum level at an all-in sustaining cost (AISC) of US\$830 per oz, and Simberi reported a 2017 first quarter result of 30,430 oz gold at an AISC of \$A1025 per oz, its best ever performance.

Porgera production has remained steady at about 500,000 oz of gold per annum but Hidden Valley output has dropped dramatically due to the stage 5 and 6 cut-back of the pit wall. To complete the cutback and plant upgrade there will be an ore "gap" this year of about 4 months so production will be well down.

Kainantu and Tolukuma have recently started producing again at a very modest level after undergoing reparation

## PROJECT CONSTRUCTION

The Solwara 1 Deep Sea Mining Project being developed by Nautilus and its joint venture partner, Kumul Minerals, is well advanced.

The three seafloor production tools have been completed in the UK and they have recently been shipped to PNG where they are currently undergoing wet testing under fully submerged conditions.

The subsea slurry lift pump which enables the transfer of the mineralised slurry from the seafloor to the production support vessel (PSV) has also been completed and is undergoing testing.

Significant progress has been achieved in the construction of the PSV which will serve as the operational base for production activities. The 220m dedicated vessel is expected to be finalised and commissioned by third



**The nickel concentrate that is shipped to buyers. It is usually referred to as mixed hydroxide product (MHP).**

and overhaul.

Output at Ramu has now reached full nameplate capacity exceeding 30,000 tonnes of nickel and 3,000 tonnes of cobalt (in concentrate) on an annualised basis.

Ok Tedi is expected to further increase production this year to about 110,000 tonnes of copper and about 290,000 ozs of gold returning the project to a solid financial footing. It is now a totally different operation with a restructured workforce on a fly-in fly-out arrangement.



**The Seafloor Production Tools which are currently undergoing wet testing in PNG.**

quarter 2018.

Nautilus is currently seeking significant additional funding in order to complete the build and deployment of the entire seafloor production system.

## KEY FACTS ABOUT SOLWARA 1 PROJECT

The Solwara 1 deposit, which sits on the seafloor at a water depth of some 1600 metres, boasts a copper grade of approximately 7 percent.

That compares with land-based copper mines, where the copper grade today averages 0.6%. In addition, gold grades of well over 20 g/tonne have been recorded in some intercepts at Solwara 1 and the average grade is approximately 6 g/tonne.

Seafloor Massive Sulphide (SMS) deposits form directly on the ocean floor where superheated water carrying metals from deep in the earth, mixes with cold seawater depositing metal-rich minerals.

They are considered the modern analogues of volcanogenic massive sulphide deposits, historically a major source of the world's copper, gold, zinc and silver.

## MINERAL PRODUCTION AND COMMODITY PRICES

Because of global economic uncertainty, gold has recovered modestly to around US\$1,245 an ounce compared with previous highs of US\$1,900 in 2011.

Unfortunately copper and nickel prices remain at very low levels. In January 2016, copper fell to a low of US\$1.94 a pound, its lowest level since April 2009 and is currently about US\$2.60 a pound, and nickel has dropped to a 12-year low from US\$13 per pound to less than US\$4.05 per pound (see graphs).

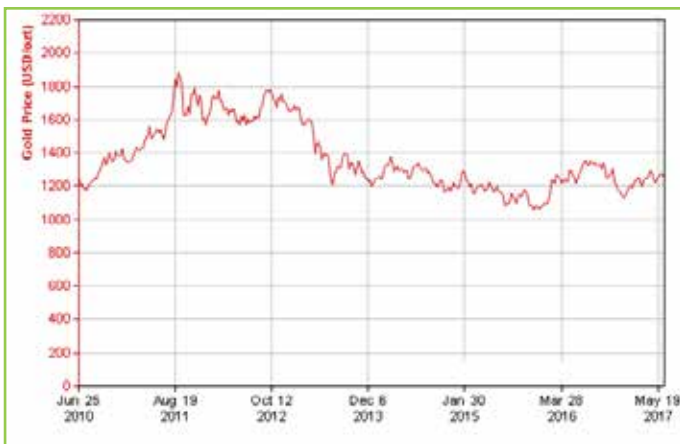
By far the best recovery has been cobalt, an important by-product for Ramu Nickel, which has more than doubled in value in recent times as it is used in electric car

batteries.

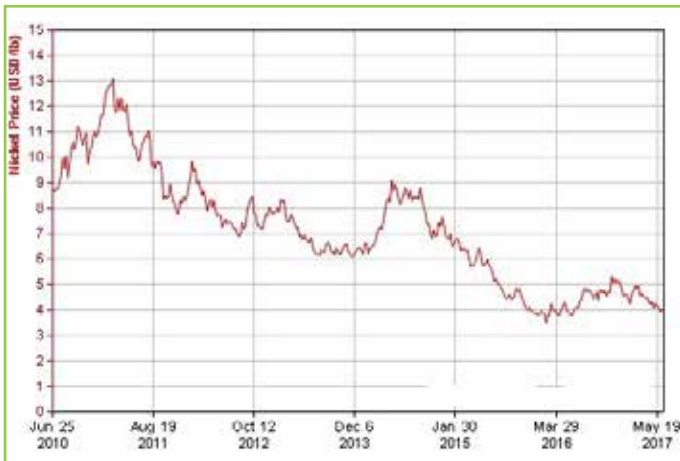
PNG gold production has remained steady in recent years at about 1.8 million ounces but is expected to increase significantly this year to over 2.0 million ounces with the recovery at Ok Tedi and the increased production at Lihir and Simberi. Copper production from Ok Tedi is expected to reach around 110,000 tonnes this year and nickel production from Ramu over 30,000 tonnes.

The total value of PNG gold production in 2016 was K7.61 billion including alluvial gold output. Production of other metals was valued at K2.09 billion.

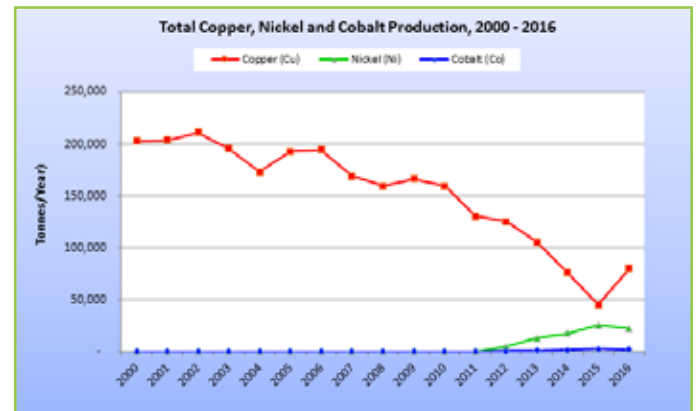
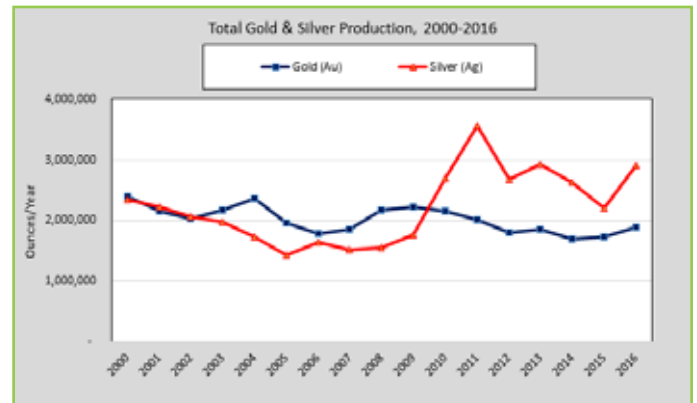
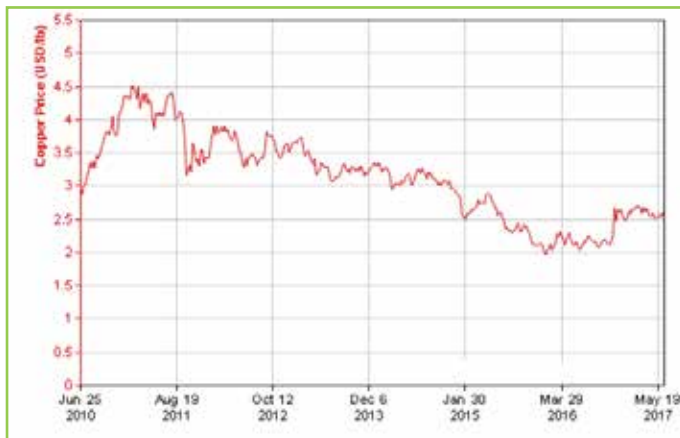
**Gold Price (USD/oz), June 2010 - 21 June 2017**



**Nickel Price (USD/lb), June 2010 - 19 June 2017**



**Copper Price (USD/lb), June 2010 - 19 June 2017**





**Porgera Gold Mine**

Operator: Barrick Niugini Ltd  
 Year Started Operation: 1989  
 Expected Mine Life: 20 years  
 Annual Production: 500,000oz Au & 300,000oz Ag

**Ramu NiCo Mine**

Operator: Ramu NiCo Management Ltd  
 Year Started Operation: 2012  
 Expected Mine Life: 20+ years  
 Annual Production: 30,000t Ni & 3,000t Co



**Ok Tedi Mine**

Operator: Ok Tedi Mining Ltd  
 Year Operation Started: 1984  
 Expected Mine Life: 15 years  
 Annual Production: 110,000t Cu, 290,000oz Au & 1Moz Ag



**Kainantu Gold Mine**

Operator: K92 Ltd  
 Year Started Operation: Re-summed 2017  
 Expected Mine Life: 10+ years  
 Annual Production: 20,000oz Au

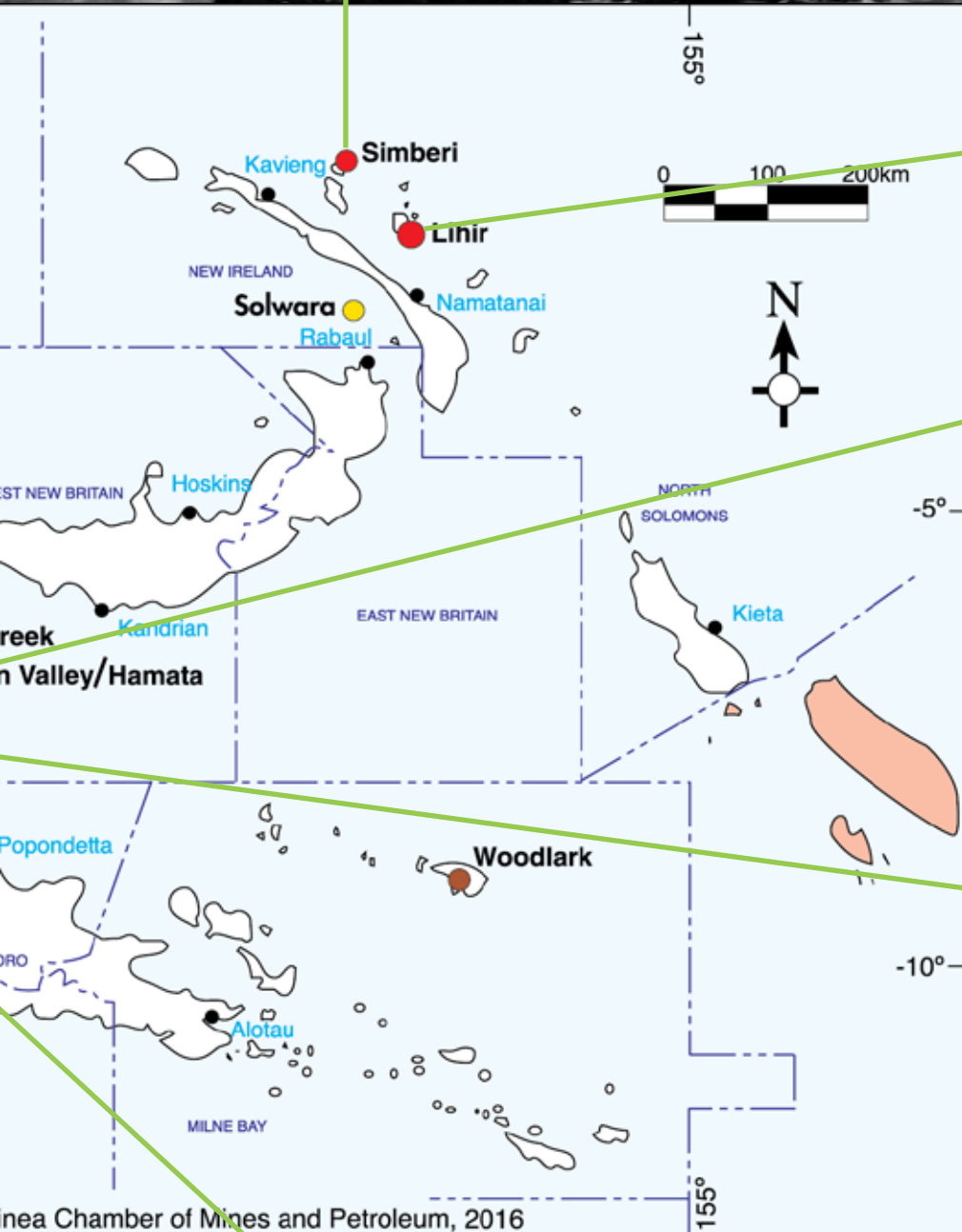




**Simberi Gold Mine**  
 Operator: St Barbara Ltd  
 Year Started Operation: 2008  
 Expected Mine Life: To 2020  
 Annual Production: 120,000 ounces Au & 110,000oz Ag



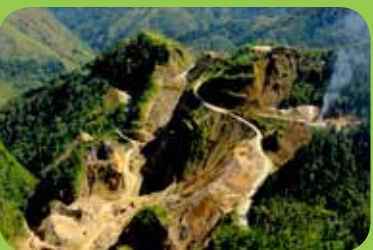
**Lihir gold mine**  
 Operator: Newcrest Mining Ltd  
 Year Started Operation: 1997  
 Expected Mine Life: 30+ years  
 Annual Production: 900,000oz Au



**Edie Creek**  
 Operator: Niuminco  
 Year Started Operation: 2007  
 Expected Mine Life: 10 years  
 Annual Production: 8,000oz Au



**Hidden Valley**  
 Operator: Harmony Gold  
 Year Started Operation: 2009  
 Expected Mine Life: 10 years  
 Annual Production: 105,000 ounces, 1,050,000oz Ag



**Tolukuma Mine**  
 Operator: Asidokona  
 Year Started Operation: Re-started 2017  
 Expected Mine Life: 10 years



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