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THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Just Transitions and the Pacific

Case study 1:

Copper in Papua New Guinea

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Version 2

This note constitutes an output from the Just Transitions and the Pacific project, a collaboration between the University of St Andrews' Centre for Energy Ethics, and the University of Queensland's Centre for Social Responsibility in Mining (CSRM), in the Sustainable Minerals Institute.

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Work Package 3: to develop three qualitative case studies on the justice dimensions of extracting different ETMs in the Pacific under conditions of climate change: Papua New Guinea (copper), New Caledonia (nickel), and Cook Islands (cobalt)

Author: Dr Emilka Skrzypek, Senior Policy Fellow, Centre for Energy Ethics, University of St Andrews

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Contents

Notes on the conceptual framework

This document presents one of three country case studies produced as part of the Just Transitions in the Pacific Project – each focused on a particular Energy Transition Metal sourced from a given Pacific country:

- **Papua New Guinea (copper)**
- New Caledonia (nickel)
- Cook Islands (cobalt)

They case studies offer a granular examination of justice issues that accompany increased pressure to extract ETMs found in the Pacific for global renewable energy technologies.

The energy justice literature generally accepts three foundational justice elements, or what Raphael Heffron and Darren McCauley (2018) have termed a 'triumvirate of tenets': distributive, procedural and restorative justice. Expanding on this, Heffron has developed a 'JUST framework' to consider 'the role of justice in developing critical minerals' (Heffron 2020). In summary, the framework stresses the following elements:

- three core forms of **justice**: procedural, distributive and restorative justice
- two **universal** forms of justice: cosmopolitanism and recognition
- attention to the **spatial** dimensions of developing critical metals
- attention to the **temporal** dimensions of developing critical metals and climate change initiatives

This framework unites climate, environmental and energy (CEE) justice considerations with the view towards reducing inequality and injustice within society, and we adopt these elements accordingly (see Box 1).

Box 1: Justice Dimensions

Procedural justice: refers to fairness of processes used by those in positions of authority to reach specific outcomes or decisions.

Distributive justice: recognises that the economic, political, and social frameworks that each society has result in different distributions of benefits and burdens across members of the society.

Restorative justice: emphasises peaceful processes 'whereby parties with a stake in a specific offence collectively resolve how to deal with the aftermath of the offence and its implications for the future' (Marshall 1999:5).

Cosmopolitanism justice: stems from the belief that we are all 'citizens of the world' and pushes us to consider the effects of actions beyond specific territorial boundaries or legal jurisdictions.

Recognition justice: defines the conditions of a just society through the aim of recognising the individual dignity of all individuals.

The JUST framework helps us to emphasise past, present, and future injustices of extracting ETMs – and the restorations or reparations that are also required – and to consider how justice issues arise over different time and spatial scales.

In the Just Transitions and the Pacific project we extend this framing to understand how justice issues interact and transform across these scales – what we term **justice convergences**.

Building on the foregoing discussion and categorisation of justice issues related to the extraction of ETMs in the Pacific, in our project – and through the three case studies - we stress the need to understand the relationship between justice issues: how they converge and transform one another, and the effect of time and scale on these convergences and their impacts.

Country location map

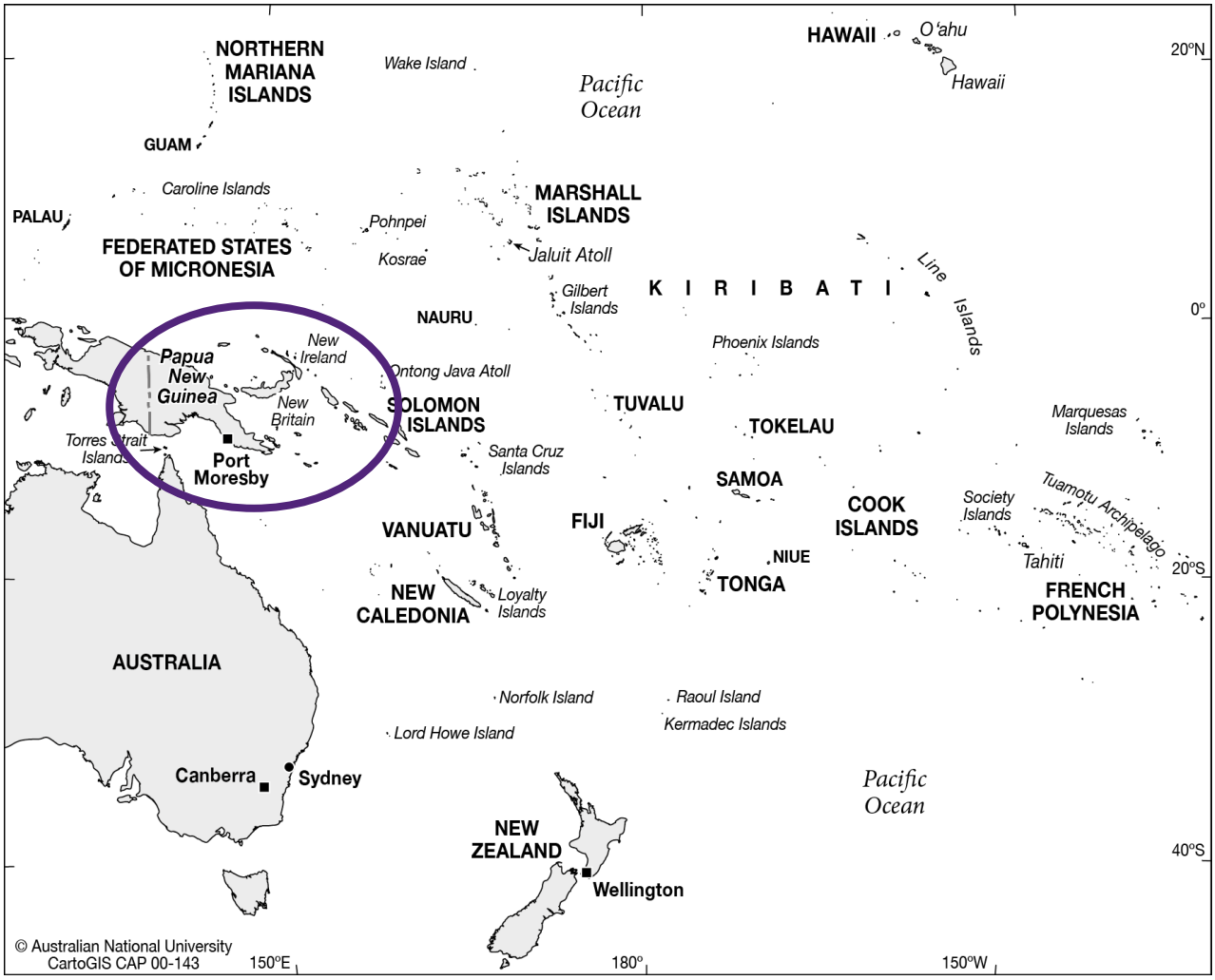


Figure 1.1 The Pacific region (source: ANU CartoGIS unit)

1. Introduction

Copper is one of the most widely extracted and used metals in the world. Demand for the metal grew throughout the 20th century, driven by population growth, improvements in living standards and expansion of copper-intensive technologies, such as renewable energy (Rotzer and Schmidt 2020). Since 1965, the world's copper production doubled every 25 years (Henckens and Worrell 2020) and the growth in production of copper is projected to increase further – with Watari et al (2022) estimating that it could reach up to 62 million metric tonnes a year by 2050, more than three times the current extraction rate.

A significant proportion of this additional demand comes from the renewable energy sector. Copper is considered one of the 'strategic' or 'essential' metals for energy transitions (Hache et al 2019). A highly efficient thermal and electric conduit, it is a critical component of renewable energy generation, storage and transmission technologies – necessary for mitigating the global effects of anthropogenic climate change – as well as electric motors and vehicles. A three-megawatt wind turbine contains up to 4.7 tonnes of copper, and there are some 5.5 tonnes of copper per megawatt in solar power systems (Navigant Research 2019). According to the EIA, renewable or clean energy technologies accounted for some 20% of global demand for copper in 2010. This is expected to increase to 30% by 2040 in a scenario that considers stated policies, or to over 40% in a scenario consistent with meeting the goals of the Paris Agreement 2015 (IEA 2021).

It is now clear that the low-carbon future will be mineral intensive. Research suggests that mineral content, including copper, per unit of capacity is ten times higher in a solar PV rooftop compared to a gas plant, and three times higher in an onshore wind turbine than a nuclear power plant (Seck et al 2020). As the world moves towards a less carbon intensive economy the demand for energy transition metals (ETMs) such as copper is expected to grow putting pressure on countries in many parts of the world to develop their mineral reserves. Source countries stand to benefit from this rise in demand – but they will also be expected to manage the environmental, social as well as climate footprints associated with increased extraction (Hund et al 2020:7). Whilst copper contributes to development of low-carbon technologies, the extraction of copper is highly energy-intensive and a major emitter of greenhouse gasses.[1] It requires large volumes of water putting pressure on local water sources (Fuentes et al 2021), and produces large volumes of waste that needs to be stored safely to prevent damage to the natural environment or, in some cases, such as the Brumadinho tailings dam disaster in Brazil in 2019, loss of life (see e.g. Cambridge and Shaw, 2019).

The world has significant copper reserves. This means that there are limited concerns about availability of the metal. However, only a small proportion of those reserves is currently economically viable for extraction and many known reserves are in areas characterised by high levels of environmental, social and governance (ESG) risks – posing questions about accessibility of copper, and affordability of the metal – particularly for poorer countries (Henckens and Worrell 2020).

Lebre et al (2019) estimate that as much as 63% of the world's copper reserves are located in complex ESG contexts, where the presence of numerous concurrent medium-to-high risks raises concerns about the ability of the mining industry to meet the demand on the one hand – and potential impacts of taking those projects forward on the other.

Considered within their ESG contexts, the current stock of undeveloped copper orebodies is characterised by its high complexity. As Valenta et al (2019:816) point out, the copper mines of the future will be 'lower grade, deeper, and large footprint operations'. They will consume more water and energy, whilst generating more waste and producing harmful elements such as arsenic. They are also more likely to be located in ecologically sensitive and geographically remote areas, on the lands of indigenous peoples, and in countries characterised by high levels of corruption and poverty. Considering a range of ESG risks Valenta et al warn that the growing demand for copper, driven partially by development of renewable energy technologies, may 'unlock previously uneconomic orebodies' and 'unleash an unacceptable suite of environmental and social impacts' (ibid. 817).

[1] This issue has received significant scientific attention. Elshkaki et al (2016), Moreno-Leiva et al (2020), Haas et al (2020), and Rotzer and Schmidt (2020) among others, have highlighted opportunities for renewable energy usage in copper mining.

There are currently around 250 copper mines in operation in nearly 40 countries around the world. Almost half of the world's copper reserves are concentrated in Central and South America, with the world's two biggest producers of copper being Chile and Peru. Between them, the two countries provided almost 40% (or 8,242,840 metric tonnes) of the world's copper in 2020 – followed by China (8.14%), Democratic Republic of Congo (7,07%) and the United States of America (6,09%) (Mróz 2022).

Papua New Guinea (PNG) is not among the world's top copper producers, and its copper production decreased significantly in the last two decades. It ranked 21st in 2018 (most recent available data) with 96,000 metric tonnes extracted in that year – down from 218,000 metric tons in 2001 (USGS 2022).

Yet, as a direct consequence of several 'irresponsible' mining projects – including two large scale copper operations – the country has exerted an instructive, disproportionate, and reforming influence on the mining industry (Filer et al., 2008) that led to the formation of the Global Mining Initiative in 1999, the Mining, Minerals and Sustainable Development Project in 2003, and to establishment of the industry governing body, the International Council on Mining and Metals (ICMM), soon after.

Although PNG's current share of the world's copper supply market may seem insignificant on the global scale, the impacts of copper mining on the national and regional economy, politics, natural environment and communities are and have been substantial. There is a high risk that those impacts will increase further as demand for copper grows. There is also a high likelihood the country's relative position as a global copper producer will increase significantly in the future. Two planned large scale copper operations in PNG – Wafi Golpu and Frieda River – have recently completed feasibility studies, taking them one step closer to project development. Both are among the largest undeveloped copper deposits in the world, by tonnage, and included on Valenta et al's (2019) list of complex copper orebodies with medium to high levels of risk across the 12 categories employed in the study. Should those projects progress to construction and production, their combined estimated average annual copper production will be 336,000 tonnes – significantly increasing the country's share in global supply of the metal and introducing wide ranging social and environmental impacts in and beyond mining localities. This would add to the already substantial and well-evidenced concerns about the justice dimensions of extracting copper in PNG and the wider Pacific region.

2. Copper mining in Papua New Guinea

Located in the southwestern Pacific, PNG is home to around 9 million people, representing over 800 language groups scattered over a very rich and diverse geographic territory. The country occupies the eastern portion of the island of New Guinea, and includes numerous offshore islands (see Fig 1.1). It is commonly considered among the most linguistically and culturally diverse places in the world and widely recognised for the global importance of its flora and fauna. It is also frequently described in terms of an either 'failed' or 'weak' state – a description linked to the country's perceived difficulty in forging a strong national identity on the one hand and creating effective state institutions on the other (Bizhan and Gorea 2020). This weakness demonstrates across many areas of policy and economy, including resource extraction: PNG is a country rich in mineral resources – such as copper, gold, natural liquid gas, and nickel – but has thus far largely failed to translate its natural wealth into positive development outcomes for a majority of its citizens.

The country's history of utilising mineral resources for practical and ceremonial purposes goes back thousands of years. The European presence which began in 1800s led to intensification of the scale of extraction, particularly following discovery of gold on Sudest and Misima islands in the late 1880s (Nelson 1976) – setting the country on a path towards a so-called 'resource dependency' (Bainton and Skrzypek 2021). In 2018, extractive industries accounted for 89% of PNG's exports, 29% of the country's GDP and 9.4% of total government revenue (PNG EITI 2019). PNG produces large volumes of gold, copper, silver, LNG condensate, nickel and cobalt – all of which form an integral part of the country's extractive industry. Copper, silver, nickel and cobalt all can be defined as energy transition metals (ETMs) due to their significance for renewable energy technologies. This case study focuses specifically on copper.

As much as the country's mineral wealth made PNG attractive to explorers, adventurers and successive colonial powers,[2] it also formed the basis of the country's economic system at independence. In the 1960s, when the prospect of independence was no longer a question of if but when, the Australian colonial administration began mapping the country's resources. In 1961 rich copper and gold deposits were discovered on the island of Bougainville, at Panguna. In 1967 an agreement was negotiated with the Australian Government and ratified by PNG's House of Assembly, and a decision to proceed with developing the mine was made in 1969 (Vernon, 2005). The mine – one of the largest in the world at the time – began operations in 1972, marking the official beginning of commercial scale copper mining in PNG.[3]

On average, the Panguna mine was producing 175,000 tonnes of copper and 18 tonnes of gold a year. Its initial commercial success was critical for funding PNG's transition to independence, evidencing the new nation's claims of economic viability and development potential. In September 1975, the country officially became independent of Australia. In the years that followed, and utilising the resource boom of the late 1970s, the government of the newly independent state worked to strengthen the country's position as a 'mining resource frontier' (Hyndman 2001).

In 1984 a second large mine, the Ok Tedi mine, started operating in the country's Western Province. Initially a gold-only operation, it begun extracting copper in 1987, becoming the second largest copper extraction venture in PNG.

Today, Ok Tedi is the only operating mine in PNG which extracts copper as a primary commodity (alongside gold and silver). Copper is also being extracted as a tertiary commodity (after gold and silver) on a much smaller scale at the Edie Creek goldfield in the Morobe Province, and the Kainantu Gold Mine in the Eastern Highlands. Overall, the country hosts 70 copper projects, at various stages of development – from exploration through operations to closed or abandoned projects. Of those, 37 have copper as their primary commodity, including 14 projects that are currently identified as active (for location see Figure 1.2).

By the end of the 20th century, both Panguna and Ok Tedi became examples of some of the most socially and environmentally disastrous large scale mining projects in recent history. The Panguna mine closed in 1989 following an armed conflict that claimed thousands of lives. The Ok Tedi mine continues operations amid what Kirsch (2014:133) described as a 'slow-motion environmental disaster' caused by the mine's riverine tailings disposal and chronic mismanagement of its severe environmental impacts.

Despite experiences of those two mines, once described as 'pioneering' and 'symbols of national optimism', but now best known for their devastating impacts on people and environments – the PNG government continues to pursue new copper mining prospects, including those at Wafi Golpu and Frieda River. As Wafi Golpu and Frieda River progress through the stages of a new mine permitting process, questions of the impacts of mining activities on extractive locations and the country more broadly, and justice dimensions of copper extraction in paricular, gain in both importance and urgency.

Below, we trace the history of copper mining in PNG, and key social and environmental issues associated with the country's experience of copper extraction to date, by looking at PNG's largest operating and prospective copper projects: the Panguna and Ok Tedi mines; a failed attempt to mine copper from the seabed at the Solwara 1 project in the Bismarck Sea; and the prospective Wafi Golpu and Frieda River projects (see Figure 1.2).

The material presented here provides context for discussion of justice issues that accompany copper mining in PNG – which is presented in section 3.

[2] Since the 1800s, all of parts of what is now Papua New Guinea has been colonised by Holland, Germany, Britain and Australia.
[3] Some small-scale copper mining was present in the early 1900s at the Laloki and Sapphire-Moresby Kind mines outside of the country's capital – Port Moresby, and a small amount of the mineral was extracted in the early 1960s from the Kora mine in the Kainantu region (Mudd et al 2020).

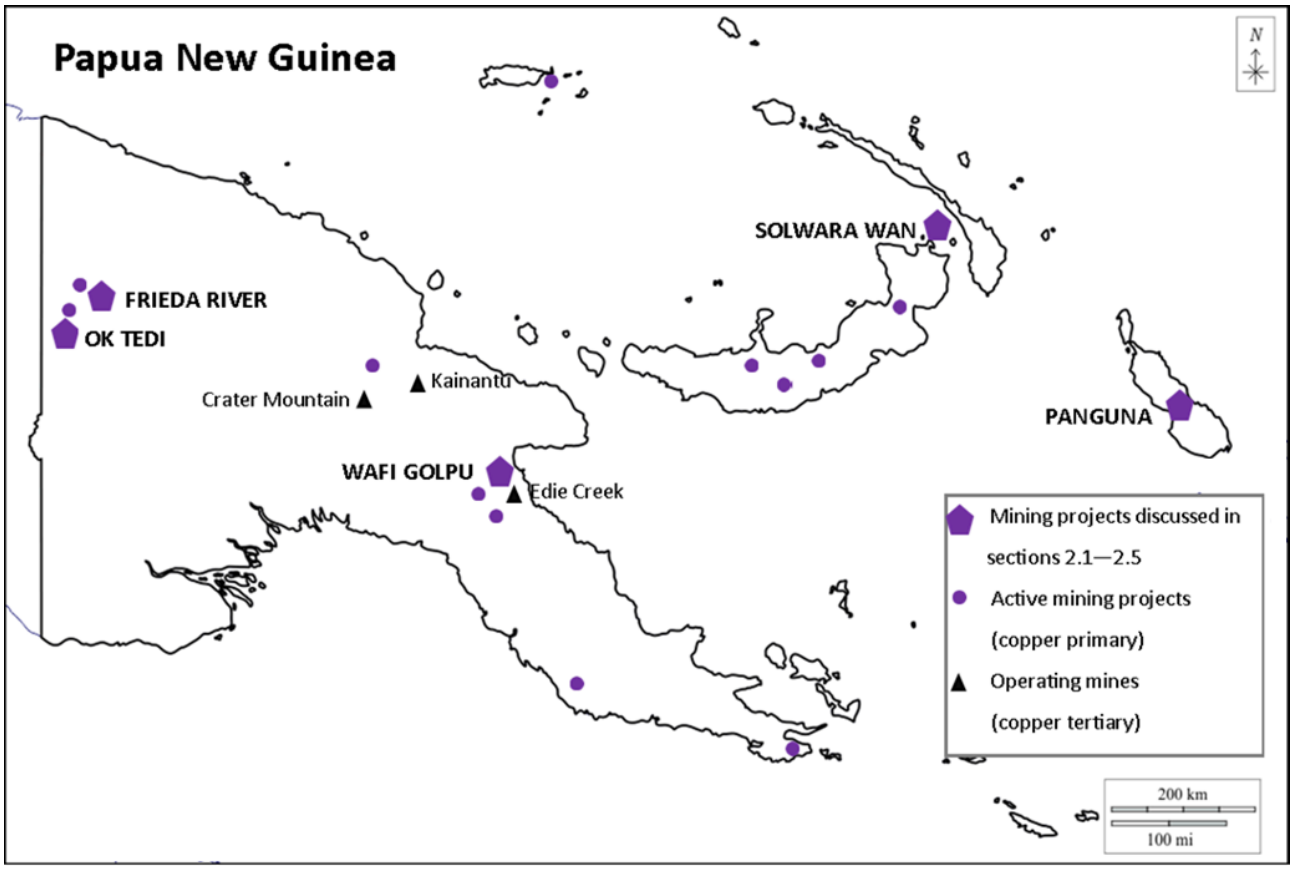


Figure 1.2 Location of active copper projects in Papua New Guinea

2.1 Panguna, Bougainville Island

Rich copper and gold deposits were discovered at Panguna on Bougainville in the early 1960s. This discovery was welcomed enthusiastically by the Australian Government which exercised colonial power in the country, and the PNG House of Assembly – a legislature of the territory of what is now PNG between 1964 and 1972, and renamed after independence in 1975 as the National Parliament of PNG. A decision to proceed with mine construction was made in 1969, and the mine began operations in 1972. The project was operated by Bougainville Copper Ltd (BCL), a subsidiary of a global mining giant, Rio Tinto, and governed by the Mining (Bougainville Copper Agreement) Act 1967 (revised in 1974).[4] Panguna was one of the world's largest copper and gold mines of its time.

Nowadays it is commonly associated with environmental damage and dramatic social disintegration on the island. But in some regards, and for some time at least, the mine offered excellent employment and training opportunities to its majority Papua New Guinean workforce, and successfully operated the Bougainville Copper Foundation with a mandate of supporting community activities and projects on the island (Vernon 2005). With the strained relationship between the PNG government and Bougainville looming in the background, the financial success of the mine was crucial in funding PNG's independence – providing much needed revenue for the newly formed national government.

[4] For a detailed commentary on the document see Denoon (2000).

In the 17 years of operations the Panguna mine produced 3 million tonnes of copper, 306 tonnes of gold and 784 tonnes of silver – representing around 44% of the country's export and 17% of internally generated revenue at the time. But this mineral income came at a high environmental and social cost.

Profound effects both the local river systems were identified shortly after the mine begun operations and were considerable and obvious (Vernon 2005). The operation directly discharged toxic mine tailings into the Jaba River system (see Photo 1.1) at rates up to 140,000 tonnes a day (Powell and Powell 1999), destroying the riverine ecosystem and the surrounding land, and causing a range of reported health issues, including birth defects. The company had set up a system of racial segregation on the island, with one set of facilities for white workers and one set for the locals, adding to growing tensions between Bougainvilleans and 'outsiders' (white expats as well as 'red skins' – Papua New Guineans from mainland PNG) attracted on to the island by the copper prospects.

The benefits that were promised to outweigh the cost of development never materialised for a majority of Bougainvilleans who resented the limited employment opportunities and access to revenues from the mine's operations. Between 1972-98, only 1.37% of Panguna cash revenues went to local landowners and what little was received was distributed in ways that involved significant inequality (Regan 2017: 358). Recognised landowners in the mine lease were also eligible for compensation payments, alongside the royalties – but the inadequate and widely contested landowner identification process and the mismatch between levels of compensation and severity of impacts and disruption only contributed to community unhappiness and, eventually, anger. Together with the growing resentment towards in-migrants, increasing economic inequality, land shortages caused by rapid population growth, and a sense of abandonment by the PNG administration, these elements combined to a widespread sense of grievance that led to a violent conflict that erupted in the late 1980s (ibid.).

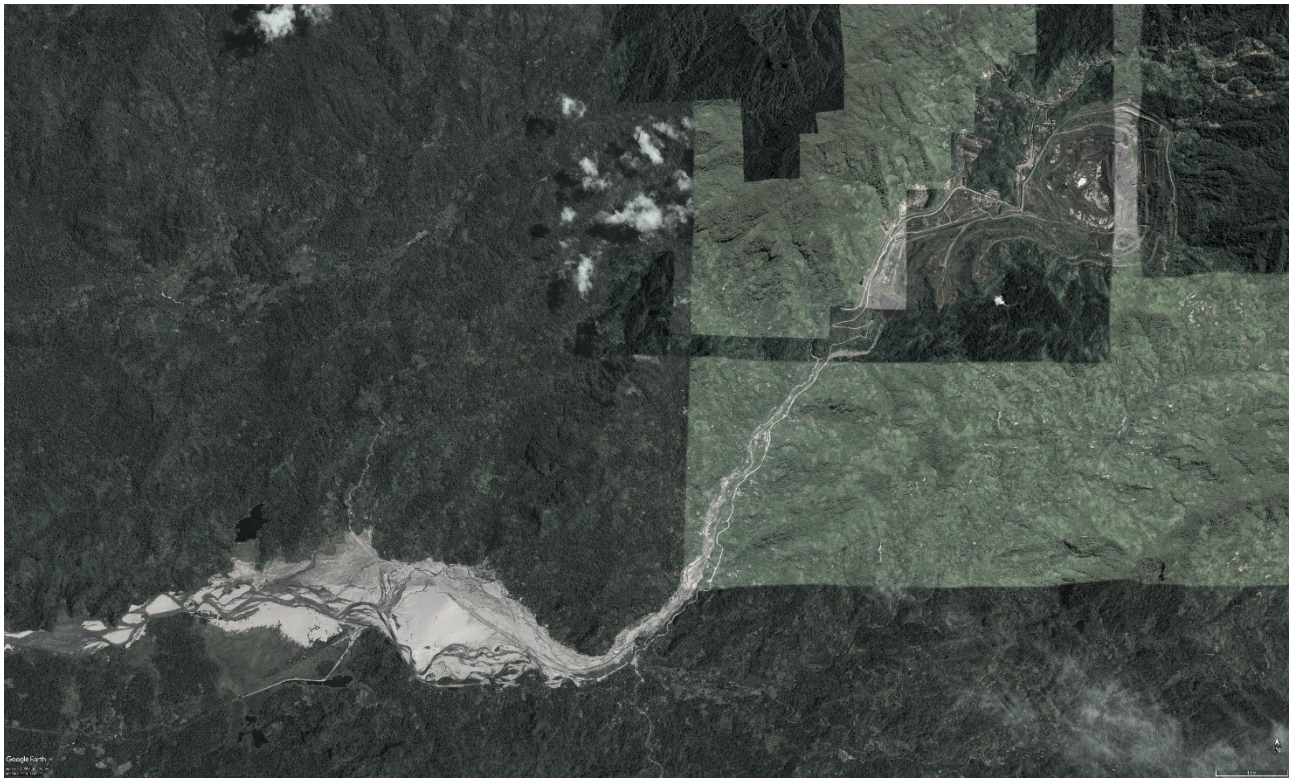


Photo 1.1 Panguna mine and the upper reaches of Jaba River – note the build-up of sediment downstream (recent image, source: Google Earth)

In November 1988 militant landowners begun a campaign of sabotage against the mine. In an attempt to subdue the militants, in March 1989 the PNG government despatched troops to the province. However, rather than relieve the tensions, 'the frequency of armed clashes between the militants and the security forces increased to the point at which a protest against the mining company had become an act of rebellion against the authority of the state' (Filer 1990: 1). Despite efforts of numerous organisations to negotiate peace, violence endured. In May 1989 Panguna mine was forced to shut its operations and evacuated all personnel.

The fighting continued for another 8 years, claiming thousands of lives. Much restorative work remains to be done to correct the harm done by the mine's operations to Bougainville's people and environment.

In 2016, Rio Tinto officially divested from the Panguna mine, transferring its 53.8% share to the PNG government and the autonomous government of Bougainville – a move described by the Human Rights Law Centre (HRLC, 2020b:14) as an 'abandonment of their responsibilities' for environmental damage caused by its operations between 1972 and 1989. In July 2021, under pressure from community members represented by the HRLC and following a complained filed by HRLC to Australian National Contact Point, the company reluctantly agreed to fund an environmental and human rights impact assessment of legacy impacts of the former Panguna copper mine. The results of this assessment and description any remedy actions are yet to be published.

After decades of a troubled relationship, in November and December 2019, in a non-binding referendum, an overwhelming majority of Bougainvilleans voted for independence from PNG. Although the PNG government has not yet granted the independence, in February 2022 the Autonomous Bougainville Government and landowners from the mine area signed a joint resolution to re-open the Panguna mine in what the government believes will be 'a major boost for the region's economic future and … guarantee Bougainville's independence' (Kenneth 2022 np.).

2.2 Ok Tedi, Western Province

The Ok Tedi mine was PNG's second large copper mining development, and first one post-independence. OK Tedi began operations in 1984, a part of the '1980s exploration bonanza' (Ballard and Banks 2003). It was constructed in Western Province – part of the country facing issues of severe economic and infrastructural underdevelopment which King (1997:97) described as 'so underdeveloped as to be effectively outside the control of Papua New Guinea'. Positioned in the Star Mountains, some 2000 meters above the sea level, the mine is located in a geologically unstable terrain with high rainfall and in a tributary of two large river systems – the Ok Tedi and Fly Rivers (see Banks 2001). At Ok Tedi Mining Limited (OTML), the PNG government entered the mining consortium with a 30% stake and sought out Broken Hill Proprietary (BHP) as the mine developer. The mine quickly became a symbol of national optimism of the new state, seen politically as an ideal opportunity to bring security to the border area with Indonesia, as well as revenues into PNG economy and development to a remote area.

The Environmental Impact Statement for the mine outlined plans for the toxic tailings generated in the mining process to be stored behind a large dam – providing a tailings storage facility necessary for keeping the toxins out of the rich but fragile natural environment, and to protect the health and livelihoods of the thousands of people living on the Ok Tedi and Fly Rivers. The dam construction did begin, but before it could be completed, the dam foundations were destroyed in 1984 during an earthquake. In less than three weeks, the Joint Venture sought and received permission to dispose tailings directly to the Jaba River sysem (Mudd et al 2020).

With the civil conflict threatening the future of Panguna, and to ensure the country's economic stability, the government agreed to a range of compromises and exemptions under the Environmental Planning Act, Environmental Contaminants Act, and the Water Resource Act, and allowed the mine to continue operating using riverine tailings disposal (despite of the negative environmental impacts experienced at Panguna).

In 1999, fifteen years after the mine started operating without a tailings storage facility, BHP reported that over a period of more ten years 90 million tons of mine waste was annually discharged into the river, destroying downstream villages, agriculture and fisheries, changing local landscapes – and significantly reducing riverine resources and services available to local communities.

In early 1990s, two indigenous leaders from a Yonggom community downstream on the Fly Tedi River, turned to the Australian lawfirm Slater and Gordon for help and challenged BHP on the grounds of environmental impacts. After a protracted legal battle, described in detail by Stuart Kirsch (2014), an out of court settlement was reached in June 1996 in which BHP agreed to pay K40 million in compensation to the worst affected areas of the Ok Tedi, and a further K110 million to all people affected by the mine. The agreement included the company's commitment to find and implement an economically viable tailings storage solution, which never materialized. Communities' anger grew and in 2000 the lawsuit against BHP was re-opened, as communities demanded a river clean-up and environmental restoration in addition to financial compensation packages.

Photo 1.2 Ok Tedi and upper reaches of the Ok Tedi River (recent image, source: Google Earth)

In 2001, BHP stepped away from the mine as majority shareholder 'because the company's directors had come to see it as a political and economic liability for which no future profits could compensate their shareholders' (Filer and Jenkins 2017:231). In a highly controversial arrangement, it agreed to transfer its 52% stake in the mine to a newly established 'PNG Sustainable Development Program' fund (PNG SDP) in exchange for indefinite legal indemnity against future liability – an arrangement formalized in the Mining (Ok Tedi Mine Continuation Ninth Supplemental Agreement) Act 2001. The Act contained provisions for a so-called Environmental Regime that requires OTML to undertake and report on a number of environmental indicators for the project.[5]

[5] These indicators include: dissolved and bioavailable copper concentrations in the river water; acid-base geochemistry of riverine sediments at the lower Ok Tedi Levee; fish flesh metal concentrations; average tailings sulphur discharge content; quarterly average

The Act also formalized a series of Community Mine Continuation Agreements (CMCAs) signed with the affected communities. These agreements promised signatory communities additional compensation, investments and development payments in exchange for them opting out from the continuing legal action against the mine (Kirsch 2007). Initially only signed with landowners closest to the immediate project area, in the years that followed, the number of CMCA signatory communities grew and by 2011 some 56% of the population of Western Province were included in the agreements (Filer and Jenkins 2017). In January 2017 Sepe-Auti village in the South Fly District was the final and 158th mine-impacted community to sign the CMCA.

In 2013, the PNG Government seized 100% ownership of Ok Tedi Mining Limited and repealed legislation that granted BHP immunity from legal action over environmental damage caused by its operations at Ok Tedi. In response, BHP expressed confidence, stating that 'it had other indemnities in place that protected shareholders from future legal costs' (Middleton 2013 np).

Since the start of operations, OTML has produced 5.01 million tonnes of copper, 15.4 million ounces of gold and 35.4 million ounces of silver. The mine continues operating and disposing tailings to the Fly and Ok Tedi river systems. It is co-owned by the state of PNG (67%) and the people of Western Province (33%). It is currently the only operating mine that extracts copper as primary commodity in PNG. The mine now has a closure plan that, in theory, contains provisions for rehabilitating the affected areas after the mine ceases operations in 2025. Experts estimate that if the mine ceased operations now, it would take between 150 and 300 years for the riverine system of the Fly River to recover from pollution caused by the toxic tailings.

2.3 Solwara Wan, Bismarck Sea (deep sea project)

In the 1990s a series of studies established mineralisation of the seafloor beneath the Bismarck and Solomon seas. Keen to expand its mining portfolio and access new mineral wealth, the government of PNG issued a number of exploration licenses to a Canadian company, Nautilus Mining Ltd, with the aim of establishing the feasibility of extracting these deposits (Filer and Gabriel, 2018). This included the Solwara 1 deposit – a hydrothermal field first discovered in 1996 and estimated to contain around 120,000 dry tonnes of copper.

The Solwara 1 deposit is located approximately thirty kilometres from the nearest coast (New Ireland Province) and fifty kilometres north of the international port of Rabaul (East New Britain Province), at a depth of around 1,600 meters. An Environmental Impact Statement (EIS) for Solwara 1 identified a range of impacts, some 'inevitably severe', on the environment, including but not limited to 'loss of habitat and degradation of water quality; loss, regional or wider scale loss, of endemic or rare species; decreased diversity of species or higher taxonomic levels; and loss of knowledge or of future opportunities (i.e., what we do not know)' and assessed it highly likely that all of those will occur (Steiner 2009:4).[6]

In January 2011, the government of PNG granted Nautilus a twenty-year mining license for the Solwara 1 project despite its widely recognised status as 'an engineering experiment, an environmental experiment, an economic experiment, and a policy experiment' (ibid. 394). In 2014 the PNG state took on a 15 per cent stake in the project, entering into a joint partnership agreement with Nautilus and investing an estimated K400 million (£100 million) in the project via a loan from the Bank of South Pacific.

Whilst conversations about deep-sea mining have been part of larger mining debates for at least the last twenty years, the fact that the technology was untested and unproven made the project risky to investors, and the uncertainties around social and environmental impacts of deploying those technologies (Weaver et al 2018) led to significant opposition to the project from stakeholders locally and further afield. Doubts were also raised about the project's ability to obtain a 'social license to operate' for the project, among mounting

Net Acid Production Potential (NAPP) in tailings; and quarterly average Net Acid Production Potential (NAPP) in waste dumps. More information can be found here: https://oktedi.com/how-we-work/environmental-sustainability/compliance-monitoring/

[6] Steiner conducted a full review of the EIS in 2009 and recommended that, on the basis of the EIS, the government rejects the mining license application for Solwara 1.

difficulties in identifying 'local communities' and secure their informed consent, and in light of unsuitability of existing regulatory frameworks, developed for terrestrial extraction, to seabed mining activities (Filer and Gabriel 2018). In 2016, opponents of the mine formed an organization called the Alliance of Solwara Warriors. Supported by a number of international civil society organisations, the alliance produced reports drawing attention to risks associated with seabed mining (e.g. Rosenbaum, 2011) and highlighted issues related to the socio-political and regulatory context for seabed mining in PNG (Rosenbaum 2016). The intention was to pressure the PNG government and the developer into recognising those risks and provide a counternarrative to that promoted by the company and the state that described seabed mining as 'a more sustainable alternative to terrestrial mining and a necessary, new 'frontier' for resource extraction' (Childs, 2019: 1, Batker and Schmidt 2015).

Among the many known and unknown unknowns associated with implementation of untested seabed mining technologies, what information was available about the project's possible impacts was veiled by secrecy and characterised by uneven access. In 2017, affected communities supported by the PNG Centre for Environmental Law and Community Rights and the Solwara Warriors alliance, launched a legal bid to gain access to key documentation for the project, which they had been persistently denied, including environmental and social impact assessment data used by the government to grant a mining license for Solwara 1.

Ultimately, following a decade of community resistance, legal and technical challenges and funding difficulties, the Solwara 1 project was collapsed on the 7th October 2019. Unable to raise enough capital for the project, Nautilus filed for bankruptcy protection in a Canadian court. This came shortly after the PNG Prime Minister, James Marape offered his government's support for a ten-year moratorium on future seabed mining developments in the region, proposed by his counterpart in Fiji, Frank Bainimarama. Speaking at the Pacific Islands Forum meeting in Fiji in August 2019 he stopped short of condemning the seabed mining model but said he would support the moratorium 'until that seabed mining technology is environmentally sound and takes care of our environment at the same time we mine it'. Reflecting on the Solwara 1 project in an interview with the Post Courier, one of PNG's two daily newspapers, the Prime Minister stated: 'We don't have the luxury of that informed decisional research because that [seabed mining] technology is not proven anywhere and PNG we burnt almost K300 million in that Nautilus project on a concept that someone told us it can work, but it is a concept that is a total failure as I speak' (Vari, 2019, np).

We address justice dimensions of seabed mining in another case study produced as part of our project: Bainton, N. 2022. The Justice Dimensions of Extracting Energy Transition Metals in the Pacific. Case study 3: Seabed Minerals in Cook Islands. Just Transitions and the Pacific Project: University of St Andrews and University of Queensland.

2.4 Wafi Golpu, Morobe Province

Wafi Golpu is one of two large scale copper projects in Papua New Guinea that have completed feasibility studies and are awaiting mining permits (the second being Frieda River, see below). It is a 50:50 joint venture between Australian-based Newcrest Mining, and Harmony Gold Mining registered in South Africa. If it goes ahead, the mine is expected to produce 150,000 tonnes of copper and 320,000 oz gold per year with an estimated lifespan of 28 years. The proposed underground mine will be located beneath Mt Golpu, 60 kilometres south-west of Lae – the capital city of PNG's Morobe Province. It is located near an open-pit gold and silver operation, the Hidden Valley Mine (owned and operated by Harmony Gold) which began commercial production in 2010.

Mineralisation at Wafi Golpu was first discovered in 1977 by CRA Exploration Pty Ltd – and what was then known as Mt Wanion Exploration License (EL440) was granted three years later. Despite over forty years of exploration, the project is yet to progress to construction and operations. On 25 August 2016 the Wafi–Golpu Joint Venture submitted a Special Mining Lease application to the Papua New Guinea Mineral Resources Authority. Environmental approval for the Golpu Development was sought under the PNG Environment Protection (Prescribed Activities) Regulation 2002. The feasibility study was subsequently updated in December 2017 and submitted to the Conservation and Environment Protection Authority (CEPA) in March 2018.

In June 2018, the joint venture partners formally submitted the EIS for the project to CEPA. This is part of a new mine approval process, set out under PNG Environment Act 2000 (see below). Once submitted by the project developer, the EIS is considered by the Minister for the Environment, before being passed on for approval to the Minister for Mining. In January 2021 the joint venture partners enthusiastically welcomed CEPA's granting of an Environment Permit for the project stating that it 'looked forward to progressing the permitting of the project as soon as practicable under the Mining Act 1992' (WGJV 2021).

But their celebrations were short lived. The permit was later stayed by the Deputy Chief Justice Ambeng Kandakasi who cited 'possible breaches of the relevant provisions of the Environment Act 2002' (The National, 12.09.2021). At the heart of the controversy and numerous protests from local communities is the proposed Deep Sea Tailings Placement (DSTP) system, which would dispose a predicted 360 million tonnes of tailings over a period of 28 years into the Huon Gulf. The company publicly defended this method of tailings disposal as the best option for the project and insisted that it is not predicted to affect people's livelihoods. Communities, and provincial government representatives challenge this assessment, as well as the way in which the company conducted a series of consultation processes related to DSTP.

Photo 1.1 Stakeholder meeting at the Venembeli community, Wafi Golpu (photo by the author)

Other challenges that have stalled development of the project relate to identification and registration of landowners at the mine site – a highly political process commonly associated with resulting in new forms if inclusion and exclusion, particularly as these apply to access to benefits from the project. In 1981, the Local Land Court recognised Babuaf communities as rightful landowners in the project area – a decision that triggered a dispute between three main landowning groups in the area – Babuaf, Yanta and Hengabu – over land ownership that shifted recognition and framed landowning policies over the years and is still ongoing. The project has also seen contestations of community leadership and representation. These became particularly apparent when different groups in the project area sought to register as Integrated Landowning Groups – a group of customary landowners legally given recognition under the Land Group Incorporation Act 1974 (amended in 2009). Originally designed to help people decide affairs on their customary land, and promote cash-earning opportunities, it has more recently become a highly politicised mechanism for accessing and distributing incomes from resource extraction projects (Weiner 2013).

In 2018, a breakdown in stakeholder relations driven by disputes over land ownership and representation led to a court injunction and suspension of the so-called Development Forum (see below). Completion of the Forum is a legally sanctioned requirement for issuing a mining license. It is convened by the Minister for Mining to consider views of the different stakeholder groups in a proposed mining development – including national and provincial governments, and the landowners of the area subject to mining application. The Forum, held in July 2018, was suspended when the Hengambu Landowners Association, Yanta Development Association and Babuaf Landowners Association challenged the legitimacy of newly formed Wafi-Golpu Area Landowners Association and its demands for inclusion in benefits sharing agreements.

In December 2021, Prime Minister James Marape publicly expressed his approval for re-convening the development forum. As of February 2022, the forum was yet to take place and the Joint Venture partners are still waiting to receive an environmental permit.

2.5 Frieda River, Sandaun Province

Like Wafi Golpu, the Frieda River project is currently in the permitting phase of its mineral project life cycle. Located near the border between East Sepik and Sandaun provinces, some 70 km south of the Sepik River, in an area characterised by high rainfall and high seismicity, and rich flora and fauna. Once operational, it is expected to produce an estimated 175,000 tonnes of copper per year, as well as a substantial amount of gold.

Mineral prospects were first identified at Frieda River during a regional mapping exercise in 1966. In 1969 a Prospecting Authority (today known as Exploration License 58) was granted to an Australian mining company, Mount Isa Mines Ltd, and its subsidiary, Carpentaria Exploration Company, allowing for exploration work at Frieda to begin. Exploration has been ongoing since, but noticeably intensified in 1996 when, in the middle of the global resource high, Highlands Gold Properties Pty Ltd completed the first full feasibility study for the Frieda River Project. That study cast great doubt on the economic viability of the venture, placing it among a special cohort of projects worldwide known colloquially as ‘stranded assets’.

Photo 1.2 Entrance to the company exploration camp, Frieda River (photo by the author)

The second full feasibility study was completed in 2013 by Xstrata Frieda River, a subsidiary of Xstrata Copper, which at the time was the fourth largest copper producer in the world. Xstrata withdrew from the project a short time later. The Frieda River Project is now wholly owned by Brisbane-based PanAust who describe Frieda River as 'a core component of a transformative nation-building opportunity' – which the company has dubbed 'the Sepik Development Project' (PanAust 2018). The Sepik Development Project includes, alongside an open pit mine at Frieda River (the Frieda River Copper-Gold Project), the Sepik Power Grid Project, the Sepik Infrastructure Project, and the Frieda River Hydroelectric Project – an integrated storage facility designed to hold anticipated 1,500 megatons of tailings produced over the anticipated 33 years' mine lifespan, behind a 190m embankment.

Unlike conventional hydroelectric power dams, the requirement to maintain a permanent water cover over the reactive tailings and waste rock precludes the reservoir being drained. The embankment is expected to exist in perpetuity and will require monitoring and maintenance over the long term – raising concerns about who will cover the cost and provide the ongoing maintenance once the company closes the mine and leaves the area. Should the dam ever collapse, Frieda as well as the Sepik River area will face catastrophic environmental contamination.

Six communities closest to the proposed mine site are recognised landowners in the proposed Special Mining Lease and Lease for Mining Purposes area. These communities stand to gain access to civic infrastructure and basic services and royalty payments from the project (Skrzypek 2020). They are mostly supportive of the mine hoping that it will give them access to the development opportunities which the state is consistently failing to provide (Skrzypek 2021)

The project is located in the tributary of the Sepik River which runs through northern PNG. A globally significant ecosystem, the Sepik is over 1,100 long and home to around 300 language groups. Some 430,000 people depend on the river for a living. When the new project design was unveiled, it was met with strong opposition from the Sepik communities who are at risk of severe environmental impacts should the dam collapse but are largely removed from agreement making and the benefit streams of the project. The EIS for the project, submitted by the company in 2018, received crushing responses from a range of experts who questioned both the EIS as a methodology and an assessment tool, as well as its findings. Ten UN Special Rapporteurs wrote to the PNG government to consider the risks posed by the project. The PNG government did not respond.

Since 2019, an alliance of local and international NGOs has actively protested the development, under the 'Save the Sepik' campaign, claiming that the project in its current design poses risks to human and environmental rights across the Sepik plain. The PNG government is yet to announce whether it will accept the EIS and issue an environmental permit for the project.

3. Justice dimensions of extracting copper in Papua New Guinea

At the beginning of this case study, we introduced Heffron's (2020) JUST framework examining the role of justice in developing critical minerals. In this section, we use this lens to examine justice dimensions of extracting copper in PNG. As copper tends to be extracted along with other metals and minerals (as either primary or non-primary commodity), and mining legislation applies to the sector as a whole, some observations provided below have a wider extractive focus.

Where possible, however, the material refers to copper and copper projects outlined in section 2. Examples of impacts and activities presented under each of the three categories representing key forms of justice identified in the JUST framework are provided to illustrate the kinds of specific issues and considerations where injustices can arise in the context of copper mining in PNG.

3.1 Procedural justice

Refers to fairness of processes used by those in positions of authority to reach specific outcomes or decisions. Principal procedural considerations concern the regulatory regime and structures, and the processes for consultation and consent.

PNG has long faced concerns about the state's ability to govern its natural resource wealth for the benefit of its citizens at and beyond mining localities. The government's enthusiasm for resource-led development notwithstanding, PNG is a challenging operating environment for mining companies which often find themselves caught up between the 'powerful local' and the 'weak state' (Gilberthorpe and Banks 2012).

There are two key provisions in PNG legislation that define the relationship between the state and communities in the context of mining. First, over 97% of the total land area in PNG is 'customary land' – owned by the country's indigenous population under customary title (Trebilcock 1983). Second, 'all minerals existing on, in or below the surface of any land in PNG … are the property of the State' – as declared in the Mining Act 1992. The Act further stipulates that 'all land in the State … is available for exploration and mining and the grant of tenements over it.'

In public discourse and academic debates alike, PNG is regularly described in terms of a 'failed' state and victim of the 'resource curse' – the latter often linked to a range of procedural issues such as underperformance of state institutions, government's inability to distribute benefits from exploitation of its natural resources to its people, the state's preoccupation with distant opportunities over locally defined social and economic goals and disconnect between decision makers and society. The Constitution (1975) calls for 'wise use to be made of [the country's] natural resources', advocates for conservation and replenishment of the environment, and adequate protection for flora and fauna.

These statements contrast sharply with the country's mining legislation that actively promotes extraction of non-renewable resources, and a resource governance regime that is neither resourced nor capable enough of upholding the terms of legislation to their full extent.

The main regulatory instrument governing all exploration and mining on the country's territory is the Mining Act (1992). The Act is administered by the Mineral Resources Authority (MRA) which acts on behalf of the government to enforce regulation, provide support to prospective and existing operators of extractive projects in PNG, advise the government on matters related to resource exploitation in PNG, and issue and manage mining licenses.[7] The MRA is also responsible for collecting mining fees. This means that whilst financially autonomous from the PNG government – the majority of its income comes from issuance of exploration and mining leases and collecting license and permit payments.

The second key piece of legislation governing the mining industry is Environment Act 2000. The Act regulates the impact of the industry on the physical environment and sets out requirements for obtaining environmental permits for mining activities. The act is administered by the Conservation and Environmental Protection Authority (CEPA), which also oversees the EIS process for major projects, such as the ones described above. Like the MRA which replaced the Department for Mining, CEPA was previously a government Department of Environment and Conservation. CEPA functions on a model similar to the MRA, and generates operating funds through environmental fees and user charges. However, in practice both MRA and CEPA have struggled to achieve autonomy from the political process or competency as bureaucracies, and questions about the funding model based on issuing leases, licenses and permits persist.

[7] MRA is also responsible for administering the Mining (Ok Tedi Continuation Agreement Act) 2001 and the Mining (Safety) Act (1977, revised in 2007), which includes regulatory provisions regarding safety of mining infrastructure and mining operations around the country. All acts can be accessed from the Pacific Islands Legal Information Institute at: http://www.paclii.org/pg/indices/legis/

One of the key responsibilities of CEPA is issuing environmental permits for proposed mining projects (or expansion of existing projects). Under the Environment Act 2000 the environment permit is subject to a comprehensive environmental impact assessment. The assessment is submitted to CEPA in the form of an EIS which is reviewed by the authority and presented for a period of public consultation. An environment permit must be granted before a mining license can be obtained. The EIS tends to be a voluminous document, containing thousands of pages of highly technical information concerning anticipated environmental impacts and proposed mitigation measures. The Wafi Golpu EIS was 6800 pages long, and the Frieda River EIS had 7000 pages. In line with legislation, the documents were made available for a period of public consultation. Whilst the process made the documents available for review, their content proved inaccessible to majority of interested parties.

At Frieda River, the Save the Sepik campaign engaged eleven overseas academic experts to review and summarise sections of the EIS to allow community members to engage with its content. The reviews raised serious concerns about environmental risks associated with the project and shortcomings of the EIS process itself[8] – findings mirrored in a review conducted by governments of both host provinces who voted to reject the EIS.[9] Assisted by an alliance of international lawyers, academics and campaigners, Save the Sepik submitted written responses to CEPA in 2019. While the EIS cost upwards of AUD 10 million to produce, the communities relied on good will of pro-bono experts without whom they would not have been able to take part in a process. In their view, this demonstrated structural inequalities embedded in PNG resource governance frameworks that advantage the developer and the government and limit communities' access to meaningful participation (Save the Sepik campaign, personal communication 2021).

Responses provided during the public consultation were not made publicly available, and there is no information in the public domain about the progress of the permit application, highlighting further issues with fairness and transparency of the impact assessment and environmental permitting process.

Another example of a procedural consideration critical in the context of resource extraction concerns consultation and consent process – who is consulted and in what ways? How is consent defined? One of the main consultation mechanisms in PNG is the Development Forum. It was first established in 1988 to facilitate discussions between the local, provincial, and national governments and landowning communities at Porgera mine and was initially envisaged as a mechanism for securing endorsement for the project and agreeing upon the division of benefits. In practice, it emerged as a tool for negotiating benefits sharing agreements which are not part of the contract between the state and developer (Filer 2008) – such as those related to distribution of royalties.

The Forum is legislated under the Mining Act 1992 which requires the Minister for Mining to convene the Forum prior to issuing a mining license 'to consider the views of those persons whom the Minister believes will be affected' by the proposed development. The mining company is allowed to be present in those negotiations, 'but the benefits are understood to be those that the National Government secures in its capacity as the nominal owner of the mineral resource' (Filer and Gabriel 2018:396).

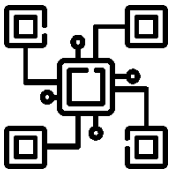
To be included in the Development Forum, communities must be recognised as 'landowners' in the project area – a legal category based on a premise that there exists in PNG an indigenous system of land ownership that can be written down by common law, turning a fluid history of indigenous land tenure into a system of discrete land units for which legal owners can be found (see Skrzypek, 2020 and Jorgensen 2007). In practice, the process of identifying and registering landowners is a difficult and contentious task, and the ability of communities (or, in some cases, competing factions within communities) to secure recognition as landowners has as much to do with their ancestral claims to land as with their ability to articulate their claims under the common law system.

[8] See Roche et al. (2021) for their analysis of failures of the EIS process at Wafi Golpu.
[9] As the decision on whether or not to grant the environmental permit lies solely with CEPA, these votes carried no legal power. Reports submitted to CEPA by both provincial government were considered as part of the open review process.

Even once established, claims to land ownership can be challenged in court by another group where access to resources such as good lawyers can be critical in deciding the outcome. The Development Forum must be recognised for providing a valuable platform for negotiations and agreement making between the three levels of government and landowning communities. A caution should also be exercised, however, around the possibility of it standing the way of broader participation in the process of managing benefits from extraction of highly contested resources (Filer 2008). Both those arguments played out during Development Forum for Wafi Golpu which had to be suspended after a new group demanded inclusion in the conversations claiming to represent the project's stakeholders thus far excluded from benefits sharing negotiations, and the established groups challenged its credentials.[10]

A successfully completed forum results in Memoranda of Agreements (MOAs) that set out distribution of benefits such as royalties and Infrastructure Development Grants (Togolo 2016). Those MOAs constitute an integral part of a new mine development project and serve an important procedural purpose. But bemefot sharing and compensation agreements considered fair at one point may be challenged as new impacts become known, and new claims to benefits emerge. At Panguna, the mismatch between levels of compensation negotiated at early stages of project development, and severity of impacts that unfolded over time, was one of the contributing factors in tensions that eventually morphed into a full-blown civil conflict.

In light of dramatic changes mineral projects go through as they move through their life cycles, Filer (2008:146) is therefore right to caution that 'no agreement made as part of the development approval process can be treated as a substitute for the transparent and effective management of benefit streams that begin to flow at the end of the project construction phase'.



3.2 Distributive justice

Recognises that the economic, political, and social frameworks that each society has result in different distributions of benefits and burdens across members of the society. Distributive justice dimensions largely concern the spread of costs and benefits of extracting copper.

On the most basic level, distribution of copper *deposits* is pre-determined by the Earth's geology and is inherently uneven across the globe (see Figure 1.6). Distribution of copper *mining projects*, however, is influenced by a range of other factors – such as accessibility of the deposits, technical feasibility, availability of relevant knowledge and expertise, economic viability and, increasingly, ESG risks. These factors are further influenced by global trends in demand for copper, and its price on the global markets.

The question of scale is of importance here. Considering the need for a transition to low carbon energy systems, and the role of energy transition metals in enabling this transition, the arguments for extraction of copper for global benefit are clear. However, there are also significant social and environmental costs to supplying those metals. These costs unfold on more localised scales and are predominantly borne by regions and communities hosting extractive activities. These costs are also more likely to be absent from debates about the role of renewable energy technologies in addressing the challenge of anthropogenic climate change than the clear and important benefits of those technologies – which are often described as 'green' and 'clean' by their producers and users.

In PNG, in the years following independence, the withdrawal of the colonial administration left voids in the provision of services and in the maintenance and development of infrastructure which the newly formed

[10] The 'Sustainable Development Policy and Sustainability Planning Framework for the Mining Sector in Papua New Guinea: Green Paper' (PNG Department of Mining, 2003) also highlighted the disconnect between the EIS and the Development Forum as a procedural weakness that needed to be addressed.

government found difficult to fill. By the 1990s, despite disastrous impacts of Panguna and Ok Tedi, a large majority of Papua New Guineans seemed to 'subscribe to the belief that their land does contain some valuable resources – whether gold, oil, diamonds, or the truly visible logs – and that their only chance of development lies in their share of the rent to be collected from the extraction of these resources by some multinational company' (Filer 1997: 113). This view was heavily influenced by the government's ongoing struggle to deliver development to many areas of the country amidst growing disparities in access to services between its urban and rural populations. It also drew divisions between people whose land did contain known natural resources, and those whose land did not. These differences are reflected a pattern of 'enclave development', where large benefits are available to a small proportion of people, to exclusion of others. In parallel debates, the government has been accused of agreeing to a risky and contentious trade-off – accepting negative social and environmental impacts in exchange for economic gains from resource extraction (Jell-Bahlsen and Jell 2012).

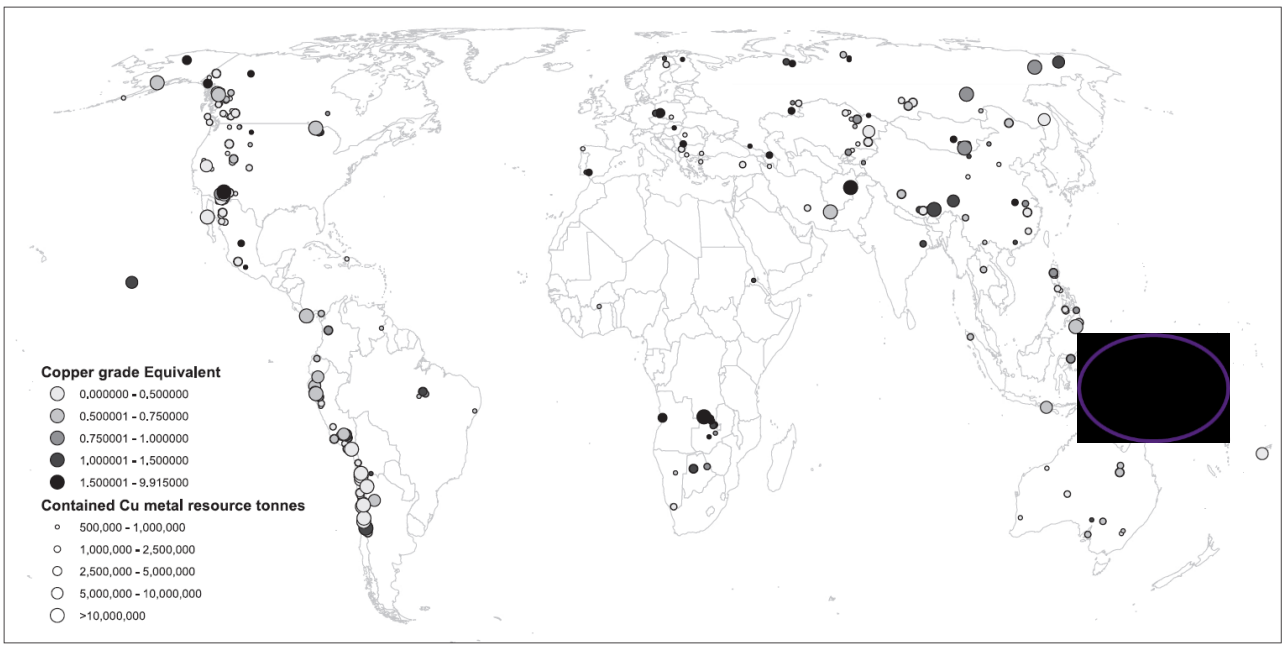


Figure 1.4 Global copper orebody location and size (source: Valenta et al 2018:820)

All mining projects operating in PNG are meant to pay corporate tax (a proportion of their income), group tax (withheld from employees' salaries) and foreign contractor withholding tax which puts additional tax on non-residents performing contracted roles within PNG, among others (e.g. import and goods and services taxes). These are collected by the Internal Revenue Commission and transferred into the National Budget. In 2019, the estimated production value of the PNG's mining sector was 14,243 million Kina and accounted for 40.1% of total exports and 17.2% of GDP (PNG EITI 2021). In theory at least, consolidating these benefits in the national coffers provides a mechanism for redistributing mining benefits across the country for wider benefit of all citizens – mitigating the risk of 'enclave development'. The extent to which this aim has been achieved in PNG is a subject of an ongoing debate. Despite abundance of natural resources, over a third of PNG citizens continue to live below the poverty line (ibid.). Many development needs – including universal provision of basic services and civic infrastructure – remain unfulfilled, and trust in government's capacity to effectively manage resource rents is limited.

In addition to the tax revenue, the government – as the owner of the resource – collects royalty payments from the developer, equivalent to 2% of the gross value of mining production. Legally, the government may decide to retain the royalty – or to share it with provincial government of the province hosting the project, and

the landowners. In those cases, the landowners are entitled to at least 20% of the royalties paid to the state – the exact amount being negotiated at the Development Forum.

However, their access to royalties depends to a large extent on their success in asserting their status as 'landowners' in the project area (see 3.1, above). Landowner identification exercises conducted at mining projects around the country have led to new forms of inclusion and exclusion – which directly translated to unequal access to benefits between groups that often live in close proximity and share a range of pre-existing ties and histories.

In PNG, the benefits sharing system is based on the premise that communities in the greatest proximity to the project bear the highest costs and are therefore entitled to greatest benefits – which is often true. There is plenty of evidence of the burden borne by communities living closest to the mining operations – such as loss of access to customary lands, loss of livelihoods, reduced security, damage to immediate environment, and high levels of in-migration that can result in social disintegration. However, as the example of the communities living downstream from the Ok Tedi mine has demonstrated, the costs associated with the project can traverse large distances – and communities can find themselves faced with significant social and environmental costs whilst far removed from main benefit sharing streams (what OTML was forced to redress through the successive CMCAs, for example).

Similar issues are already unfolding at Frieda River. If and when the project begins operations, the six recognised landowning communities in the project area stand to receive substantial payouts and benefits. Significant impacts on their lives, livelihoods and environment notwithstanding, some of these groups will be able to move to ancestral hunting grounds at higher altitudes. This option is not available to communities living on the Sepik plain who face potentially catastrophic impacts should the tailings dam at Frieda River ever collapse – but due to their residence further away from the Special Mining Lease area their access to benefit streams is limited.

The above is a manifestation of the PNG government's 'preferred area policy' that 'effectively creates a set of concentric rings or 'zones of entitlement' around each major mining project' (Bainton and Jackson 2020:368). The inner circle is occupied by customary landowners in the lease area and characterised by access to the greatest range of benefits. This is followed by people who reside in the wider project area (most often the district hosting the mine, followed by the province), with the government and nation as a whole occupying the largest circle. The range of benefits is the greatest in the inner circle – and decreases moving outwards. A good example here is access to highly sought employment opportunities that can provide, alongside income, significant training opportunities (a large contributing factor to the early success of Panguna). Most projects have 'preferred area hiring policies', whereby the residents of the inner circle are given first preference for employment opportunities, particularly in the unskilled or low-skilled categories, before moving on to the middle and outer circles. There are other factors that impact access to employment opportunities, such as pre-existing levels of education, physical ability (or disability), and gender. This means that pre-existing inequalities are often exacerbated. Whilst the mining sector is one of the major employers in the country, its workforce is predominantly male. For example, in 2019 the OTML had 1,753 employees (1,661 of whom were Papua New Guinean). Only 190 (181 PNG nationals) were women. In recent years, recognition of the gendered inequalities in distribution of costs and benefits at mining projects has led to emergence of several programs and organisations with a mandate to strengthen women's access to benefits sharing agreements and practices (e.g. Pacific Women's Women in Mining Project).

The provision of these benefits and opportunities is strongly influenced by the state. In PNG, the relationship between the state and many rural communities is weak. In those places, the state is likely to exercise an 'absent presence' – where the presence is experienced most strongly through its absence (Bainton and Skrzypek 2021). This may occur, for example, where the state fails to fulfill its role as either a regulator or a service provider. When the state exercises an absent presence in mineral extraction locations, community members may and often do turn to the developers to step in and fulfill what would traditionally be considered

as the responsibility of the state (ibid.). This occurs, for example, through the provision of education and health services, income generating opportunities, or civic infrastructure (Bainton and Macintyre 2021). In most cases, the government welcomes this substitution as the unequal distribution of financial, logistical and technical capacity means that it also relies on mining companies for development assistance. Local level governments are particularly vulnerable in this regard, through inequalities in distribution of funds and capacity between national, provincial and local level governments (either through inadequate or mismanaged distributive procedures). Since the 1970s, the mining industry has provided a significant amount of direct development assistance in PNG. This has raised concerns about the long-term impacts of the state's withdrawal from some of its service delivery functions, and how reliance upon the industry for basic needs effects the ability of communities to offer their free consent for a project.

When considering distributive justice dimensions associated with copper mining in PNG, time is a central factor. The impacts of resource extraction – both positive and negative – evolve over time and can affect people differently at different stages of mine development. They can also take different forms and manifest differently depending on historical context and pre-existing vulnerabilities – not all of which can be known and included in future modelling scenarios. Any consideration of time in the context of justice and access to mining benefits forces the question of intergenerational equity. The PNG Constitution (1975) calls for the country's natural resources and environment 'to be conserved and used for the collective benefit of [all citizens] and be replenished for the benefit of future generations'. Whilst we have documented the practical and political challenges to this lofty goal, the non-renewable nature of copper also means that once extracted minerals cannot be replenished. Even when projects include provisions for ensuring that future generations can access the benefits of mining their ancestral lands (e.g. trust funds and future funds), these arrangements are unlikely to counter the complex legacies and burdens of these projects that are likely to persist well beyond mine closure.

3.3 Restorative justice

Emphasises how parties 'collectively resolve how to deal with the aftermath of the offence and its implications for the future' (Marshall 1999:5). Restorative justice dimensions concern the remedy for past, current and future injustices related to copper extraction.

Large scale mining operations produce volatile and long-lasting effects on environments within which they operate. Possibly the most obvious restorative justice issue associated with copper mining in PNG is how to remedy for environmental impacts of mining operations – acknowledging that in places such as PNG environmental and social impacts cannot be easily separated (King 1997).

The Mining Act 1992 contains no provisions for mine closure and rehabilitation – although some limited provisions exist under the Environment Act 2000 that require that all mining projects to have a closure and decommissioning plan, and to activate it within five years of anticipated closure. The Mining Act is currently under review and the revisions are expected to include inclusion of a Mining Rehabilitation and Closure Policy.[11]

To date, the country has very limited experience with managing a planned mine closure as many of its mining projects closed down, or were forced to close down, without enforcing closure procedures, resulting in what Carr and Filer (2012:3) described as 'a reasonably "ad hoc" approach to closure'.

The Panguna mine represents a case in point. The mine was shut down in dramatic circumstances, amid a civil conflict that forced Bougainville Copper Limited (BLC), a subsidiary of Rio Tinto, to end operations in 1989. The mine operated for 27 years and left behind a legacy of severe environmental and social devastation (HRLC 2020b). In 2016, 17 years after the mine shut down its operations, and without

[11] The policy was included in the published (but not enacted) draft of the Mining Act 2016.

implementing measures for rehabilitation, Rio Tinto divested its share in Panguna. The company described this divestment in terms of a 'gift of shares' distributed equally between the Autonomous Region of Bougainville (ABG) and PNG – a decision that stirred the long-standing tensions between the two governments. In a follow-up press statement, Rio Tinto declared that when it evacuated the site in 1989 'BCL was fully compliant with all regulatory requirements and applicable standards at the time' – absolving themselves from responsibility for long term effects of the mine (Rio Tinto 2016b). In a deeply emotive statement to the House of Representatives, the ABG President, Dr John Momis called this decision 'deeply evil and unjust'– a feeling shared by many Bougainvilleans – and called for 'the strongest possible international campaign to apply all necessary pressure on Rio Tinto to accept its mine legacy issues' (Momis 2016).

In September 2020, the Human Rights Law Centre (HRLC), acting on behalf of 156 landowners representing some 12-14,000 people living downstream from the Panguna mine, filed a complaint against Rio Tinto to the Australian Contact Point (AusNCP) for the OECD Guidelines for Multinational Enterprises. The complaint provided a detailed account of environmental issues and human rights violations brought about by the mine under Rio Tinto's management and called on the AusNCP to try to facilitate resolution of those issues (HRLC 2020a). AusNCP accepted the complaint in November 2020. In response, Rio Tinto released a public statement committing to entering into discussions with the affected landowners and other stakeholders, followed by another statement in July 2021 that announced that 'Rio Tinto and Bougainville community members … have reached an agreement to identify and assess legacy impacts of the former Panguna copper mine' (Rio Tinto 2021).[12] The assessment will be funded predominantly by Rio Tinto and in a shared statement both parties expressed a hope that it will 'lay the foundation for long-term solutions' (HRLC and Rio Tinto 2021).

Although possibly most prominent in the context of mine closure and rehabilitation, as in the case above, restorative justice issues can emerge at any stage of the mineral project life cycle. Legislation makes provisions for compensation agreements that acknowledges that damage or disruption to land occurs during a mining process and needs to be compensated – from when they first appear in the early stages of mineral exploration. Compensation rates are set out in legally binding compensation agreements, co-signed by the company and affected group(s), and approved by the government.

Compensation can also be used on case-specific basis to compensate a person or community for a particular grievance (particularly where the grievance becomes a risk to the project operations), or to remedy harm where restoration is no longer possible.

At the Ok Tedi mine, the Community Mining Continuation Agreements (CMCAs) offered communities enhanced compensation payments and access to additional benefits– in exchange for them not pursuing legal action against the mine – de facto allowing the mine to continue operating despite its international reputation as an environmental disaster (Filer and Jenkins 2017). By then, the extent of environmental damage was significant – and irreversible. When in 1999 OTML proposed to the government four possible courses of action for dealing with the issue of managing mining waste, none of the four put a halt to the environmental damage caused by the previous discharge of tailings into the river system. And while a World Bank review of the four options concluded that closure would be best from the standpoint of the environment, it warned that 'from a social standpoint this would result in a potentially disastrous situation because there is no preparedness form mine closure' (World Bank 2000:8 in Filer and Jenkins 2017). By that point, local economic systems were dependent on the mine, and OTML was a critical provider of key services (e.g. hospitals, schools, roads, utilities) in the district (Carr and Filer 2012).

[12] A full AusNPC Update and Parties' Joint Statement can be accessed here: https://ausncp.gov.au/sites/default/files/2021-07/210721_update_statement_AusNCP.pdf https://ausncp.gov.au/sites/default/files/2021-07/RIOTinto-HRLC_joint_statement_2021.pdf

The CMCAs emerged from a consultation process that followed. As the extent of the environmental damage meant that environmental restoration was not an option, financial pay outs and development support were used to compensate communities for past, current, and future impacts associated with mine continuation.

When it began its operations in 1984, the Ok Tedi Mine had no plan for closure and rehabilitation – a fact cited by the World Bank as one of the reasons for keeping the mine open. The Ninth Supplemental Agreement (2001) contained provisions for a mine closure plan and set up a 'financial assurance fund' to pay for the plan's implementation. In 2017, OTML assessed that the fund should contain minimum of USD 200 million to meet its obligations. Currently, the mine is set to cease operations in 2025.

As the above examples show, the question of mining legacies is inherently a question about distribution of costs and responsibility. It is also a question of procedural injustice that allowed both mines' to function without adequate impact assessments and safeguards for mitigating social and environmental effects of their operations.[13] And it is an exercise in restorative justice. How do we account for and remedy past, present and future injustices related to copper extraction? How do we legislate for remediation? What restoration pathways are available to affected individuals, communities and regions? Who should bear the cost? Who does the liability for restoration lie with – and where does it end?

As the global demand for copper grows, driven by rapid expansion of renewable energy technologies, these questions will gain in salience and urgency.

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[13] When Panguna was going through the permitting process, an EIS was not a required part of the process.

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