

CAN PANGUNA SAVE BOUGAINVILLE?

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Introduction

Although there are other potential mining sites in Bougainville, and exploration licences have been approved for some of them, Panguna is the only proven mineral resource on the island and the only site of an existing industrial scale mine. It has therefore been at the centre of debates about whether or not to restart mining in Bougainville. Panguna is also the case for which the best data is available. However, the challenges and constraints facing these other mines will be similar to those facing Panguna.

The Panguna mine also serves as a case study for the debates about mining as a whole. It

1. The authors would like to acknowledge the work of Roger Moody, whose 2015 paper 'Panguna: Between a Rock and a Hard Place' on the topic significantly assisted the development of this paper.

makes sense therefore to explore the economic viability of reopening Panguna for its own sake, as well as for what a study might reveal about the benefits or otherwise of exploiting other mineral deposits on the island.

The aim of this paper is therefore to examine three sets of questions:

1. What are the various estimates of revenue needs for Bougainville? How would independence affect these needs? What models of government expenditure are these estimates based on?
2. Is reopening Panguna commercially viable from a mining company perspective, and (perhaps more importantly) from an investor perspective? Could Bougainville Copper Limited (BCL) or another operator, make money from reopening Panguna as BCL and

Rio Tinto did in the 1970s and 1980s.

3. How might earnings from the sale of copper and gold from Panguna translate into estimates of government income for Bougainville? When would these revenues start to flow? What assumptions are such estimates based upon?

The revenue needs for an independent Bougainville

Before estimating the potential revenues that the Panguna mine could generate for Bougainville, we must first explore the question of what annual revenues the Autonomous Bougainville Government (ABG) might need in the long term, assuming that the ABG remains, more or less, in its existing form. One estimate puts ABG's total recurrent expenditure for 2017 at PGK 162 million.² However, this recurrent budget figure excludes other support received from the central government such as payments for Tuition Fee Free Education. It also does not include any funding for a capital budget. The 2018 budget indicates that Bougainville is expected to receive K105 million in additional capital funding in addition to its recurrent budget.³ Given that the ABG usually raises only about 10% of its revenues, or around only PGK 20 million in present value,⁴ this would place the total budget more in the PGK 240-250 million range.

Estimates of what an appropriate revenue intake for an independent Bougainville vary. Satish Chand has outlined one possible scenario for Bougainville's revenue needs. If one

were to make Bougainville's revenue expenditure equal to its current proportion of PNG's expenditure (i.e. 4% of PNG's), this would put its revenue needs at PGK 286 million.⁵

When considering this number, however, we do need to consider what would be an appropriate or desirable expenditure level as proportion of GDP. For example, PNG national government expenditure has varied between 27% in 2013 and 18% in 2017, reducing as GDP grew due to LNG sales and expenditure fell due to budget squeezes.⁶ In comparison, Vanuatu's expenditure as a proportion of GDP has been estimated at 17%, whereas that of the Solomon Islands is said to be as high as 43%.⁷

This therefore begs a question, why is Vanuatu's budget as a percentage of GDP so low, compared to the Solomon Islands? This may be because Vanuatu is more efficient in its spending. Thus, another way to make revenues closer to expenditure would be to find ways to reduce unnecessary spending – through initiatives such as reducing the number of 'ghost names' on the ABG's payroll for example.⁸

A Vanuatu-level of government expenditure – i.e. government spending similar to current revenues but without PNG's help – would still mean that Bougainville would have a lot of work to become self-sufficient. How much work exactly? Well, given that the Autonomous Region of Bougainville (ARB) currently gets around 90% of its revenues from PNG, it would have to massively increase its revenue intake. How might it do this? Chand argues that the first step would be to

2. Satish Chand, 'Transitioning to Fiscal Self-Reliance in the Autonomous Region of Bougainville', *ABG Tax & Revenue Summit*, 27 September 2017, 7. [http://www.abg.gov.pg/images/misc/3._Chand_2017_Transitioning_to_fiscal_self_reliance_in_the_ARoB_\(Chand\).pdf](http://www.abg.gov.pg/images/misc/3._Chand_2017_Transitioning_to_fiscal_self_reliance_in_the_ARoB_(Chand).pdf).
3. 2018 PNG Budget Volume 2d, 2018, p380. See also Tanya Lahies, '2018 Budget More Strategic', *ABG Media Release*, 29 December 2017. <http://www.abg.gov.pg/index.php/news/read/2018-budget-more-strategic>.
4. Chand, 'Transitioning to Fiscal Self-Reliance', 3, 7-8.

5. Chand, 'Transitioning to Fiscal Self-Reliance', 11.

6. PNG Budget Database 2017 FBO, Released March 2018, Development Policy Centre, Crawford School of Public Policy, ANU College of Asia & the Pacific. <https://devpolicy.crawford.anu.edu.au/png-project/png-budget-database>

7. Chand, 'Transitioning to Fiscal Self-Reliance', 11.

8. Radio New Zealand, Bougainville govt rids itself of ghost names on payroll, 5 July 2018, <https://www.radi-onz.co.nz/international/pacific-news/361157/bougainville-govt-rids-itself-of-ghost-names-on-payroll>.



Photo credit: Christina Hill

double its tax efficiency. However, even if it could achieve this, it would still need to grow its GDP significantly. As Chand has argued, this is likely to take many decades.⁹

An independent Bougainville would need to develop new government capacity in areas such as trade, diplomacy, defence, etc. So, moving to independence is likely to place more pressure on the government's budget. If Bougainville were to move towards independence, it unclear whether and how much financial support PNG would continue to provide.

This, then, is where the case for reopening Panguna and other new mines originates: Bougainville will take such a long time to be self-reliant, the argument is, that mining is the only chance for it to achieve fiscal independence. Indeed, the prima facie argument is strong. The Panguna mine was in operation from 1972-1989. Over that time it extracted between 50 and 90 million tonnes of ore annually, and earned between PGK 190 million and PGK 500 million annually in

net sales. Annual tax payments to the PNG government varied although tended to fall between PGK 20 million and PGK 50 million.¹⁰

Projected earnings from the Panguna Mine

Is reopening Panguna commercially viable? Answering this question requires two sets of calculations. First, what would be the gross earnings from digging up the ore and selling it overseas? Second, what would it cost the company to reopen and then operate the mine?

Let us turn to the first part of the question. Panguna's reserves are mainly copper, although it also produced smaller amounts of gold and silver. The relative sales earnings changed depending on the relative price of copper and gold, but the percentage of per annum sales from Panguna varied in its years

9. Chand, 'Transitioning to Fiscal Self-Reliance', 7-8.

10. Bougainville Copper Limited Annual Report 2009, 32-33.

of operation between 50-80% for copper and 20-50% for gold. Silver production tended only to yield about 1-2% of sales earnings.¹¹

The ABG has long been clear (since around the year 2010) that the previous operator BCL would be its preferred partner in reopening Panguna. However, after a landowners' meeting in December 2017, the ABG announced in early 2018 that it would not extend BCL another mining exploration license. It appears that some landowner groups are now talking with other interests including the Australian-headquartered RTG Mining about re-developing Panguna. With Rio Tinto giving away its 51% controlling interest in BCL in mid-2017, there are in any case questions over whether BCL can pull together enough financial backing for the project.

Nevertheless, BCL continues to make the case that reopening Panguna is commercially viable and that it is the company with the experience to do it. Even more importantly, BCL remains at present the only source of any hard data that might enable us to consider the mine's commercial viability.

11. Bougainville Copper Limited Annual Report 2009, 32-33.

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BCL's Estimates

BCL's most recent presentation on the economic viability of Panguna was made to the ABG's Tax and Revenue Summit in September 2017. The analysis does not specify company earnings nor profits. However, it does project possible revenues for PNG and for Bougainville (see next section).

The amount of money that a mine grosses in any given year depends on a number of aspects: the amount of material that is mined, the ore grade, the mineral recovery rate and of course, the price of ore in the market.

In BCL's 2017 presentation to the tax summit, they stated their assumptions for contained copper and gold production, as well as their assumed copper and gold selling prices (see asterisk items in the table below). Although the BCL presentation did not include gross earnings, it is a relatively simple task to

Table 1: BCL projected annual yields and earnings per annum

	Copper	Gold	Total
Assumes annual milling rate	60 million tonnes pa		
Assumed ore grade	0.40%	0.46 g/tonne	-
Contained ore production*	178,000 tonnes	570,000 ounces	-
Assumes market price (US dollars)*	USD 3.00/lb or USD 6,614/tonne	USD 1,300/oz	-
Annual sales earnings (US dollars)	USD 1.177 billion	USD 741 million	USD 1.918 billion
Annual sales earnings (PGK PNG)	PGK 3.807 billion	PGK 2.396 billion	PGK 6.203 billion

* From BCL tax and revenue summit presentation. Data from BCL does not include potential earnings from silver.

Graph 1: Copper prices historical chart



Source: Macrotrends LLC, Copper Prices - 45 Year Historical Chart¹²

produce them as per Table 1.

If we are to believe BCL's projections, then the mine could bring in gross earnings of as much as USD 1.9 billion or PGK 6.203 billion per year for up to 25 years. This is presumably based either on some sort of expansion of the mine, or the expectation that better technology will allow mining efficiency to increase.

Given these enormous sales earnings, it might seem that reopening Panguna is a bit of a no-brainer. However, these predictions are based on two very important assumptions. The first assumption is an average long-term copper price of USD 3.00 per pound (which produces most of the earnings from the mine).

It is possible that the price of copper may average out to around USD 3.00 per pound over this period. However, as Graph 1 shows, the copper price is very volatile, as are the prices of metals generally. A fall in demand or an increase in supply – because other large

suppliers come online for example – could easily see the copper price fall.

Another important factor on which the projected earnings are based are the various assumptions about the amount, quality and accessibility of the mineral reserves. Or to put it another way: how do we know how much copper and gold is actually there, and how easily can that copper and gold be extracted?

BCL's projections assume a contained copper production of 178,000 tonnes per annum. This is higher than the average amount of copper extracted during the life of the mine (166,000 tonnes).¹³ However, it is more or less consistent with what BCL was extracting in the final full years of the mine's life (1985 to 1988). BCL's projected contained gold production of 570,000 ounces per annum is relatively consistent with 1980s trends.

12. <https://www.macrotrends.net/1476/copper-prices-historical-chart-data>

13. Bougainville Copper Limited Annual Report 2015.

BCL have projected the milling of 60 million tonnes of ore per year for at least 25 years. This is higher than historical data for ore milled each year and, with regards the 25 year lifespan, is based presumably on an ‘indicated’ resource of 1,538 million tonnes.¹⁴ However, as BCL themselves acknowledge, BCL has yet to undertake scoping studies to demonstrate technical and financial viability¹⁵ and as such these figures are unreliable.

Economic viability of Panguna for the mining company

However, if the mine earnings in the BCL presentation seem unreliable, one also must consider the operating and other costs in determining viability. These must be subtracted from sales earnings in order to determine whether the mine is profitable for the company and, perhaps more importantly, for its investors. These operating costs fall into three categories (1) start up costs; (2) waste management costs; and (3) payments made to the government landowners, salaries and shareholders.

Capital costs of re-opening the operation

Due to the conflict, the Panguna mine had to be abandoned in a hurry. As is evident from the many photos that have been taken over the years, bulldozers and other equipment, buildings and roads that were part of the infrastructure of the project had to be abandoned. In a less hasty departure, much of this infrastructure and equipment would have been ‘mothballed’ – i.e. preserved to the greatest extent possible for later use. The long duration of time and the toll taken on the infrastructure and equipment in a tropical climate has seen further degradation. Reopening the mine, therefore, would not simply be a

14. see Bougainville Copper Limited 2016 Annual Report for Panguna mineral resource data.

15. Bougainville Copper Limited 2016 Annual Report.

case of turning up again with staff and commencing to dig. The mine more closely resembles a greenfield site rather than a brownfield site. Equipment will need to be replaced, and infrastructure first demolished and then re-built. Finally, there is also the issue of whether a future operator of Panguna would be liable for cleaning up the environmental damage (see below) which would likely be a significant sum.

So, what would the start-up costs be? The simple answer is that we do not know, as there has been no in depth or detailed study or information to investors or others on what the start-up costs would be. BCL’s current estimation according to the 2017 Tax and Revenue Summit presentation is between USD 4 billion and USD 6 billion.¹⁶ Over time, BCL has made a number of estimates of the costs of reopening including ‘approximately USD 3 billion’ in its 2011 Annual Report and ‘in excess of USD 5 billion in the 2013 Annual Report. It is not clear whether any of these estimates included environmental clean-up costs or not. In its 2009 Annual Report, BCL stated that the actual start-up costs could not be properly assessed until a mining pre-feasibility study was completed. Needless to say, no such study is likely to be completed without an exploration license being granted.

Waste management

In the first iteration of Panguna, the mine waste – tailings and waste rock – was simply dumped into the Kawerong and Jaba Rivers. The basic precaution of trying to use tailings dams was never used causing immense and permanent environmental damage onsite and downstream. Additional pollution of the rivers has occurred through Acid Rock Drainage (ARD). This is the process by which water runoff from the mine site becomes highly acidic

16. Bougainville Copper Limited, Development of the New Panguna Project—Potential Revenue Streams, ABG Tax and Revenue Summit, September 28, 2017. <https://bit.ly/2PX72VA> (henceforth: BCL, Development of the New Panguna Project).

BCL clearly has aspirations, whether Bougainville achieves independence or not, to negotiate a tax arrangement that is more favourable to itself.

which is caused by the oxidation of sulphide minerals found naturally in the rock. Copper mines are often associated with ARD because they contain iron sulfides (ie pyrites). Elevated levels of toxic heavy metals (including copper) may also be present as these metals are more readily dissolved in highly acidic waters. Elevated copper levels are toxic to plant and animal life and in high levels are dangerous to human health. Anecdotally, the Jaba River is understood to be a 'dead zone', and the pictures of the Jaba and Kawerong Rivers show a bright turquoise-blue coloured deposit or stain (due to the elevated copper levels) on the riverbed.

It is impossible to imagine that the people of Bougainville, let alone the Panguna landowners, would sanction a repeat of this sort of environmental damage again.

The question thus becomes, what sort of waste management strategy would any redeveloper of the Panguna resource use, and how expensive would this be? Relatively straightforward tailings management systems can and do fail – as was seen in the 2014 failure of the Mount Polley copper mine in British Columbia (which is discussed by Catherine Coumans in her paper). There are more sophisticated tailings storage mechanisms these days, which generally go under the name of 'integrated tailings management'. Building a highly engineered tailings management system at Panguna, which is in an area of high rainfall and high seismic activity, while not impossible, would be very difficult and very expensive. The cost to design and construct a tailings dam at Panguna could easily exceed USD 1 billion, as might the cost to remediate existing environmental damage.¹⁷

Once again, it is impossible to know what the costs of tailings management would be without some sort of feasibility study. If any such

study has been done, it is certainly not publicly available at this time. What we can say is that the safer the environmental management plan, the greater the cost.

Taxes and revenues

The third unknown that could potentially eat into the profits of any company that wanted to exploit the Panguna resource is the amount of taxes and other payments that a company would need to pay to access and extract the resource. Aside from operating costs, there are four major expenses: payments to the PNG Government (corporate tax and other types of taxes); payments to the ABG (royalties and development levies); payments to landowners (royalties, equity in BCL); payments to staff (salaries and other benefits). The amount of taxes and other revenues that BCL estimates it might pay under the current legal regime are discussed in detail below in the next section.

An independent Bougainville could see new tax and revenue arrangements negotiated, but we have no idea what these might look like. If the people of Bougainville vote for independence, decisions would have to be made as to whether to adopt PNG's current tax code or not. The BCL presentation at the Tax and Revenue Summit says that the project may not proceed 'unless the ABG and National Government can provide assurances as to what taxes will apply in the long term'.

BCL clearly has aspirations, whether Bougainville achieves independence or not, to negotiate a tax arrangement that is more favourable to itself. BCL argues in its presentation that PNG's Additional Profits Tax 'reduces project value and probability (sic) prevents the Panguna mine from ever being redeveloped'. Needless to say, if rates are negotiated down, this may make the project more financially viable, but that will obviously translate into a worse deal for the people of Bougainville.

17. Personal communications, 17 July 2018, Dr Gavin M. Mudd, Associate Professor - Environmental Engineering, RMIT University.

Table 2: BCL Projected Annual Revenues from Panguna Mine (USD million per annum)¹⁸

	Revenue stream	Standard case assumption*	High case assumption**
Revenues to the ABG	Royalties, development levies	44	53
	Total	44	53
Revenues to the National Government	Corporate tax (30%)	286	345
	Additional profit tax (30%)	133	178
	Dividend withholding tax (15%)	70	82
	Personal income tax	30	33
	Total	519	639

* 60 million tonnes per annum

** 90 million tonnes per annum

How much revenue would Panguna generate for Bougainville?

In the first life of the mine, BCL paid taxes on earnings to the PNG Government of approximately 20.2% (9.8% corporate income tax and 10.4% additional taxes). The North Solomon Provincial Government (i.e. Bougainville) received just over 1% of revenues from royalties and other payments.

However, since 1990, the tax code in PNG has changed. Under current PNG tax law, there is a corporate tax rate of 30%, which is calculated on profits (not earnings). There is also an additional profits tax of 30%, which is applied to profit levels if they exceed 15% returns. Moreover, in 2015, the ABG passed a new Bougainville Mining Act, which sets the amount that the provincial government (i.e. the ABG) would receive in terms of royalties, etc. It sets a 1.25 per cent regional

development royalty, a 0.5 per cent health and education royalty and a 0.5% production levy.¹⁹ There is also a dividend withholding tax of 15%.

Assuming Bougainville were to remain part of PNG (i.e. no independence for now), BCL has estimated potential revenues breakdown as detailed in Table 2. As the table shows, without independence, most of the revenues would go to the National Government. This could however be partially justified by the fact that the PNG Government currently provides around 90% of the ABG's annual revenues. Obviously, if Bougainville were to gain independence, and it were to maintain similar tax code as PNG, then all the money currently going to PNG Government could theoretically go to a newly independent Bougainville Government.

18. Source: BCL, Development of the New Panguna Project.

19. Bougainville Mining Act 2015, Clause 291, p. 164. http://www.abg.gov.pg/uploads/acts/Act_2015-3-Bougainville_Mining.compressed.pdf.

[...] revenues from Exxon and its partners to PNG have been (and are expected to continue to be) much less than projected in the first few years of production. This could (and most likely would) also happen for Panguna revenues in the early years of the production phase (late 2020s and early 2030s).

If these figures were to be taken at face value, this would amount to a very strong case for the reopening of Panguna. Bearing in mind the exchange rate, even without independence, royalties and development levies alone would boost ABG coffers; and the increased tax take for the PNG Government would be a strong case for the ABG to argue for a large increase in budget support from Port Moresby towards services in Bougainville.

However, taking these figures at face value would be very foolish indeed. First of all, these projections are subject to all the assumptions as regards to earnings discussed in Section 2 above: variations in the price of copper, in volume extracted and in the tax regime. As noted above it is not clear the basis for BCL's projected milling rate of 60 million tonnes per year. The high case of 90 million per year therefore seems highly speculative. They are also subject to the assumptions discussed in Section 3 above, particularly the question of tailings management. A better tailings management system would have huge capital costs as well as ongoing maintenance costs, which would erode profits, thus cutting into the revenues from taxes and royalties.

The second problem with the above figures is that they do not address the question of timing. BCL's timeline has feasibility study being conducted in 2020-21, raising finance in 2022, the construction phase 2023-24, and production from 2025 onwards. With the non-renewal of the exploration license, however temporary, this timing is now impossible. Production (and therefore revenues) would

therefore not be likely before 2026 or 2027 – i.e. at least 7 to 8 years away.

The third problem with the above figures relates to the tax concessions that are likely to come to any company – as indicated earlier, BCL has indicated it would not proceed if it had to pay the Additional Profits Tax included in the above table.

There is also a major issue concerning the timing of tax revenues. These will not only fluctuate greatly with international prices, but usual resource tax law allows taxes to be based on profits only after capital costs and debt repayments are taken out. Given the amount of capital investment needed, and the amount of debt any company is likely to need to take on to restart production, this means that for some years after production starts, the project may see little to no company taxes going to the PNG Government (or indeed a future independent Bougainville). Current PNG company tax law allows for all capital costs to be deducted against profits on a “25% declining balance basis”. This means that in its first year of operations, if the capital costs of restarting the mine were \$US6 billion, then 25% of this could be claimed against profits in the very first year – or \$US1.5 billion. Another claim could be made in the second year of \$US1.125 billion. Such deductions will be much greater than the profit levels implied by Table 2. Any mine operator would then be in a tax loss situation for many years.

This is indeed what has transpired for PNG LNG revenues. Revenues from Exxon and its partners to PNG have been (and are expected to continue to be) much less than projected in the first few years of production.²⁰ This could (and most likely would) also happen for Panguna revenues in the early years of the production phase (late 2020s and early 2030s). It would therefore seem prudent to assume that Bougainville will see little financial benefits to its budget bottom line from company taxes until at least 5 years from the commencement of mine production given depreciation tax write-offs.

The final issue that needs to be taken into consideration is the question of risk. As is clear from other papers in this report and previous reports from Jubilee Australia, there is clearly a large part of the Panguna community who are against any mining returning at this time. Leaving aside the ethical and moral questions around forcing or manufacturing consent upon a population with significant and legitimate concerns about any new mine, and considering the issue from a purely financial point of view, the question is still one of concern. Unless a larger player with deep pockets secures the rights to Panguna, the ability of a small company like BCL to find financing to back this project in the face of ongoing landowner discontent about the mine will be difficult.

Conclusion

A number of conclusions can be drawn from the above analysis. It is going to take a long time (decades) for Bougainville to become economically self-sufficient given its current economic activities and trajectory. If Bougainville stays part of PNG, it would likely be dependent on financial support from the PNG Government for some time. If it were to choose independence, the financial situation would likely result in significant dependence on foreign aid. Given all these realities, it is perhaps understandable why many have made the case that mining is the obvious solution to a future dependence either on PNG or on foreign donors.

However, mining's viability as an option would seem to be undermined by several important considerations. First, it seems unlikely, even if mining licenses could be approved, that Panguna is viable enough to make it commercially profitable for a company or for investors without a number of significant assumptions being met. The yields would need to stay as high as they were in the 1980s, the copper price would also need to maintain its recent level, the company may engage in questionable but cheaper

environmental practices, the company would need to not meet any landowner resistance, and the tax regime would need to be favourable to the company. That all of these assumptions will prove to be met would seem to be highly unlikely.

Second, even if a company (whether BCL or another actor) was able to restart Panguna, this would not likely bring any significant revenues to Bougainville in the short or even medium term. This is because of the time it would take to start operation and the likely reality of the tax regime that would be negotiated between the mining company and the government. Even if some payments were to come at this point, whether they will provide the sort of financing that Bougainville is said to need remains an open question, and is dependent on many assumptions. It is hard not to avoid the conclusion that the mine may be profitable for the company, or for the government, but probably not to both. It is also an open question whether either the company or the government can make significant money without the risk of continuing environmental destruction on the island.

For at least the next ten years, an independent Bougainville is therefore going to need significant aid either from PNG or other donors whether or not Panguna (or other mines) are opened up. Given that this is the case, the question should perhaps be asked, is it worth the risk for the ABG to push the country down a mining path, or would it not be better to explore alternative paths – that are broad-based and sustainable – for the next decade and see how these bear fruit in the meantime?

20. Paul Flanagan and Luke Fletcher, 'Double or Nothing: The Broken Economic Promises of PNG LNG' (NSW: Jubilee Australia Research Centre, 2018).