

# Artisanal and Small Scale Mining in Bougainville: Risk, Reward and Regulation



Australian  
National  
University

CIARAN O'FAIRCHEALLAIGH AND ANTHONY REGAN  
WITH SIMON KENEMA

SSGM DISCUSSION PAPER 2017/4

## Introduction and Background

This paper provides a high-level but comprehensive review of the status, as of mid-2016,<sup>1</sup> of the artisanal and small-scale (ASM, or sometimes AASM) industry in post-conflict Bougainville, drawing on extensive fieldwork conducted during 2014–16.<sup>2</sup> It focuses on the location of ASM activity and the modes and methods of production being used, the identity of miners, and the nature of their participation in ASM. It outlines preliminary findings regarding the way in which access is gained to land used in ASM. It then considers key issues raised by ASM under three broad headings: the economic *rewards* it generates; the environmental, social, cultural and safety *risks* associated with ASM; and informal and formal efforts at *regulation* of ASM activity.

Despite the less than 20-year history of ASM in Bougainville, its experience is highly relevant to a number of issues that arise, and in some cases receive inadequate attention, in the international ASM literature. These include the critical matter of how small scale miners gain access to land and minerals, and the economic, social and cultural implications of the ways in which they do so; and how local knowledge and governance capacity can be mobilised to help regulate a form of mining that is highly dynamic and typically occurs in remote areas far from administrative centres.

The Autonomous Region of Bougainville (ARB) is a politically autonomous region of Papua New Guinea (PNG) which emerged as part of the 2001 Bougainville Peace Agreement which ended 12 years of conflict following the closure of the Panguna copper mine in 1989, operated by Bougainville Copper Ltd (BCL), a subsidiary of Rio Tinto. The ARB and the Autonomous Bougainville Government (ABG) were established in mid-2005, under complex constitutional arrangements giving

effect to the Peace Agreement and making available to the ABG considerably wider powers than are vested in provincial governments elsewhere in PNG. In 1997–98, faced with the absence of income-earning opportunities caused by the Bougainville conflict, people started to engage in ASM. It began at the abandoned Panguna Mine Concentrator, Kupei and Karato, expanding to BCL's tailings disposal area in 2001. As news spread about gold's potential value as an income source, and as knowledge of ASM methods was obtained from miners from Panguna and the tailings area, ASM spread to Kanavitu, Atamo and Kopani, and then into other areas, mainly in central Bougainville. Its spread was accelerated in the mid-2000s when the pest cocoa pod borer devastated many recently re-established cocoa blocks, forcing cocoa farmers to find an alternative source of income. As we shall see, ASM now occurs at dozens of sites, provides a livelihood, or supplementary incomes, for thousands of Bougainvilleans, and constitutes at least the second largest sector of Bougainville's cash economy after cocoa production.

## ASM: Places, Methods, People

### ASM Locations in Bougainville

ASM occurs at more than 50 distinct sites, some in close clusters, and most in central Bougainville, one of three regions of the ARB (south, central and north).<sup>3</sup> As we explain in detail below, the extent of activity at individual sites at specific points in time can vary significantly depending on climatic conditions; exhaustion or discovery of gold-bearing ore; site accessibility; and family, economic, social and cultural factors that influence miners' behaviour.

In south Bougainville, mining occurs at Sinimi and at four sites



in the Torokina area.<sup>4</sup> Sinimi involves an industrial-style operation organised by former Bougainville Revolutionary Army (BRA) commander Damien Koike. In central Bougainville several thousand people are engaged in mining in and around the abandoned Panguna mine and associated facilities, and between Panguna and the west coast, referred to here as the 'tailings area', where processed waste material from the mine was deposited between 1972 and 1989.<sup>5</sup> Washing or mining of gold from materials in old stockpiles, from tailings and from unmined 'hard rock' deposits occurs along the Kwarong River (upper, middle and lower tailings); at the Jaba pump station; at the concentrator, Moroni, Mosinau area, and Panka'a area (all at Panguna); Kupei; and at Pakia Gap and at the Kumo crusher near Morgan Junction, both on the route from the east coast to Panguna. Gold washing also occurs at BCL's former port area at Loloho. Other ASM sites in central Bougainville are Kanavitu (with about eight separate locations); Atamo; Avaipa (or Awaipa), also known as Eivo 2; Tabataba in Kokoda; and Kongara 1 and 2. In north Bougainville ASM occurs at Tinputz.

While some ASM sites, especially those in the Panguna and tailings areas, are relatively easy to access, others are very remote. For example, there are no roads to the sites in the Avaipa and Torokina areas. They are located in rugged terrain, with precipitous mountains, dense forests and fast flowing rivers, accessible only by foot, often taking eight to nine hours to reach from the main access points.

### **Modes of Production and Mining Methods**

A range of different modes and methods of production are employed in Bougainville ASM. These include methods typically defined as artisanal, including panning and sluicing using basic tools (picks, shovels, wheelbarrows, pans and buckets). Homemade sluicing boxes which employ carpets to recover the gold are common, especially in the tailings area and in river bed gravels. Gold-bearing material is often dug out from beneath river banks or cliffs where it has been deposited by river flows, sometimes a risky process. At Panguna, ore is taken from the former mine stockpile at the concentrator and processed at peoples' houses in Dapera, Moroni

and other villages using panning dishes and sluice boxes. In hard rock mining, the primary stage involves 'chipping' gold-bearing ore from rock faces using crowbars and picks, with the ore then being crushed in (usually homemade) crushers made up of pieces of metal sufficiently heavy to reduce the ore to fine sediments. Water from nearby creeks is used for sluicing of the crushed ore, which leaves the gold and heavier particles behind. Metal detectors are used to search for gold nuggets in some areas, while diving is used in certain creeks, where miners locate gold-bearing material below the water and bring it to the surface for processing.

In larger scale operations, usually referred to as 'small scale' as opposed to 'artisanal' mining, water pumps combined with generators are used to clear overburden, direct gravels into sluice boxes and wash the gold-bearing material. In some cases, rough stone walls are constructed to divert creeks or create simple dams to provide a water supply. Small commercial crushers and other equipment are also employed. For example, a new commercially purchased crusher is operating at Kupei. The most 'industrial scale' ASM operation in Bougainville occurs at Sinimi in the isolated and sparsely populated Konnou area of the eastern part of Buin, in south Bougainville. The operation there is controlled by Damien Koike, and employs a unique, semi-mechanised mining method. According to Koike, the method has been adopted from the traditional method used in that area to process sago in large quantities, mainly for feasting ceremonies. After several years of using small scale panning and sluicing to obtain only modest quantities of gold, the Sinimi miners developed a homegrown, cost-effective method of mining to produce gold in much larger quantities.

The machinery used in the process includes a generator-powered water pump, and an excavator and bulldozer occasionally hired from a civil works company based in Arawa. The equipment also involves a large box made out of wood, mesh wire and galvanised roofing material; hoses; and several other sluice boxes positioned and assembled below the main box, all strapped together with nails and vines (bush ropes). The excavator and bulldozer do the chipping, crushing and piling of the ore next to

the main box. The miners then shovel the ore into the box, water is pumped from a small creek and transported to the box via hoses strapped together with old car tubes. The water is sprayed onto the box containing ore, and with shovels and bare hands and using the force of gravity the men push the material downstream to the galvanised roofing iron and finally to the sluice-boxes where gold is trapped in carpets. The carpets are then taken to another box, made out of canvas and banana stalks, and the gold is extracted. The gold amalgams mixed with water are then moved to a conveyor belt using buckets where they are collected ready for separation and purification by employing mercury.

In terms of gold processing, as explained in detail in a later section, mercury is used to recover small gold particles, which attach to the mercury and form an amalgam. This is later 'cooked' over a fire to evaporate the mercury. The gold recovered is then sold directly to buyers, often to be further processed at one of three small gold refineries, one in Buka and two in Arawa.

### The Miners

Field work to date indicates that ASM is conducted almost entirely by Bougainvilleans, though people from elsewhere in PNG and overseas are involved in purchasing gold and supplying specialised inputs for mining. Individual men and women, family groups (father, mother, children), related families and clan groups, church and youth groups, and the unique military-style corporate organisation at Sinimi, are all involved in ASM. The proportion of males and females at mine sites varies considerably, depending on the type and location of ASM sites. Children are frequently involved, but are less likely to work at sites distant from villages and/or where levels of danger are high. Outside Panguna, the tailings area, Torokina and Sinimi, most miners are landowners working on their own land, though it is not unusual for landowners to allow involvement of non-landowners in return for some form of payment (see next section for details). In most cases, the fact that miners are landowners means that they are mining close to their place of residence, but there are exceptions. For instance, it takes approximately three hours to reach the Birepan site, where

mining started in 2014, via a track following the Naniuka River uphill from the closest hamlet, Maro.

In terms of work roles, it is more common for men to undertake heavier or more dangerous tasks such as chipping through the rocks with picks and crowbars, or shovelling and pushing of loads of gravel and sand, while women and children do the washing. However, rotation of work roles between men and women is also observed.

The major point to make in relation to all of the groups engaged in ASM is the dynamic and shifting nature of their involvement, reflecting a variety of factors. Some are environmental, with mining having to cease in river beds either because of excessive water flows due to heavy rain or inadequate flows due to absence of rain. For example, in June/July 2015 continuous heavy rainfall and a cyclone resulted in numerous landslides in some ASM sites in central Bougainville, including Pakia, Moroni, Panguna mine pit, Pirurari, Guava and the upper and middle tailings, forcing some of these sites to close temporarily for safety reasons. Geology also plays a role, with numbers at a site declining as accessible gold-bearing ore is exhausted, while the discovery of a new, rich source of ore results in a spike in mining activity in the area concerned (occurring in the Torokina area early in 2016). Fatal accidents can lead to the closure of sites for an extended period of time. The ASM site at Asimana in the Siuema Village Assembly area, where some 200 people were regularly mining, was closed in late 2015 due to a death caused by a large landslide and was expected to remain closed until March 2016 when a customary feast was planned by grieving relatives to end the period of mourning.

Commercial factors including fluctuations in the gold price and the motivations driving individuals and groups can also affect the level of activity. In the latter regard, some families engage in ASM periodically, especially during school holidays, to accumulate a specific amount of money, for instance to pay school fees. Individuals living in an area which lacks ASM may move elsewhere for a number of months to accumulate funds, for instance to settle court matters, help pay for a feast, build a house or purchase a vehicle. Church and youth groups may engage in ASM to accumulate

funds to travel to a sports event, or to purchase community water tanks or build houses. Some land-owners undertake ASM steadily but on a part-time basis, combining mining with gardening and cash cropping and varying their mining 'effort' depending on the time demands of these other activities.

The complete absence of women and children in mining at Sinimi in south Bougainville is unusual and possibly unique for Bougainville, though it does occur in other parts of Bougainville, including Manus Island. This aspect of the Sinimi situation reflects a number of factors, including the leadership of Damien Koike and his long involvement in militaristic groups, and his adherence to the principles of the strongly secessionist Me'ekamui group. Also relevant is the location of Sinimi in a very isolated place, part of a wider area where localised armed conflict, the 'Konnou conflict', occurred from 2006 to 2011. The non-involvement of women and children at Sinimi may also, in an area where land systems are patrilineal, reflect a dominant belief that heavy industrial labour is inappropriate for women and children and that men should provide for them, and not be regarded as 'les man' or lazy person in the community.

In summary, at any one time there will be a core of 'full-time' miners, especially in the Panguna and tailings areas and in Sinimi. Around this core, however, ASM participation is hugely diverse and variable. Given this reality, it is very difficult to state how many people are engaged in ASM. On the basis of visits to many sites and information provided by knowledgeable informants, we estimate that over a period of 12 months there are likely to be some 8000–10,000 people involved, with as many as 1500 to 2000 working in the tailings area, 300 or more at Sinimi, and about 500 at Kupei. However, this does not mean that if it were possible to count everyone engaged in mining on a single week day it would come close to this total. Depending on the range of factors listed above, this number could be as low as 1500, or as high as 3000 to 4000.

### Access to Land and Gold

The international literature contains little detailed analysis of how ASM miners get access to land, particularly to land held — or regarded as held

— under customary group title (Corbett and O'Faircheallaigh 2015). The Bougainville experience sheds light on the complex issues that can be involved in such situations, issues that can have marked impacts on the way ASM is organised and conducted and its financial returns distributed and, as discussed later in the paper, on the possibilities for its regulation, informal and formal.

Having said that, the issues involved in land and related social systems are highly complex and cannot be fully explored here. A brief discussion of four interconnected issues will illustrate this complexity.

First and most fundamentally, ethnographic evidence shows that across Bougainville human-land relations are intertwined into complex configurations where it can prove difficult to draw distinctions between or to untangle the co-constitution of land and persons (Dove et al. 1974; Kenema 2010; Oliver 1967). This creates a problem if terms such as 'access' and its conceptual cousin 'exclusion' are premised on a dissociative relationship between humans and land, that treats land and persons as distinct entities or domains. This is especially so in relation to land or activities undertaken on it. In such a formulation, land is seen as a separate domain, object or commodity that needs to be 'accessed', in this case to recover gold. It becomes an entity from which particular people can be seen as 'socially excluded', if the economic and political arrangements emanating from its use are discriminatory, for whatever reason. The danger is that the use of 'access' and 'exclusion' as analytical frames sets up a division between land and humans which is not at all obvious in the vernacular registers through which that relationship is conceptualised and articulated in Bougainville. This does not of course deny the existence of monetised transaction of land between specific parties, or that such transactions may favour some people and marginalise others.

The second issue involves the fact that land across many Bougainvillean societies is not merely viewed as the physical surface and subsurface soil. Rather, it only makes sense to talk about land by also including the stories, histories, myths and legends that anchor individual communities to land. Indeed, it is not far-fetched to suggest that the physicality of the land is far less important than the

societal narratives that constitute and define land for certain groups. This has significant implications for the ways in which land boundaries and ownership issues are contested and negotiated. Because land stories change over time and across generations this feature renders landholding inherently fluid and a matter of intense political activity.

The third and related issue involves matrilineal inheritance, widely identified as a distinctive feature of landownership systems in much of Bougainville. Matrilineal inheritance in and of itself conceals a range of complexities and is far from providing a simple explanatory model for the organisation of land tenure. Stories about land are distributed across both men and women in matrilineal societies, and in many cases the land stories under senior men's custody bear more force and weight when land disputes arise, and in their settlement. Thus the distribution of land stories across both sexes problematises the simple model of matrilineal inheritance.

The final issue relates to the minerals for the extraction of which access to land is sought. It involves the fact that the history of mining in Bougainville is deeply intertwined with local cosmological beliefs. This is no different in relation to ASM. People's understanding of geology is nested in various configurations of origin and mythical stories of powerful spirit beings or animals. This problematises simple and straightforward notions of resource ownership. It also indicates that despite the social transformation brought about by modernity, many people's understanding of economic wealth production is informed through a cultural lens that views wealth production as a matter of ritual and magic (for a detailed discussion of these themes in another Papua New Guinea context, see Biersack 1999).

Against this background, the following brief discussion of land access seeks only to sketch in broad outline a number of current access arrangements. Developing a deeper understanding of these arrangements, and of their economic, cultural and social implications, is a major focus of our ongoing research.

In many parts of Bougainville, landowners determine who is to mine and whether or not to give permission to non-clan member miners to do so, and they also control arrangements for buying

and selling gold. The extent to which this control is exercised by women as a result of their role in matrilineal land systems, or by men as a reflection of their tendency to dominate many aspects of public life in Bougainville, is as yet unclear, and may vary. But in several ASM sites in the Eivo area of central Bougainville where we have conducted interviews, senior women members of the clan group involved claimed to have central authority in deciding access to the ASM areas. In many cases, ASM is undertaken by the landowners themselves, and members of 'landowning' clan-groups make their own arrangements in relation to organisation of ASM and sharing of the benefits it generates, if this occurs. The available evidence indicates that mining on land regarded as belonging to the clan-group of which a person is a member does not usually require permission from other clan-group members, though it may require authorisation from the senior clan leader, who may often be a woman. There is usually no agreement in such cases to share ASM revenue with other clan-group members, given that most mining work is based on the hard labour of individuals or small groups. Larger numbers of clan-group members may participate in ASM when communal needs arise, such as feasting ceremonies.

Landowners also enter arrangements, almost always verbal, for others to conduct ASM on their land. In some cases they will permit people with whom they have family links, including through marriage, or complex historic clan or family connections (often derived from clan migration stories) to engage in ASM, as part of broader, reciprocal economic and social relations. In other cases landowners, particularly in the Panguna and tailings areas, may pay individuals or groups, for instance church or youth groups, to extract and process gold-bearing ore on their behalf. Alternatively, landowners will permit miners to access their land in return for a specific number of grams of gold, or on condition that the miners sell all the gold they win to the landowners.

The situation is different in the Panguna and tailings areas. Here there appears to be acceptance by most landowners that all Bougainvilleans have some rights in relation to land as a result of post-conflict reciprocity principles based in 'custom'.

There is broad agreement amongst the multiple linguistic and cultural groups of Bougainville that they share long-established principles concerning the rights gained by allied groups supporting landowners in conflict and whose blood is spilled as a result. The allied group gains some rights over the land involved. During the Bougainville conflict, the origins of which lie with the Panguna mine and its forced closure in 1989, the original BRA leaders from the mine lease areas actively sought the support of traditional leaders from other areas. Young men from all areas joined the BRA. Several thousand people from all over Bougainville died as a result of the conflict, and many more were injured or suffered trauma. Most landowners interviewed on the subject referred to the claim that because blood was spilled all over Bougainville as a result of mining, and often at the request of leaders from the Panguna mine lease areas, any Bougainvillean had the right to come to the Panguna and tailings areas to pan for gold.

The precise nature of rights generated by the 'blood spilled' concept ('blut I kapsait' or BIK) requires further detailed investigation. Whatever its precise content and significance, as discussed in detail below, it is clear that certain landowners are far from accepting the presence and activities of at least some of the miners from other areas, particularly if they lack any family or clan links, recent or 'historical'. In addition, there are places in the upper tailings area where permission must be sought from the landowners to engage in ASM, and in the middle tailings some landowners are selling access to blocks of land they have allocated for ASM for K2000 to K3000 per block.

## Rewards

### Motivations and Economic Incentives

Based on information obtained from both site visits and knowledgeable informants including gold buyers and smelter operators, we estimate that gold with a minimum value of K75 million per annum, and possibly more than K100 million, is being produced from ASM in Bougainville. These figures, which would make ASM the second largest sector in Bougainville's cash economy after cocoa, relate to

direct income from gold mining only, and do not include the 'multiplier effect' generated by ASM's demands for goods and services.

While ASM is arduous and at times dangerous, it can be highly rewarding relative to the alternative income-earning opportunities available in Bougainville. The returns from mining obviously vary greatly depending on the area involved, the skill and good fortune of the miner, the way in which mining is organised and gold is sold and the purity of the gold involved. It is not unusual for a miner to win 2 or 3 grams of gold in a day. With prices paid by buyers at ASM sites typically in the region of K30–K50 per gram, this equates to K450–K750 per five-day week, constituting a highly attractive income. One benchmark in this regard is PNG's statutory minimum wage which is K140 a week, though of course the reality is that in most of Bougainville opportunities for formal wage employment are absent.

Gold mining has other advantages over cash crops such as cocoa and copra. It can generate income quickly, whereas in cash cropping there can be a long delay between when work is undertaken and crops are harvested and sold. Over recent years, gold prices have been rising whereas prices for cocoa and copra have been unstable or falling. Rising gold prices have been especially important given the increasing cost of living in PNG. A major advantage in remote areas is that buyers often buy gold directly from miners where they live and/or work, so the miners do not have to go to town. This situation is unlike other sources of income such as cocoa and copra, often expensive to transport to town or port due to difficult terrain and lack of road access.

Some people rely solely on gold production for income. That includes non-landowners or 'settlers' mining in the Panguna and tailings areas and, more generally, people from other areas of Bougainville given permission by landowners to undertake ASM on their land. This reliance on ASM income may be necessitated in part by the ongoing (though diminishing) impact of cocoa pod borer on income from cocoa production, or to land pressures in their home areas, or to the need to accumulate cash for some specific purpose. For others, mining consti-

tutes a supplementary source of income, adding to food they produce and/or proceeds from cash cropping. They may undertake regular, part-time mining, or periodic activity designed to generate income for specific needs, including school fees, paying for a feast or building a house. For example, miners at sites in the Eivo area (Kanavitu, Atamo and Kopani) told us that they continue to allocate enough time to work in their gardens to secure an ongoing supply of nutritious food, while using their part-time mining work to purchase 'market' goods and services.

Income from mining is used to pay for food, housing materials, school fees, and passenger motor vehicle (PMV) fares, to settle disputes and to purchase food and other items for customary obligations. Young people exchange gold for goods such as keyboards, radios and electrical instruments. We heard of a few cases where an individual accumulated enough gold to purchase expensive items, such as new four-wheel drive vehicles. While for some people mining income must be spent immediately on the necessities or pleasures of life, for others gold is a form of saving. We were informed that in the Torokina area some family and clan-groups hold a stock of gold, generally used only when a specific family or clan-group need arises. In this situation, all family or clan-group members will need to agree to sell some or all of the gold stock. Gold is also used to generate capital to invest in small businesses. A number of businesses operating shops in Arawa or PMV services from Arawa to Buka have been established with start-up capital from the sale of gold.

Encompassing and underlying many of the specific motivations discussed above is a general trend towards monetisation of economic, cultural and social life in Bougainville. As in many other parts of the developing world (see for example Bryceson et al. 2014 on Tanzania), over time, cash is playing an increasingly important part in people's lives. Factors involved include a long-term decline in subsistence food production and its increasing replacement by store-bought foods. A related factor involves changes with cultural and social activities and events such as marriage arrangements, conflict settlements and mortuary ceremonies. Previously conducted within

the subsistence economy, they increasingly require mobilisation of cash and store-purchased goods. As this trend increases, demand for cash grows. Given the paucity of available alternative income-earning opportunities, ASM is likely to continue to expand as long as readily winnable gold remains available.

While a comprehensive analysis of such underlying social trends is beyond the scope of our project, our research can hopefully contribute towards an understanding of how their impacts are manifesting themselves on the ground.

### Wider Economic Networks

ASM yields a product that must ultimately be sold on international markets, and mining requires the purchase of a range of inputs. For these reasons, ASM creates or relies on economic networks that must be understood if the nature and impact of ASM is to be fully appreciated.

Looking first at pricing and marketing of gold, there is no 'official' market for gold in Bougainville and the ABG plays no role in this regard. A wide range of informal arrangements are practised by sellers and buyers. In areas where mining is undertaken by or with the consent of landowners, at the primary stage of gold extraction buyers are usually ASM landowners and they largely determine prices. Miners, especially those from outside the area, have little or no choice in setting the price and are not free to sell to a different buyer under the buying arrangements agreed with landowners (see the earlier discussion of access arrangements). This type of local pricing arrangement is currently the most widely practised in Bougainville. At the next stage the original or primary buyer, or miners who have freedom of choice in selling their gold, are free to choose which 'middle buyer' to sell to, and usually sell to the buyer offering the highest price. In most cases in central Bougainville, that is Golden Valley Limited, in Arawa. These middle buyers then usually sell to large national gold-purchasing businesses based in Port Moresby.

Prices paid for gold vary widely depending on the 'level' at which the transaction occurs; the quantity and quality of gold offered for sale; the number of potential buyers operating in an area; and timing issues, for example proximity to Christ-

mas and dates when school fees are due. The interaction and operation of these factors can be complex. For example, more people may wish to sell gold leading up to the time when school fees are due, which would tend to depress prices, but if a family or clan have saved gold and have a substantial quantity to dispose of, this will have the opposite effect, as buyers are generally willing to pay a higher price per gram for large purchases (presumably reflecting the lower effort required of them, compared to a situation where they have to conduct multiple transactions to acquire a similar quality of gold). The presence of additional buyers who may travel to an area because they know that substantial quantities of gold will be for sale may also push prices up. The net result of the factors just discussed is that prices paid for gold vary considerably, from as little as K30 per gram paid to a miner compelled to sell to a landowner; to K50 per gram for an 'outside' buyer purchasing directly from a miner not compelled to sell to them; to a maximum standard price of about K80 per gram paid by large local buyers in Buka or Arawa; to K100 per gram paid for purchases of large quantities of high purity gold.

Provision of credit may also play a role in selling arrangements. Miners may borrow or purchase tools and equipment, in return for a fee or promises of later payment of gold. Credit purchase of store goods is common in the Panguna district, especially in the Panguna and tailings areas, where landowners who own small trade stores allow miners to get goods on credit, which they have to repay after they sell their gold. Some stores in Arawa provide materials such as carpets, tools and equipment, and in return the miners undertake to sell their gold to the supplier.

Against this general background, it should be noted that the situation with gold marketing is highly dynamic. For example, landowners have expressed concerns that outsiders or 'settlers' entering their area are not adhering to arrangements made for sale of gold to the landowners. It is also the case that quite specific commercial arrangements are in place for some ASM sites. At Sinimi external buyers are involved, including expatriates who come across the border from Solomon Islands. They supply mercury, 'free

of charge', and expect the miners to have gold available for them to purchase. As Sinimi mining is done cooperatively, the miners are able to influence the market price depending on how much gold they have in stock. Miners at Birepan have their own buying and selling arrangement which is rooted in the clan. Two main buyers from the Marata sub-clan buy gold from the miners. These two buyers charge a small tax, which goes towards the community, from every seller depending on how much gold they sell. These buyers then sell to the main clan buyer, who is currently chief Paul Alopa, who also deducts a small tax which goes towards Siuema Village Assembly. From late 2015, a gold buyer and equipment supplier called IMJ Solutions, based in Arawa and run by three Australian men, has been offering both gold purchasing and equipment supply services for small scale miners. In early 2016 the gold price offered was K80 per gram. IMJ imports mining equipment from the United States, and accepts the exchange of gold for machines, with most of the equipment supplied ranging in price from 200 grams to 600 grams of gold. IMJ requires a percentage deposit in grams of gold before the machine is ordered from its US supplier.

This last example raises the issue of purchases of inputs used in mining. Some of the inputs required include food, often prepared by local residents and sold to miners; tools and equipment such as wheelbarrows, carpets, sluice boxes/beds, containers, panning dishes, hoses, crowbars and picks; and larger mechanical equipment such as water pumps, electricity generators, small crushers, and smelters. Some equipment is made by miners themselves from bush and recycled materials and scrap, while tools and items such as pumps and generators are usually purchased from stores in Arawa or Buka.

Mercury and to a lesser extent nitric acid are important input items. There are three major locations for the sale of mercury and nitric acid in Bougainville: Arawa, Buka and in the villages and trade stores close to the mining sites. For instance, at the middle tailings, mercury is often sold at the trade stores located near the pump station and in the surrounding landowner and settler villages at Toku, Konuku and Darenai. Mercury is sold by miners,

gold buyers and trade store owners (who may also be either miners or buyers), commonly at a rate of K30–35 per ml, though it can be purchased in Port Moresby and Lae at as low as K3 per ml. Suppliers in Arawa often provide mercury to regular customers ‘for free’, who in return will sell their gold back to the suppliers in order to get a further ‘free’ supply of mercury. Another arrangement involves the exchange of gold for mercury, an approach practised for example by Golden Valley Ltd, which is reportedly the largest buyer of gold in Bougainville. Some mercury is smuggled into Bougainville by foreign gold buyers who come across the border from Solomon Islands.

## Social, Health and Environmental Risks

### Social Issues

ASM can generate a range of social issues and impacts. In recognising this fact, it is important to stress that their incidence and severity can vary greatly from site to site, depending on location, who is involved in mining, and what sorts of governance arrangements are in place. Social impacts are likely to be less substantial where mining sites are remote, mining is conducted by local landowners, and local community or/and landowner leaders exercise effective administrative control. They are likely to be more serious where sites are easily accessible, involve outsiders as well as local landowners, and lie in areas where governing structures are weak or contested. It is also important to recognise that ASM can generate significant social benefits that must be set against any social problems that do arise.

ASM is labour intensive and so requires a substantial commitment of time by those involved. This can prevent miners from attending to food production and to family matters and community activities related to local schools, churches and Councils of Elders. We were informed that this can result in theft of food from gardens by miners and neglect of children, including a failure to ensure that they attend school. On the other hand, in some areas miners are required to devote one day of the working week to community activities, or the gold won during a day each week is allocated for com-

munity purposes or, as mentioned earlier, local authorities may impose a tax on gold sales which is then used for community purposes. In addition, in at least some cases ASM is substituting for alternative economic activity (for instance cocoa production) that would have involved substantial labour demand in any case. Also important is the fact that, in many cases, ASM is a family-based activity and as such is unlikely to undermine, and indeed may strengthen, family bonds.

A more specific issue involves the use of child labour. As we note below in dealing with safety issues, this sometimes exposes children to risk of injury or death. It may also result in failure to attend school, which would obviously have negative impacts not only on the children concerned but, in the longer term, on their potential social and economic contribution when they reach adulthood. We were informed that mining has affected literacy levels in ASM areas, as many school-aged children no longer attend school, because they or their parents are attracted even by what may be quite small amounts of income they can gain from the sale of gold. We have certainly observed many school-aged children washing for gold with their parents around the Kawarong River, some as young as six years of age. However, in some areas children are only allowed to work after school hours or during weekends and school holidays. In addition, as mentioned above we observed cases where parents engaged in ASM in order to gain the income to pay school fees, serving to support children’s access to education.

Disputes over land or access to gold-bearing minerals can constitute a substantial social impact of ASM. At Kupei, fighting has erupted between miners over stolen piles of rocks. At Kopani, a new mining site has generated disputes over land issues and concern over environmental impacts on the river system. In the lower tailings, a Nagovisi village has been burnt down over stolen gold and related issues, and indeed reports of gold theft and subsequent social tensions or violence are common.

The availability of cash, in some cases in large amounts, can result in over-consumption of alcohol and illicit drugs, resulting in violence, including domestic violence, family breakdown, and death. There are reports of prostitution involving young

girls and women and miners and gold buyers. A number of our informants expressed the view that miners need to be educated about how to put money gained from mining to good use, including by investing it for the future.

At Sinimi, Koike has responded to the risk of social conflict by establishing strict rules and disciplinary measures for his mining workforce (or 'the company' as he calls it). Koike claims the rules are there to safeguard the miners from getting involved in any disciplinary or unlawful act that would tarnish his name and the name of the company. The rules prohibit alcohol consumption, use of marijuana, stealing and prostitution. The penalty for those involved in any of the above acts is total exclusion from the company if reports reach Koike. Koike allocates time, normally during morning assembly before work begins, to emphasise discipline and respect for Christian and customary values.

Movement of people out of their home areas to engage in ASM has the potential to create its own social problems, related to land shortage; possible changes to social and cultural practices of host communities; demands on community services; impact on the environment; and health and safety practices around ASM. The tailings area (and to a lesser extent Panguna) constitutes by far the largest concentration of what are often referred to as 'migrants' or 'settlers' engaged in or associated with ASM. It tends to be assumed that people not obviously belonging to clan-groups owning land in the tailings or Panguna area are migrants or settlers with no rights in the areas other than those under the post-conflict reciprocity principles outlined earlier. In fact, many are understood to have connections with local landowners through clan migration histories and other links that ensure that they are not seen only as outsiders.

A small survey undertaken in one part of the tailings area for our project found that some 80 per cent of the surveyed 'settlers' were from the Nagovisi area, which borders on the tailings area and shares many customs with it, with Bolave constituency accounting for 90 per cent of the Nagovisi migrants. This figure emphasises the important point that customary relations may exist between so-called 'migrants' or 'settlers' and the landowners

on whose land they mine. Ten per cent of migrants were from the Aita area in northern Bougainville and the remaining 10 per cent from the Buin, Siwai, Buka and Torokina areas.

Ninety per cent of landowner respondents to the survey indicated that they had experienced some conflict with settlers, and many wished to remove the settlers due to social problems they generate or to have the ABG and police step in to sort out the issue. Conflict was attributed to difference in social norms and customary beliefs; unhealthy and unhygienic conditions in which settlers supposedly live; tensions among migrants themselves; and an increase in prostitution. Some landowners complained that while the settlers have abundant land in their areas of origin, they are exhausting gold reserves and occupying land which the landowners could utilise for other purposes. Landowners also claimed that settlers steal from their food gardens and harvest their forest for building material and firewood without their consent. It should be noted that accusations of food theft are not limited to settlers. We were also informed that other families have resorted to stealing from gardens when heavy rains force mining activity along rivers to cease. Theft of food is also reported to occur when 'migrant' miners make return visits to their home areas, when, as a result of having no food gardens of their own, some steal from those of relatives and neighbours. This situation is part of a wider reported pattern of migrant miners who are absent for extended periods of time neglecting their social duties and obligations to kin in their home areas.

While tension is clearly generated by the presence of at least some settlers, we are not aware of violence occurring between them and landowners, though at one point a number of settler houses were burnt down by disgruntled youths. We should also note that not all landowners expressed a negative view of settlers. Some owners of stores indicated that settlers are their customers and are good for business, and should be allowed to stay.

### **Contribution to Localised Conflict**

While the danger of ASM contributing to localised conflict might elsewhere be regarded as part

of the broad category of 'social issues', in the particular circumstances of post-conflict Bougainville there are good reasons to regard it as a distinct category of risk. Of some importance here is the significance of economic inequality as a cause and driver of localised conflict in Bougainville. The economic inequality associated with rapid expansion of small-holder cocoa production from the 1960s and with the Panguna mine from 1969 was a significant factor in the origins of the Bougainville conflict (Regan 1998). Further, not only was localised conflict related to economic activity a major dynamic within the overall Bougainville conflict, it has emerged for extended periods and in various forms since the main conflict ended in 1997. The localised Konnou conflict (2006–11) originated in and was driven by multiple factors, but inequality was undoubtedly a significant cause. During much the same period, similar conflict occurred in neighbouring areas of central and western Buin, as well as Siwai. Inequality in these cases is the result of unequal patterns in land distribution originating in pre-colonial migration and land allocation patterns (Mitchell 1982), which led in turn to unequal access to income-earning opportunities, especially from cocoa production.

Risks exist that ASM will contribute to new local conflicts as a result of its impact on inequality. Intense resentment has been a major factor in murders of relatively well-educated, wealthy and prominent Bougainvilleans in recent years, who were accused of causing deaths, illness and other problems through sorcery. Other ways that ASM may contribute to violence and local conflict include the tensions it creates between 'settlers' and landowners and thefts of food from subsistence gardens.

### Health and Safety Issues

Use of mercury and to a lesser extent of nitric acid is a major concern in relation to health and safety issues and also the environment. Mercury is more commonly used in ASM than nitric acid because mercury efficiently extracts fine gold particles from concentrates obtained by small scale miners, where gold and mercury form an amalgam and the mercury is then evaporated, leaving the gold behind. Nitric acid, on the other hand, can only be used to

dissolve iron particles before smelting and is more dangerous to handle than mercury.

Normally, sluice-boxes and panning dishes are used to initially recover gold particles. In most instances, some of the gold particles and especially the fine gold, do not settle in the panning dish during the separation process and so mercury is placed in the dishes to accumulate these gold particles. The next stage, which is often the most dangerous practice employed during the gold recovery process, involves using heat to evaporate the mercury, usually over an open fire. The process is commonly known as 'cooking'. The harmful impacts of this process arise from inhalation of mercury vapour which results in vomiting, gastroenteritis, complaints of the kidney and urinary tracts, ulcerations in the gums, and extreme light sensitivity known as 'photophobia'. If inhaled over a long period, it can cause chronic mercurial poisoning resulting in kidney ulcerations, mercury sulphide (HgS) deposition in the body, speech disturbances and lack of concentration (Bordia 2016). However, these effects are difficult to document in Bougainville due to lack of proper government regulation and ineffective health monitoring systems, especially given that many mining operations occur in remote locations where health services are inaccessible. What appears certain is that miners have little or no information about safer methods of using mercury, such as the use of retorts to capture mercury fumes and return them to liquid form for reuse.

Some village leaders have used their authority to ban use of mercury. Such cases have been reported from Torokina, Karato and Tabataba. At certain sites, for example Avaipa, miners are mindful of the dangers involved and use mercury and nitric acid away from the mine site and villages where women and children live. However, we have observed situations in which mercury and acid handling is done very dangerously, without safety gear and protective equipment. We also observed careless handling of mercury, causing accidental spillage. We estimate that as many as 80 per cent of the miners who use mercury and nitric acid do so in unsafe and unhealthy ways, with women and children constituting a substantial proportion of those most at risk. What is especially alarming is that pregnant

mothers and children who accompany their parents to wash for gold are directly exposed to these dangerous practices.

Not only miners and their families or neighbours are potentially affected by mercury use. Mercury is sometimes discarded directly into rivers and creeks, or on land. More generally, after 'cooking' the mercury vapour can be assumed to infiltrate into soil and be transported into river systems. This poses serious potential health risks to downstream and coastal communities. The township of Arawa falls in the downstream category. Its residents rely on untreated water sourced from a river where ASM is taking place upstream, and children may accidentally consume contaminated water as they play and bathe along Bovo River which is connected to the Kupei mining area. To date, no research has been carried out on the extent of mercury infiltration, and its accumulation in both fresh water and coastal fish stocks. There is growing concern among people in areas affected by ASM about the extent of the risks involved.

Some miners are aware that mercury and nitric acid do cause health risks but do not have the information or resources to avoid or minimise these. They express the need for the relevant authorities to assist them with capital inputs and by conducting awareness training at mining sites. For example, Damien Koike, who uses substantial quantities of mercury in his ASM operation, wants immediate action taken to raise awareness of the need for its proper use. None of the miners, gold buyers or community members we spoke with reported any awareness programs being conducted on the impacts of, or safer methods of using, mercury and nitric acid.

Miners in Bougainville use mercury and nitric acid because they say it is efficient, fast, simple to use, cost effective and easily obtainable through local buying and selling arrangements. In the absence of appropriate regulatory and awareness interventions by government, the illegal sale, distribution and unsafe use of mercury and nitric acid in Bougainville will continue, and miners will put their own lives and their families' lives at risk while trying to make ends meet.

Other health risks arise from the long hours that small scale miners spend in the rivers where they are panning for gold. Miners have reported itching of the legs and skin, which later developed into ulceration of the skin and other skin diseases. Some miners have reported very sharp abdominal and chest pains after they have been involved in ASM for some time. It is possible that some of these effects are associated with disposal of mercury into the rivers. Severe weather conditions combined with inadequate access to appropriate clothing and food and water can also cause illness. Settlers in particular may lack access to reliable food supplies. Lack of access to health services may mean that health problems are not detected or treated until they have already become severe.

Safety is a serious concern in ASM in Bougainville due to the arduous, labour-intensive work involved, the dangerous conditions in which much mining occurs, and the general absence of safety measures and the lack of proper working gear. Miners were observed handling tools with bare hands and feet and wearing no proper head gear. Some miners engage children in dangerous places, including where chemicals are being disposed of. Miners are often exposed to extreme weather conditions which increase safety risks.

Even during the short life of our research project, we became aware of a number of fatalities and numerous accidents. For example, a death occurred in 2015 after a landslide at the mine site at Asimana, in the Avaipa area, and in the previous year a miner was drowned after a dam failed upstream of where he was working in a creek bed. At Kupei where hard rock mining occurs on a dangerously steep slope and partially dug-out tunnels left over from mining in the 1930s, seven people have already been injured by falling off rock edges and being hit by falling rocks. In the tailings area, a young girl was buried alive by a landslide as she and her mother were digging for gold along the river bed.

The semi-mechanised equipment used at Sinimi bears potential safety risks as vines or 'bush ropes', which could break any time since they are continuously exposed to extreme weather conditions, are used as straps to hold wood and metal

together. At Birepan where miners are using hosed water to blast off the overburden layer to expose the gold-bearing rocks on a mountain side, washing occurs right at the foot of the mountain where there is a high tendency for rock-falls and landslides to occur. Children have been observed washing for gold with their parents in this disaster-prone area. Our project staff have spoken to miners about the dangers involved, and they responded by saying that they have already learnt the lesson from an accident leading to a death at Asimana. The death resulted from undermining, so to avoid a similar incident, they ensure that the first task undertaken is to chip off and clear any overhanging deposits to leave a vertical face, before any washing for gold can be done.

An issue relevant both to health and safety and the earlier discussion of social impacts involves the uncontrolled clearing of vegetation combined with driving of tunnels below and above sections of the road from Arawa to Panguna. This is creating an ongoing problem with rocks and gravel falling onto the road, causing safety issues for travellers, while the ultimate effect of this uncontrolled activity may involve the collapse and destruction of affected sections of the road. Quite apart from the immediate threat of loss of life, this would interrupt traffic from the Panguna district and beyond to Arawa and Buka, imposing serious economic and social costs, for example by increasing transport costs and reducing people's access to health facilities. Increasing the gravity of the situation, considerable time might elapse before the ABG is in a position to repair any serious damage, given that it has very limited financial resources (Regan 2011).

### Environmental Issues

There are clear indications that ASM is causing major environmental issues, though no systematic analysis of its impacts has been conducted to date. Large quantities of waste rock and processed gravels are being deposited into creeks and rivers and, as discussed above, mercury and nitric acid are also finding their way into river systems. Interviewees have observed that some rivers and creeks have become heavily polluted, with degraded aquatic ecosystems, altered water flows and declining water

quality, resulting in the reduction of freshwater protein sources such as prawns and fish. Communities downstream of mining areas can be especially affected during periods of heavy rain which erode waste rock piles and increase sediment load. Interviewees expressed concerns about the lack of knowledge regarding the exact extent and nature of environmental destruction caused by the miners, including the impact of mercury on food sources. They stress the need to find safer ways of handling and using mercury.

In the Sinimi area, the use of semi-mechanised mining methods without proper environmental management practices results in erosion of large waste rock piles into the river system, affecting communities downstream. At Kopani and Kupei, disposition of large quantities of waste rock has heavily degraded aquatic ecosystems, causing a reduction in prawn stocks which the local communities depend on for protein. Miners at Birepan have observed environmental degradation and pollution caused by the deposition of waste rock into the Naniuka River, causing it to turn milky and yellowish brown. While they have observed the pollution, miners lack the knowledge to fully assess the level and nature of environmental impacts, though they have noticed a decline in catches of the prawns, eels and fish which are an important food source for the surrounding hamlets. Whilst this could be accounted for by an increase in population, miners have also observed the Naniuka River and surrounding creeks drying up. We observed similar environmental changes during our field visit in this area, but we are unsure whether reduced flows in rivers and creeks, which have been observed in areas of Bougainville where no ASM occurs, are due to the effects of the recent El Niño. This uncertainty highlights the need for systematic monitoring of ASM's environmental effects.

### Regulation

In most parts of rural Bougainville, considerable continuity is evident with pre-colonial social and leadership structures, including the role of clan leaders, hereditary in some areas. It is common for such leaders to play various informal 'regulatory' roles in relation to ASM, including in some cases by

banning the use of mercury in their areas. Under the Bougainville Council of Elders Act 1996, local communities have been empowered to choose to have their local level governments (Councils of Elders) comprised mainly of clan leaders, including 'chiefs' (see next section). These bodies also play a role in informal regulation of ASM in some areas.

In terms of formal regulation, until the ABG introduced its own mining legislation in 2014–15, ASM in Bougainville was regulated by PNG's Mining Act 1992. The significant changes to PNG constitutional laws enacted in 2002 to give effect to the Bougainville Peace Agreement empowered the ABG to develop its own regulatory framework for ASM through a process for the transfer of powers from the Government of Papua New Guinea to the ABG (Regan 2014:432–4). The powers made available included all those involving mining. In the period 2006–14 the ABG undertook the process required to take control of mining. This included establishing a Department of Mining with administrative capacity in relevant areas such as mining engineering geology and tenement administration (Regan 2014). The culmination of this process was the enactment in April 2015 of the Bougainville Mining Act 2015 (the BMA). It contains provisions on ASM that build upon the experience of informal regulation by proposing to incorporate local authorities into a new formal regulatory approach, and are extensive and novel in an international context. A unique feature of the BMA, not to our knowledge found in national or provincial mining legislation elsewhere in the world, is that the minerals on customary land are owned by the landowners, and not by the state (section 8).

The BMA provides for the granting of two distinct kinds of ASM licences, available exclusively to Bougainvilleans. One involves declaration of 'community mining licence reserve areas' (CMLRAs), and the subsequent granting within them of 'community mining licences' (CMLs). CMLRAs are identified and proposed within their local jurisdictions by Councils of Elders (COEs) and/or Village Assemblies (VAs). These local government authorities are established under the Bougainville Council of Elders Act 1996 and operate as a two-tiered system (Regan 2000; Sasa 2013). Under the Act, a COE

drafts a constitution which defines its structure and whether members are to be elected, or appointed from among clan leaders. About 70 per cent of the 43 COEs are comprised mainly of the latter. The VA comprises all persons living in a village and is responsible for promoting peace and maintaining law and order by assisting chiefs or clan leaders in their role of settling disputes. VAs are also responsible for determining COE membership every five years, whether by appointment or election.

A COE or VA may submit a proposal for a CMLRA, which must include the location and boundaries of the area, as well as a management plan providing 'for the granting, administration and oversight of community mining licences within the reserve area ... [and] training programmes regarding the use of mercury and other prescribed chemicals in the recovery of minerals' (s.55(1)). The mining department must provide training to relevant members of the COE and/or the VA which must include:

- procedures for the granting, administration and oversight of community mining licences
- instruction on practices to be followed or avoided when mercury is used to recover minerals
- instruction on mining methods.

CMLRAs may be declared for a period of five years. After a CMLRA is declared, a COE may 'make rules for the granting and regulation of community mining licences [CMLs] in the area', and they may be granted and otherwise administered by a COE or VA within a COE. While the CMLRAs are identified, proposed and managed at the local level, the Bougainville Executive Council (the ABG cabinet) retains the power to suspend the right of a COE to grant CMLs, and may revoke single, multiple or all CMLs within a CMLRA. The BMA does not specify the grounds upon which the Bougainville Executive Council may exercise these powers, with the exception of section 62(2) which provides that a COE's authority to grant CMLs may be suspended and a CMLRA 'disestablished' if the COE fails to submit an annual report which meets the BMA's requirements.

CMLs are granted solely for the purposes of artisanal mining within CMLRAs, and only

Bougainvillean landowners, or Bougainvilleans with approval from the landowners, are eligible to hold one. A major reason for the BMA vesting COEs and VAs with the authority to grant CMLs is that these local-level organisations are close enough to the communities to be able to determine issues about landownership, or approval by owners. A person or group applying for a CML must submit a plan outlining mining methods and environmental protection measures, comply with CMLRA rules and guidelines and hold a certificate of training in artisanal mining (s.73). A CML may be granted for one year, renewed for one further year, and may not be transferred. The BMA requires that CML holders must:

- use only non-mechanised methods
- use safe practices whenever mercury or a prescribed chemical is used to recover minerals
- not employ or use child labour
- not mine deeper than 5 metres below the natural surface of the ground
- not use explosives
- not discharge water from a sluice, pump or other equipment, except into a holding pond, settlement dam or similar structure or apparatus designed to protect a waterway from the discharge of silt, solids and other suspended matter
- keep the licence area free of alcohol and illicit drugs and ensure that miners are not in any way intoxicated while at the mine site.

A COE or VA that grants a CML has authority to revoke or suspend it if conditions of the CML are not met, and could then require further training before the licence is restored or granted anew.

The second type of licence is an Artisanal Mining Licence (AML). It is important to note that this term does not follow common international usage, in that an AML in fact allows for small scale, and not just artisanal, mining. An AML has many similar requirements to a CML including development of management plans, training, safe handling of mercury and chemicals, prohibition of child labour and explosives, and conditions for discharge of water. An AML differs from a CML in that it is granted and administered by the ABG under the auspices of a Mining Advisory Council established under the BMA; has an initial term of up to 10

years, with extensions for 5-year terms; can cover up to 5 hectares; can be transferred under certain conditions; and that mechanised mining methods are not prohibited. It can only be granted to the landowners of the licence area, or to a Bougainville entity that has obtained the written permission of the landowners of the licence area (s.158).

Together the provisions for CMLRAs, CMLs and AMLs constitute an attempt to design a regulatory framework that recognises the realities of ASM in Bougainville and at the same time helps to maximise its positive economic impact and minimise the risks associated with it. The vesting of mineral ownership in landowners is driven by the more general need, in the aftermath of the 1989 closure of Panguna and the Bougainville conflict, to place landowners in a position to control mining on their land (Regan 2014). However, along with the provision allowing grant of CMLs to Bougainvilleans from other areas with the approval of landowners, it recognises and supports the current practice of landowners, under complex customary arrangements, in negotiating with ‘outsiders’ to access their land for ASM. It also places landowners in a strong position to negotiate substantial rewards for allowing such access. The restriction of CMLs and AMLs to Bougainvilleans is designed to help ensure that the rewards of ASM accrue locally.

A number of provisions seek to address risks associated with ASM. These include, in relation to mercury, the requirement for CMLRA management plans to include provision for training programs regarding the use of mercury, and for CML holders to apply safe practices in its use, and the powers for COEs and VAs to suspend CMLs. Environmental risks are addressed by these provisions, by those dealing with discharge of water and the limits on the use of explosives and the size of CMLs and AMLs, and by the requirement for applicants for CMLs and AMLs to submit a plan outlining mining methods and environmental protection measures. Some of the potential social impacts of ASM are addressed by the prohibition on use of child labour and on the requirement to keep licence areas free of alcohol and illicit drugs. These provisions are also likely to assist in improving safety, as is the require-

ment for licence applicants to hold a certificate of training in artisanal mining.

The emphasis on local level governance through the establishing of CMLRAs and granting of CMLs is significant. As noted earlier, given the diversity of ASM in Bougainville and the remoteness of many ASM sites, local knowledge and 'presence on the ground' are likely to be critical if regulation is to be effective. The international literature certainly shows that regulation of ASM at the local level is often the most effective, due to limited central government capacity, ASM's occurrence in remote locations, and its highly dynamic nature. Local regulation may, for example, involve powerful customary landowners, such as Ghanaian chiefs who control access to their traditional lands for ASM in return for payment (Banchirigah 2008). It may involve networks of powerful local politicians and merchants who regulate ASM in their territory in 'informally formal' ways, as occurs in the Philippines (Corbett and O'Faircheallaigh 2015). However, what these and other modes of informal local regulation have in common is that they are, at least from the perspective of those engaged in ASM, an 'unstable construct' (Jønsson and Fold 2009:218). The lack of an institutional base and formal legal powers, combined with a tendency for central government to intervene in ways that undermine local decision-makers, leads to inconsistent policy and practice on the ground. This in turn deprives miners of the predictability they need to undertake longer-term investment, including in safety and environmental protection measures (see for example Hilson and Okoh 2013 on Ghana; and de Failly et al. 2013 on the Democratic Republic of Congo).

The BMA institutionalises the regulatory role of local authorities including customary leaders and grants them formal powers, providing a mechanism to enable local control to occur in ways that are predictable and secure for all participants. At the same time, the BMA confers on the Bougainville Executive Council the capacity to suspend the powers of local authorities if that predictability and security does not in fact materialise. This of course assumes that volatility in central (i.e. ABG) policy and practice does not itself create conflict with local authorities and so generate regulatory instability.

### Implementation Issues and Policy Implications

The BMA appears to offer, in principle, an effective mechanism to help maximise the rewards, and minimise the risks, of ASM, both because of its substantive provisions and the regulatory role it affords to local authorities. However, the ABG faces considerable challenges in ensuring that the BMA is effectively implemented and its potential contribution realised, a reality reflected in the fact that no CMLs or AMLs have been issued to date. These challenges arise in part from the general paucity of resources and administrative capacity faced by the ABG. Other constraints on capacity arise from the exodus of skilled personnel and the widespread cessation of schooling as a result of the Bougainville conflict, and from the fact that parts of Bougainville are still controlled by armed factions in the aftermath of the conflict.

Against this background, the tasks the ABG must undertake to effectively implement the BMA are formidable. For example, it is required to provide training to COEs, members of VAs and CML applicants and holders. The ABG will need to monitor and oversee COEs and VAs, and provide them with training needed to administer CMLRAs and CMLs effectively. COEs will need to be monitored in terms of correctly completing and lodging annual reports. Particularly given the dynamic nature of ASM and the extreme remoteness of some mining sites, ensuring that COEs and miners actually play their allotted roles and comply with the BMA is an onerous administrative task.

Another issue, just as important but more amenable to early action by the ABG, involves its Department of Mining. To date, the department has been focused almost exclusively on potential roles in administration of tenements associated with large scale mining and AMLs and has not developed expertise or capacity in the regulation of ASM. The department's focus and administrative effort will have to shift to include ASM if the BMA is to be effective in maximising the rewards and minimising the risks of ASM. Early in April 2016, the ABG President expressed grave concern about the mining department's failure to work on the administrative and training arrangements for CMLRAs and CMLs (Momis 5/4/2016).

## Conclusion

ASM in Bougainville, as in many parts of the world, is highly dynamic, with mining locations, methods and numbers of people involved changing rapidly, often over short periods of time. In less than two decades it has grown to become one of the most important activities in the formal sector of the Bougainville economy. It employs thousands of people on a regular basis, and supplements the incomes of many thousands more, often constituting their only means of generating cash. It allows miners to earn incomes that are high relative to alternative opportunities, and in some cases those incomes help, for example, to ensure that children can continue their education. At the same time, the methods used and the absence of safety equipment and safe work practices place miners at risk. ASM also creates significant health and environmental impacts not just where it occurs but also in downstream communities. It generates social costs through neglect of family and clan responsibilities, and by generating social tensions between landowners and so-called 'migrants', and between those who benefit from ASM and those who do not. This latter impact is a matter of considerable concern in a post-conflict society, and requires further study and a careful policy response, as do a range of other environmental, social and economic issues created by ASM.

One major issue involves access to land and minerals to allow mining to occur. Our research to date indicates the complexity of this issue in Bougainville, a complexity that the international literature on ASM has failed to address. Further research on the issue of land access and social and cultural impacts constitute a major priority for our research project. Another priority involves additional analysis of existing, informal regulatory mechanisms, and of attempts through the Bougainville Mining Act 2015 to institutionalise and build on these mechanisms to achieve effective regulation of ASM. Success in this regard would render Bougainville's experience with ASM of enormous interest internationally.

## Acknowledgement

The research on which this Discussion Paper is based is funded by the Department of Foreign

Affairs and Trade through the Australian Development Research Awards Scheme (ADRAS) under an award titled 'Small Scale Mining in Bougainville: Impacts and Policy Responses'.

## Notes on Authors

Ciaran O'Faircheallaigh is Professor of Politics and Public Policy in the School of Politics and International Relations, Griffith University, Brisbane.

Anthony Regan is a Fellow in the State, Society & Governance in Melanesia Program, School of International, Political & Strategic Studies, Australian National University.

Simon Kenema is a Research Fellow with the ADRAS funded project on Small-scale and Illegal Mining in Bougainville.

## Endnotes

- 1 We acknowledge that ASM in Bougainville, as in many other parts of the world, is highly dynamic and that new sites may have emerged, and mining at others may have ceased or been scaled back, between the research conducted for this discussion paper and its publication.
- 2 This included a stakeholder workshop with some 50 people involved in various aspects of ASM and its regulation held in Buka in August 2014; visits to numerous ASM sites; and interviews and informal discussions with miners and other knowledgeable individuals at these sites and elsewhere.
- 3 The boundaries of three regions are synonymous with those of the three 'open' electorates established under PNG legislation providing for elections to the PNG national parliament (Regan 2005:439–40). The Central Bougainville Electorate includes only territory on the eastern side of Bougainville, while the South Bougainville Electorate extends well into parts of the western side of Bougainville that would otherwise be considered geographically as part of central Bougainville.
- 4 While geographically in central Bougainville, Torokina is within the boundaries of the South Bougainville Electorate, and so classified as part of south Bougainville (see endnote 3).
- 5 The tailings area is divided into upper, middle and lower tailings as one moves from Panguna towards the west coast. While the amount of gold remaining in the tailings generated by BCL was small, many years of rainfall and weathering have created areas

where concentrations of gold are sufficiently high to make ASM viable.

## References

- Banchirigah, S. 2008. Challenges with Eradicating Illegal Mining in Ghana: A Perspective from the Grassroots. *Resources Policy* 33:29–38.
- Biersack, A. 1999. The Mount Kare Python and His Gold: Totemism and Ecology in the Papua New Guinea Highlands. *American Anthropologist* 101(1):68–87.
- Bordia, S. 2016. [Small Scale Gold Mining and Marketing in Papua New Guinea](#).
- Bryceson, D.F., E. Fisher, J.B. Jønsson and R. Mwaipopo 2014. *Mining and Social Transformation in Africa: Mineralizing and Democratizing Trends in Artisanal Production*. London and New York: Routledge.
- Corbett, T. and C. O'Faircheallaigh 2015. *Small Scale Mining: Issues, Impacts and Policy Responses: The International Experience*. Brisbane: Centre for Governance and Public Policy, Griffith University.
- De Faily, D., Z.B. Ntakobajira and L.B. Shonja 2013. Tracing Revenue Flows, Governance and the Challenges of Poverty Reduction in the Democratic Republic of Congo's Artisanal Mining Sector. In B.K. Campbell (ed.). *Modes of Governance and Revenue Flows in African Mining*. Basingstoke: Palgrave Macmillan, 164–222.
- Dove, J., T. Miriung and M. Togolo 1974. Mining Bitterness. In P.G. Sack (ed.). *Problem of Choice: Land in Papua New Guinea's Future*. Canberra: Australian National University Press.
- Hilson, G. and G. Okoh 2013. Artisanal Mining in Ghana: Institutional Arrangements, Resource Flows and Poverty Alleviation. In B.K. Campbell (ed.). *Modes of Governance and Revenue Flows in African Mining*. Basingstoke: Palgrave Macmillan, 138–63.
- Jønsson, J. and N. Fold 2009. Handling Uncertainty: Policy and Organizational Practices in Tanzania's Small-Scale Gold Mining Sector. *Natural Resources Forum* 33(3):211–20.
- Kenema, S. 2010. [An Analysis of Post-Conflict Explanations of Indigenous Dissent Relating to the Bougainville Copper Mining Conflict, Papua New Guinea](#). *eJournal of the Australian Association for the Advancement of Pacific Studies*, issues 1.2 and 2.1.
- Mitchell, D.D. II 1982. Frozen Assets in Nagovisi. *Oceania* 53(1):56–66.
- Momis, J.L. 5/4/2016. Debate on the Process for Lifting the 'Moratorium' on Mining Exploration and Development. Statement by President John L. Momis, to the Bougainville House of Representatives.
- Oliver, D.L. 1967. *A Solomon Islands Society: Kinship and Leadership among the Siuai of Bougainville*. Boston: Beacon Press.
- Regan, A.J. 1998. Causes and Course of the Bougainville Conflict. *The Journal of Pacific History* 33(3):269–85.
- Regan, A.J. 2000. 'Traditional' Leaders and Conflict Resolution in Bougainville: Reforming the Present by Re-writing the Past? In S. Dinnen and A. Ley (eds). *Reflections on Violence in Melanesia*. Leichhardt, NSW: Hawkins Press/Asia Pacific Press, 290–304.
- Regan, A.J. 2005. Identities Among Bougainvilleans. In A.J. Regan and H.M. Griffin (eds). *Bougainville Before the Conflict*. Canberra: Pandanus Press, 418–46.
- Regan, A.J. 2011. Autonomy and Conflict Resolution in Bougainville, Papua New Guinea. In Y.P. Ghai and S. Woodman (eds). *Practising Self-Government: A Comparative Study of Autonomous Regions*. Cambridge: Cambridge University Press, 412–48.
- Regan, A.J. 2014. Bougainville: Large-scale Mining and Risks of Conflict-Recurrence. *Security Challenges* 10(2):71–96.
- Sasa, C.L. 2013. Local Government Accountability in Bougainville. Master of Philosophy thesis, Massey University.

- 2014/1 Richard Eves, Nicole Haley, R.J. May, Philip Gibbs, John Cox, Francesca Merlan and Alan Rumsey, Purging Parliament: A New Christian Politics in Papua New Guinea?
- 2014/2 Louise Vella, Translating Transitional Justice: The Solomon Islands Truth and Reconciliation Commission
- 2014/3 Diana Glazebrook, Papua New Guinea's Refugee Track Record and Its Obligations under the 2013 Regional Resettlement Arrangement with Australia
- 2014/4 Denise Fisher, Tjibaou's Kanak: Ethnic Identity as New Caledonia Prepares its Future
- 2014/5 Sue Ingram, Political Settlements: The History of an Idea in Policy and Theory
- 2014/6 Romitesh Kant and Eroni Rakuia, Public Participation & Constitution-Making in Fiji: A Critique of the 2012 Constitution-Making Process
- 2014/7 Jenny Munro, Papuan Perspectives on Family Planning, Fertility and Birth Control
- 2014/8 Gordon Peake, Lia Kent, Andrey Damaledo & Pyone Myat Thu, Influences and Echoes of Indonesia in Timor-Leste
- 2014/9 Guy Powles, The Tongan Monarchy and the Constitution: Political Reform in a Traditional Context
- 2014/10 Priya Chattier, Measuring Poverty as if Gender Matters: Perspectives from Fieldwork in Fiji
- 2015/1 Lia Kent, Remembering the Past, Shaping the Future: Memory Frictions and Nation-Making in Timor-Leste
- 2015/2 Tim Sharp, John Cox, Ceridwen Spark, Stephanie Lusby and Michelle Rooney, The Formal, the Informal, and the Precarious: Making a Living in Urban Papua New Guinea
- 2015/3 Greg Fry, Recapturing the Spirit of 1971: Towards a New Regional Political Settlement in the Pacific
- 2015/4 Julien Barbara, John Cox and Michael Leach, The Emergent Middle Classes in Timor-Leste and Melanesia: Conceptual Issues and Developmental Significance
- 2015/5 Stephanie Lawson and Elizabeth Hagan Lawson, Chiefly Leadership in Fiji: Past, Present, and Future
- 2015/6 Graham Baines, Solomon Islands Is Unprepared to Manage a Minerals-Based Economy
- 2015/7 Richard Eves and Miranda Forsyth, Developing Insecurity: Sorcery, Witchcraft and Melanesian Economic Development
- 2015/8 David Oakeshot and Matthew Allen, Schooling as a Stepping Stone in Solomon Islands
- 2015/9 Miranda Forsyth, Understanding Judicial Independence in Vanuatu
- 2015/10 Scott MacWilliam, Bonapartism in the South Pacific: The Bainimarama Government in Fiji
- 2015/11 Joseph Suwamaru, Aspects of Mobile Phone Usage for Socioeconomic Development in Papua New Guinea
- 2015/12 Doug Porter, The Political Economy of the Transition from Logging to Mining in Solomon Islands
- 2015/13 Meabh Cryan, The Long Haul: Citizen Participation in Timor-Leste Land Policy
- 2015/14 Kerryn Baker, Pawa Blong Meri: Women Candidates in the 2015 Bougainville Election
- 2015/15 Meabh Cryan, Dispossession and Impoverishment in Timor-Leste: Potential Impacts of the Suai Supply Base
- 2015/16 John Logan, A Year in the Life of an Australian Member of the PNG Judiciary
- 2016/1 Scott MacWilliam, Indigenous Commercial Ambitions and Decentralisation in Papua New Guinea: The Missing Driver of Reform
- 2016/2 Rick Hou, A Day in the Life of a Member of Parliament in Solomon Islands
- 2016/3 Rick Graça Feijó, A Long and Winding Road: A Brief History of the Idea of a 'Government of National Unity' in Timor-Leste and its Current Implications
- 2016/4 Tony HiriAsia, Kin and Gifts: Understanding the Kin-based Politics of Solomon Islands — The Case of East AreAre
- 2016/5 Amanda H. A. Watson and Colin Wiltshire, Reporting Corruption from within Papua New Guinea's Public Financial Management System.
- 2016/6 Tarryn Phillips and Meg Keen, Sharing the City: Urban Growth and Governance in Suva, Fiji
- 2016/7 Daniel Evans, Hard Work: Youth Employment Programming in Honiara, Solomon Islands
- 2016/8 Transform Aqorau, State of the Pacific — Slippery Slopes and Rough Rides in Regional Cooperative Endeavours in the Islands
- 2017/1 Shailendra Singh, State of the Media Review in Four Melanesian Countries — Fiji, Papua New Guinea, Solomon Islands and Vanuatu — in 2015
- 2017/2 Manasupe Zurenuoc and Felicity Herbert, The Creation of Two New Provinces in Papua New Guinea — A Story of False Starts and Near Fatal Collisions
- 2017/3 Patrick Nisira, Leadership Challenges for the Autonomous Bougainville Government

*For a complete listing of SSGM Discussion Papers, see the SSGM website*



The State, Society & Governance in Melanesia Program (SSGM) is a leading centre for multidisciplinary research on contemporary Melanesia and Timor-Leste. SSGM represents the most significant concentration of scholars conducting applied policy-relevant research and advancing analysis on social change, governance, development, politics, and state-society relations in Melanesia, Timor-Leste, and the wider Pacific.

State, Society and Governance in Melanesia  
Coral Bell School of Asia Pacific Affairs  
ANU College of Asia and the Pacific  
The Australian National University  
Canberra ACT 0200

Telephone: +61 2 6125 8394  
Fax: +61 2 6125 9604  
Email: [ssgm@anu.edu.au](mailto:ssgm@anu.edu.au)  
URL: [ssgm.bellschool.anu.edu.au](http://ssgm.bellschool.anu.edu.au)  
Twitter: @anussgm



Submission of papers

Authors should follow the SSGM Editorial Guidelines, available from the SSGM website.

All papers are peer reviewed unless otherwise stated.

The State, Society and Governance in Melanesia Program acknowledges the generous support from the Australian Government for the production of this Discussion Paper.

*The views, findings, interpretations and conclusions expressed in this publication are those of the authors and not necessarily those of the SSGM Program. The Department of Foreign Affairs and Trade (DFAT) does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any information herein. This publication, which may include the views or recommendations of third parties, has been created independently of DFAT and is not intended to be nor should it be viewed as reflecting the views of DFAT, or indicative of its commitment to a particular course(s) of action.*