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**THE TREND IN ARTISANAL AND SMALL SCALE MINING DEVELOPMENT IN  
PAPUA NEW GUINEA**

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## **Abstract**

*Artisanal and Small Scale Mining (ASM) in PNG is more than 100 years old. Participation, production output and level of mechanization in the sector are influenced by changes in governance, commodity price and legislation.*

*The momentum of change was high and fast when PNG was moving toward Independence in 1975. Departure of European miners and increased participation by Papua New Guineans led to change of purpose of ASM and possibly the level of mechanisation.*

*The government is aware of contributions made by ASM and after Independence set out policies and development plans that clearly showed the government's support and commitment toward the sector. Relaxation of taxation requirements and other regimes related to ASM are some indications of the government's commitment.*

*The major constraints faced by miners include lack of technical expertise, finance and infrastructure necessary to support the sector. Shortage of manpower and inadequate funding from government are two major issues affecting effective administration and promotion of the sector. Lately, the Small Scale Mining Branch has been receiving support from donor agencies and other stakeholders.*

## **Introduction**

Papua New Guinea is located north of Australia, east of Indonesia and southeast of Philippines. Most of the 463,000 square kilometers of its total land area is sited on the eastern half of the island of New Guinea. It also comprises a handful of other relatively large islands and hundreds of smaller ones. The population of PNG currently stands at more than 5 million people.

Artisanal and Small Scale Mining (ASM) Activity in Papua New Guinea is more than 100 years old. The first discovery of alluvial gold was made in 1873 when Captain Moresby reported minor amounts of gold in the hills surrounding what is now called Port Moresby Harbour. The first gold rush involving 100 European miners occurred along the Laloki and other rivers inland of Port Moresby. Effective mining in PNG occurred on Sudest Island in 1888.

This paper briefly highlights the development trend of the sector over the last 100 years. It then outlines the PNG Government policy statement regarding the sector. How that policy is translated into Legislation and Administration mechanism is briefly explained as well.

Different stakeholders evolved in PNG over the years in resource development, including artisanal and small scale mining. The paper also identifies those stakeholders and their interests. It further highlights the current practice and problems faced by the sector as the result of the interaction between the various stakeholders.

Furthermore, key beneficiaries of ASM are identified and the benefits together with undesirable effects caused by ASM activities are stated. The paper finally identifies the key issues that are hindering expansion and sustaining of the sector. It then gives a brief account of donor funded

projects currently initiated by the Department of Mining that are targeted to addressing those key issues.

### **Small Scale Mining Development in Papua New Guinea**

ASM in PNG involves alluvial gold mining. The first recorded alluvial gold discovery was made in 1873. Mining involving 100 Europeans occurred in 1877 along the Laloki area outside Port Moresby. However, payable mining was first realized on Sudest Island in 1888.

The Morobe Goldfields was the single biggest ASM activity in the history of PNG. The gold rush commenced in 1922 mostly involving Europeans. It consisted of mining for lodes and alluvial in the Bulolo Valley. The Bulolo Gold Dredging Company operated 8 large dredges from 1932-1965, reaching a peak production of 8.5 tonnes per year in 1942. The total gold production from 1922-1977 is estimated to be about 117 tonnes. The Wau-Bulolo Area, site of the Morobe Goldfields, is still the main center for ASM activity in PNG.

Ambitious explorers and prospectors were some of the first people to enter the hinterland and outer islands of PNG in search of gold, thus the birth of civilization in PNG. Most of these early explorers' discoveries have now become the country's alluvial gold districts and also homes to some of PNG's premier mines.

Europeans had the advance over the natives who cared less about the yellow stone. The natives were comfortable with the ration and other goods offered as payment for their labour. However, things then changed when natives first went into mining on their own accord in 1949 (Mines Dept. Annual Report, 1949) in the Wanion River, Markham, Morobe Province.

Most European miners surrendered their mining leases and claims to Papua New Guineans during the late 1960s to early 1970s. During this period, PNG was preparing for Independence. However, other miners abandoned their leases long before that period presumably due to decline of gold grade and remoteness.

The departure of most European miners and its colonial administration led to many changes in the ASM sector. The purpose of ASM changed from being a commercial activity to one that would sustain livelihood of the rural community. The level of mechanization and production dropped as well. However, the number of national miners increased. They mostly equipped themselves with very simple mining techniques. In the 1980s, the Papua New Guinean mining population reached 3,500 and produced 8,000 ounces of gold. Today the population is estimated to be well over 60,000 and producing more than 60,000 ounces of gold a year.

The colonial administration played an important role in promoting ASM as an alternate economic activity for the rural places with less or no income sources. Government geologists identified and recommended potential alluvial gold deposits to miners. They were also involved in attending to land matters following change of attitudes from local people. These roles are continued by the Small Scale Mining Branch of Department of Mining.

### **Government Policy Statement**

About 80% of the 5 million population of PNG is rural based whose livelihood is sustained through subsistence farming activity. The contribution of the rural population to the national economy is

insignificant. Therefore, the PNG Government in its original Eight Point Plan emphasizes rural development with participation by PNG citizens.

The government is committed to develop the ASM sector in PNG. ASM was included in the Medium Term Development Strategy for the period covering 1997-2002. Specific policy statement relating to ASM was also mentioned in the Five Year Development Plan for 1989-1993. The present government's export driven policy also places Mining generally and ASM in a favourable position.

However, funding to Department of Mining, the government agency responsible for developing and promoting the sector is minimal. The Small Scale Mining Branch that is designated to look after the affairs of ASM is critically understaffed. The budgetary allocation is just sufficient to man the office. There is no fund available for outreach activities and field patrols.

### **Legislation and Administration**

1992 Mining Act and Mining (Safety) Act are the two main legislations governing the PNG mining sector. ASM activity is legally recognized in these Acts. The Mining Act provides for two tenements, namely, Alluvial Mining Lease (AML) and Mining Lease (ML) that are applicable for ASM.

Alluvial Mining Lease (AML) is restricted to traditional landowners. The law allows for mining without AML if the ASM activity is undertaken using non-mechanised techniques, provided that the miner is a customary landowner. AML is restricted to a size of 5 hectares and can only be undertaken within 20 metres of river courses. AML is meant for landowners and only non-mechanised and semi-mechanised techniques are applicable.

However, landowners do take out more than one 5 hectare Alluvial Mining Leases to avoid paying high application fees and security deposits if they were to apply for Mining Leases. They later engage contract miners to develop the leases. Through such arrangements the leaseholder (landowner) settles for 10-15% of the total gold production. This practice is common in the Wau-Bulolo area.

There is also a developing trend where traditional landowners form joint venture partnership with financiers to develop small scale mining operations (both alluvial and hard rock). The concept is great, but there are problems associated with this type of arrangement. Most landowners who are appointed as Directors to such joint venture arrangements are illiterate and lack the necessary skills and knowledge to perform their duties as company directors. This creates avenues for the advantage joint venture partner to influence the decision making on the affairs of the company. Overtime the customary landowner faction begins to become suspicious of the managing partner's conducts. The Mines Dept. in Wau receives complaints of such nature.

Current mining leases are consisted of leases that were brought over from the repealed Act. The leaseholders under the repealed Act were given two years to apply for conversion. After the two years lapsed, only applicants who applied for conversion are registered.

Problems were created as the result, especially in the Wau-Bulolo area, because the 1992 Mining Act did not cater for tributors engaged by leaseholders under the repealed Act. The former tributors were displaced as soon as leases that they had tribute agreements were forfeited. The 1992 Mining Act also gave more recognition to customary landowners. Most of the former

tributors were then forced into illegal mining because they were neither customary landowner nor active tributors anymore. This is because most miners living in the Wau-Bulolo area are not customary landowners, but brought to work in the goldfields during the colonial administration. However, in other parts of PNG customary landowners have total control on ASM activities. This is because leaseholders for leases granted under the repealed Act did not apply for conversion of their leases under the 1992 Mining Act.

Some of these miners lived in the area for more than 80 years, but most PNG traditional land tenure system would still regard them as non- customary landowners.

There is no proper administrative mechanism in place to disburse royalties and compensation for leases granted under the repealed Acts and currently held by non-customary landowners. Customary landowners blame the Department of Mining for this and are hopeful that these outstanding issues will be sufficiently addressed in the current review of the Act. In this year (2005) about four leases were forcefully taken over by customary landowners in the Bulolo District.

The Mining (Safety) Act is supposed to be applied to all types of mining operations. However, in practice, the administration of the Act is poor due to lack of inspectors and remoteness of ASM activities. The implementation of the Environment Act also suffers a similar set back.

The Department of Mining is tasked with the responsibility of administering Mining Acts. The Small Scale Mining Branch that looks after the affairs of ASM comes under the Mining Division. The Mining Division has specific aims and objectives which include promotion and facilitating of artisanal and small scale mining in order to directly stimulate rural development.

### **Definition of Small Scale Mining**

It is not surprising to have broad range of definitions from around the globe for ASM. This is evident from the outcome of the 1988 Inkar, Turkey, Small Scale Mining conference. The parameters adopted to classify mining operations as ASM include the production capacity, capital investment, revenue generated, number of people employed and the mine life.

The amount of capital investment is adopted as a guide for defining ASM in PNG. In PNG ASM includes a minimum investment of US\$0 to US\$1,000,000 utilising improvised panning and sluicing techniques to fully mechanized mining operations respectively. The middle range would fall within an investment of about US\$3,000 where equipment such as dredges and water pumps are employed.

The non-mechanised and semi-mechanised ASM activity is usually undertaken in family units that do not in most cases involve more than 10 people. This group represents 99% of the total ASM operations. Only 1% of the ASM activity employs full mechanization. In the Wau-Bulolo area alone there were about 10 different mechanized operators who used hydraulic excavators, shakers, trammels and screens between 1996-2002. Almost all of these operators are no longer operating.

### **Land Tenure**

Customary land groups are important stakeholders in any resource development in PNG. A customary land group is a group of people clustered in clans and tribes who by custom has the right and responsibility, by heritage or any other customary means to control their customary land and who can make fundamental decisions about their land without reference to other groups.

90 % of land in PNG is owned by Customary Land Groups. No individual or group can trespass other people's customary land without their permission. Landowner consultation commences as early as possible before any development takes place on the land. The provision for warden hearing in the 1992 Mining Act provides the avenue for landowner consultation. Resources developers who conduct landowner consultation from the beginning enjoy community support. This will avoid unnecessary delays.

Government reports and extracts show opposition by customary landowners to excessive acquiring of land by the colonial government to proclaim as goldfields. This occurred in the highlands, Sepik and Bougainville. This led to changes in government laws and policies with regard to land and gave more recognition to customary landowners. The Lands Act recognizes Incorporated Land groups as the legitimate body to consult by government and resource developers. The Mining Act and Royalty Act provide for landowner consultation and benefits respectively. As the result customary landowners are now regarded as important stakeholders in any resource development in Papua New Guinea.

In ASM activities, especially in mining alluvial gold, the Mining Act is in favour of customary landowners and citizens of PNG. Alluvial Gold Mining using non-mechanised techniques is reserved for customary landowners. The current practice in ASM sector is that customary landowners apply for Alluvial Mining Leases (AMLs) and later engage contract miners to develop it. In such situation, no compensation and royalties will be paid because the landowner is benefiting directly. In bigger leases involving alluvial gold mining, 51% of the interest is reserved for citizens. Any PNG citizen regardless of whether he or she is a customary landowner should own the 51%. However, in most cases, the customary landowners would claim the 51% interest.

ASM projects do not have the resources to undertake proper land investigations as big mining companies. Provision for more participation by landowners in ASM activities reduces the enormous task relating to identification of true landowners and boundary demarcations.

Landownership is a big business in Papua New Guinea. When people come to know the economic importance of certain places, various land groups compete for recognition by government and investors as the legitimate customary land group. When there is no compromise it eventually lands in court. Lawyers and other consultants are engaged by landowners to provide technical supports. Ordinary landowners waste a lot of resources on such unnecessary legal battles. Bills get accumulated over time and the landowners pay huge amounts of money to service providers, especially the Law Firms. Mt. Kare in the Enga Province where about 300,000 ounces of gold was extracted during a gold rush in 1988 is a classical example.

## **Stakeholder Interests**

The 1992 Mining Act accommodates customary landowner interests. Alluvial Gold Mining activity is restricted to customary landowners. There is avenue for greater consultation with customary landowners. Landowners are given the option to operate ASM themselves or engage contract miners or form joint venture partners with investors.

The Act works well for other parts of PNG because all mining claims granted during colonial administration had been forfeited and all land is now reverted to customary usage.

The case is quite different in the Bulolo District (Morobe Goldfields) where leases for ASM activities granted under the repealed Act had been legally transferred and subsequently converted. Many miners in the area originally came from other parts of PNG. They migrated during the early days of gold rush and had taken up permanent residency in the area for the last 80 years or so. The younger generation calls Wau-Bulolo home. This is already creating tension with customary landowners who do not regard them as customary landowners.

A workshop was organized by the Small Scale Mining Branch in September 2004 in Wau. The purpose of the workshop was for stakeholders in the Morobe Province to give their views on what should be done to improve management of ASM. This was undertaken in light of a major review of the 1992 Mining Act and the Mining (Safety) Act Chapter 195A.

The important stakeholders identified and included in the workshop include:

- customary landowners;
- customary landowners who are miners;
- former tributors;
- illegal miners
- settlers;
- government;
- academic institutions; and
- the community at large.

All stakeholders agreed that the Mining Act and Mining (Safety) Act have been poorly implemented. They pointed out that the factors that contributed to the poor implementation include:

- under funding of the Small Scale Mining Branch that administers ASM ;
- poor consultation with ASM stakeholders when Mining Act was first drafted;
- inadequate educational awareness that stakeholders are unaware of the contents of the Acts;
- non-availability of separate easily understood codes and standards dedicated to ASM;
- shortage of inspectors and other staff in Department of Mining (DoM).

The stakeholders also agreed that DoM need to employ officers with diversified skills to effectively guide and assist miners. They also stated that there is need for proper storage of data and information to assess the status of ASM in PNG. The mining community is of the view that the Mining Department is not doing enough to disseminate information and knowledge to the mining communities that is mostly consisted of people with less or no education. They mentioned that ASM is contributing significantly to the rural population in PNG and government needs to provide adequate resources to achieve its objectives in rural development through ASM.

The stakeholders showed a lot of opposition to mining activity that is undertaken without due care for environment and land. This is a clear reflection of the importance of land and nature to the livelihood of 80% of the rural population.

The use of mercury to capture fine gold in sluice boxes and poor retorting practices were identified as a community concern. Mercury had been introduced into PNG during the early days of mining. The miners in Wau-Bulolo depend on mercury to capture fine gold in sluice boxes and for recovery purposes. There is need for more awareness targeted at changing unsafe working behaviour of miners.

The stakeholders recommended the following options as a way forward action to mitigate undesirable effects on mining communities caused by mercury.

- More educational awareness;
- Suppliers to take part in awareness;
- Educational awareness to target women and children;
- Impose penalties on miners involved in unsafe practices; and
- Recommend appropriate retorting procedures.

The customary landowners from the Wau-Bulolo area still think that the government failed them. This is because they do not enjoy same control and benefit from ASM activities taking place on their customary land as other parts of PNG. This is because they have been denied proper compensation and royalties from ASM activities on their land for the last 12 years. However, part of the reason is that there are two faction land groups disputing the ownership of 6,000 hectares of the former Morobe Goldfields area for the last 25 years. This makes it difficult for Department of Mining to deal with either one of them. A collective inter-government agency effort is needed to put it to rest.

The landowners as well as miners clearly pointed out that there is need for capacity building programs to equip them to control and manage their activities. The programs should cover all aspects of Artisanal and Small Scale Mining, including law, environment management, business management, prospecting, mining and recovery techniques.

The customary landowners argued that government should not give recognition to settlers who migrated during colonial era. Settlers or former tributors on the other hand regard themselves as part of the community and should not be discriminated. This is an unresolved issue in the area.

The stakeholders generally agreed that:

- mining must be undertaken with proper environment stewardship;
- DoM to provide easily understood safety and environment codes;
- customary landowning group and miners' interests must be protected;
- a proper mechanism is needed for disbursing compensation and royalties;
- capacity building of stakeholders should be a priority; and
- government to put in place mechanisms for non-customary landowners to mine without compromising customary landowner's interests.

The stakeholders also agreed that the major constraints faced by Papua New Guineans in ASM sector include:

- Lack of expertise;
- Lack of finance;
- Lack of Technical and Management skills; and
- Poor infrastructure to support ASM activities.



## **Mining and Processing Techniques**

There is no evidence of mining for precious metals in the history of PNG. Mining and trading gold as commodity to earn money to subsequently create wealth had been a new concept introduced on the primitive society. The techniques of prospecting and mining were also learned from early European miners. Papua New Guineans had this opportunity to learn from early European miners when they were engaged as labourers by early European miners who controlled the sector from 1888 to 1960s.

The Small Scale Mining activities in PNG during the early days were complex and required more investment capital and technical know-how. Small Scale Mining activity during those days involved mining various outcrops especially in the Wau-Bulolo area employing both underground and open pit methods. Dredging activity in the Bulolo valley from 1936-1965 to exploit alluvial gold was a world class operation at that time. Ground sluicing activities were widespread in various parts of the country.

The Mt. Victor Gold Project, New Guinea Goldfields and Porgera Gold Dredging Company were the next lot of Small Scale Mining projects that came on stream in the 1980s. These projects ceased operations in 1990.

In recent times we had the complete mining and processing systems introduced mostly from Australia and New Zealand. This type of system was relatively more complex with integrated mobile equipment and associated ancillary equipment such as hydraulic excavator, bulldozer and front end loader. The standard configuration of such a system would comprise of trammel, custom designed sluice boxes, jigs and concentrators such as knusden bowl, knelson concentrator or riffle tables.

There were nine of such operations mostly in the Wau-Bulolo Districts in the 1990s. Mt Kare Operation employed similar mining and processing systems but closed down due to riot. There were 3-4 of such nationally owned operations, one in Maprik, one in Kokoda and two in Wau. However, all have winded down except for only one operating. The main reasons why such operations are not sustainable include lack of exploration budget to prove up resources, non-compliance and lack of security of tenure.

Even after the 100 years of mining in PNG, there is no obvious trend of transfer of skills and knowledge. Since the departure of European miners due to Independence, many Papua New Guinean miners are still unable to operate mines of the magnitude that were operating during the colonial era. 90 per cent of miners today only use sluicing and panning techniques. They are mostly mining to sustain livelihood and not to create wealth and expand their economic bases.

The setback is due to the following reasons.

- First PNG miner had little or no education;
- Poor or no contact with equipment suppliers and experts;
- Social and cultural factors;
- Lack of security of tenure;
- Lack of finance and inability to source finance; and
- Lack of knowledge and skills to manage large operations.

Consequently the large scale operation of small scale mining activity dropped in PNG. Papua New Guineans who have long history of subsistence farming applied a similar concept to mining. They go to the rivers or mountains to look for gold when they need cash to pay for goods and services. 90 per cent of the more than 60,000 ASM miners in the country fall within this category. There is little or no drive among miners to go into entrepreneurship through mining. Our hope to upscale ASM in PNG is to target the educated and skilled Papua New Guineans. However, there is need for more promotional and educations awareness needed to attract this group of people to invest in ASM activities.

The level of mechanization is unsustainable but the mining population has increased from about 3,500 in 1980 to well over 60,000 in 2001. The activity is pumping about K100 million into the rural economy. 90 percent of these miners use simple mining techniques such as panning and sluicing. About 9 percent of the total mining population use dredges and water pumps. Another 1 percent employs fully mechanized operations comprising bulldozers, excavators and front-end loaders for mining and haulage and screens, shakers, trammels and jigs for processing and concentrating purposes.

Gold pans are sold at various outlets around the country. The price of one pan ranges from US\$15 to US\$50. However, miners do improvise old dishes, pots, etc to start mining. There are stories too that where there are nuggets in clear flowing rivers, villagers dive and pick the nuggets. Other miners do lend their tools to friends and relatives to mine. In this context, mining in PNG can virtually start with no start up capital.

Sluicing can also start with no capital upfront. Miners in Bulolo and Upper Watut had been seen digging trenches with around the same width of a conventional sluice box and place grass, cloth and other improved material as mats to trap gold. Some of them tell us that it does better job than recommended manufactured mats. The miners are more comfortable with this configuration because they do not have to carry the boxes and mats home every time after mining.

However, wooden and metal sluice boxes are also very popular in all parts of the country. Metal sluice boxes are usually bought at local stores. Wooden sluice boxes could be built from local timber and second hand nails.

Panning and sluicing is mostly done to sustain livelihood. However, when capital items including water pumps and dredges are purchased for mining, the miners would definitely want to earn amounts over and above their initial investment. In PNG, Metals Refining Operations, the country's only refinery also has a section called "Gold Pan" that sells alluvial gold mining equipment including dredges. National Gold Limited in Wewak also sells dredges to alluvial gold miners. There are about 30 dredges ranging from 3 inch to 8 inch operating in the Sepik region.

### **Statistics on Gold Production**

The major contributor of Papua New Guinea's gold production from ASM sector since 1922 is the Morobe Goldfields. Production up to 1942 was 70 tonnes of gold. From 1945-1977, the Morobe Goldfields produced an additional 47 tonnes. There was no production for 1943-1944 because of disruption caused by the 2<sup>nd</sup> World War. The Morobe Goldfields comprising Wau and Bulolo is still an important centre for ASM activity.

However, there had been stepped up ASM activities in the Sepik and Enga regions lately. Mt Kare in the Enga Province had a gold rush in 1988 that had an estimated output of about 300,000

ounces (G. Hancock) of gold. Panning was the main technique used by about 5000 people to mine the alluvial gold deposit.

Gold production from the alluvial sector in 1999 and 2000 came to 59,080 and 59,761 ounces (B. Susapu and G. Crispin) respectively. However, on average gold produced from the alluvial sector revolves between 50,000 to 120,000 ounces a year. Some of the gold produced from the ASM sector is smuggled out of the country. There was a case where one person was caught by the Australian Police while smuggling gold through the southern border to Australia. There is high possibility that many of such activity is taking place at our borders.

The main alluvial gold districts and their historical production figures are tabulated below.

Alluvial District	Year of Discovery	Production (ounces)	Period of Production
Sudest	1887	10,000	1888-1900
Gira-Yodda	1897	67,465	1898-1932
Waria	1906	1,028	Unknown
Lakekamu	1906	37,395	1909-1931
Kainantu-Groka	1930	2,024	Unknown
Kuta	1932	3,598	1932-1948
Maprik	1937	52,687	1937-1972
Simbai	1954	3,598	1958-1967
Porgera			
Mt. Kare	1988	300,000	1988-1990
Wau-Bulolo	1922	3,762,000	1922-1977

**Source: Geological Survey Support of Departmental Effort to Promote Small Scale Mining (1987)**

West Sepik, Oro, Western and Bougainville Provinces are also important alluvial gold districts in the country.

Gold production records are very poor due to various reasons. Firstly, leaseholders do not submit their monthly production figures as required by the 1992 Mining Act. Secondly, not all gold produced in the country is exported through the Bank of PNG. Thirdly, there is no consistency in the recording system due to change from Colonial Administration to Independence and liberation of gold trade within PNG in 1987.

Some of the abandoned goldfields has potential for further development, but were most probably left idle because they are remote, decline in gold grade and drop in gold price. Resources in these areas need to be identified and assessed in order to attract miners to return to these alluvial gold mining sites.

Gold production from ASM sector is not as big as all the medium and large scale mines operating in the country put together. However, it has advantages over large and medium mines because cash generated is well distributed, more women and children are involved, less environment damage is caused and it is sustainable.

## **Gold Marketing Practices**

Miners in Papua New Guinea have the freedom to sell their gold to anybody who offers good price. Gold from very remote locations can change hands with at least two field buyers before it reaches the refinery or any of the licensed gold exporters.

Metals Refining Operations (MRO), the country's only metal refinery used to be the main exporter of alluvial gold. However, this is changing due to increasing number of gold exporters.

Bank of Papua New Guinea issues Exporting Licence. At present there are about six licensed gold exporters. Despite this, some of the gold produced from the ASM sector is likely to be illegally smuggled out of the country. It is quite difficult to control the smuggling of gold out of the country.

The Department of Mining used to have an assay laboratory, but this was closed down in 1996. There are only two assay laboratories operating in PNG. Both of these laboratories export gold directly to overseas refineries. Most people engaged in both formal and informal businesses and operating in close proximity to mining communities become the main field gold buyers. They then sell the gold to any one of the exporters.

Many stakeholders, especially customary landowners in Wau-Bulolo area expressed strong opposition to free gold trading during the September 2004 workshop held in Wau. Their argument was that free gold trading encourages illegal mining and smuggling of gold. In the colonial period gold trading was restricted to leaseholders. Most of the gold was sold through the commercial banks. This had ceased since 1987 as soon as national government deregulated any dealing in artisanal and small scale mining produced gold.

The deregulation exempted anybody involved in small scale mining from 10 per cent withholding tax and 2.5 per cent royalty, replacing them with a 5% export duty. However, in 1994 the 5 per cent export duty was completely removed, thus, providing small scale gold miners to enjoy good prices.

Due to the freedom in marketing of gold and no proper control mechanism in place it is difficult to assess the gold production status of the small scale mining sector. However, the miners are enjoying better prices because of more competition among the field buyers. People in the Sepik region are currently bargaining for K29-K30 per gram for gold with average fineness of 90% when the Refinery's price located in Port Moresby is offering K31 per gram for refined (99.9%) gold.

## **Positive Contributions of ASM to Communities**

Our current estimate of miners stand at 60,000 and about 90 per cent of them are involved in artisanal mining, utilizing sluice boxes and gold pans. About 9 per cent are engaged in semi-mechanised operations where water pumps and dredges are employed. Only 1 per cent uses mechanised operations. About 30 percent of the total mining population is children under 16 years of age and another 20 per cent is women. We still think that including seasonal miners and miners in very remote locations, not reached during the AusAid Program, the number can possibly go up to 80-100,000. This is about 2% of the country's 5 million people. Therefore, the sector is providing employment and cash flow to the rural population. It is also contributing to foreign exchange earnings for the national economy.

The social security and structure in PNG custom is centered in sustaining family and relative bonds through helping and sharing. This assures fair distribution of benefits from ASM to trickle down to the entire community. This provides the much needed cash to pay for health and education and livelihood improvements for the under privileged population of the community.

Because of the introduction of the government's user pay policy in 1996, ASM activity is what many would regard as main source of cash income to pay for goods and services. This is the reason why we see increase in gold production during the Christmas Holidays in preparation the coming academic year.

There are sustained multiplier effects of ASM activity in rural communities. The most noticeable example of such effects is in the Wau Town where there are about 6 trading stores. The level of consumption of processed goods in the Wau area is high because there is buying power contributed from income generated from ASM activities. Other rural towns such as Kainantu and Maprik also receive similar effects from ASM activities.

Large scale mines may close and move on, but ASM stays with the community to sustain the huge cash economy gap created as the result of closure of the medium and large scale mines. Medium and large scale mining companies should include ASM in their Sustainable Development and Mine Closure Plans.

### **Examples of Livelihood Improvement to Miners**

About 80% of PNG's 5 million people sustain their livelihood through subsistence agriculture. People just produce enough for personal consumption. The annual cash income reported in ADB reports on Micro-finance in two thirds of the provinces in PNG is around K461 compared with people engaged in ASM activities earning about K250 per month. Therefore, people in locations where ASM is occurring are far better in terms of cash income.

There are increased informal and formal business activities because there is cash flow. Good example is Wau Town, which is a colonial town but it is still sustained. Many people who live in the town are from other parts of the country. Most of these people are not formally employed. They do not make gardens because they do not own land. They survive through engaging themselves in informal business activities sustained by cash flow generated from ASM activities.

Unlike most parts of PNG where houses are basically built of bush materials, semi-permanent houses are increasingly built in the Wau area. Power is connected to most of these houses around the old mine town. People who are not formally employed can still afford to pay for bills. This practice is not common in other rural places in Papua New Guinea. The number of people traveling between Lae and Wau every day is from 500-1000. The minimum spending money one would carry is K40.

During a DoM survey undertaken in May 2005 in the Wau-Bulolo area, it was found that many miners do not give 100% commitment in their ASM activities because they do not own the leases. Availability of water is also an important factor. Miners mine intensively during wet periods. Most miners want to upgrade their techniques. However, what they are earning is not enough to save for improvement. Many non-leaseholders also mentioned that they are comfortable working on their own leases than committing resources on somebody else lease where they lack security of tenure. People living in the Mrs Booth area in Wau has advanced in their savings and diversified

their investment in other business activities. People living in this village come from different parts of PNG with different backgrounds.

### **Survival Strategies of Miners**

It has been noticed on various places that almost all mining communities have gardens. They feel insecure to depend entirely on mining. Most of them mine when their garden is ready for harvesting so that if they do not find any gold they can feed from the garden.

Miners also look after animals that they can be sold or consumed. Mostly, settlers from other places would engage in some additional income generating activities such as raising chickens and pigs. They would also build trade stores or do roadside sales of both store and garden products. This is common along the road between Wau and Bulolo.

The Nangamanga Limited, a company buying gold in the area has been seen operating a credit account for regular customers to borrow money or goods on credit basis. The miner then pays back the credits when he/she finds enough gold to sell.

### **Interaction between Large Scale and Small Scale Mining**

Most large scale mines operating in PNG have potential for ASM after closure. There is significant alluvial gold mining activity in the Ok Tedi River involving about 500 miners. The gold mined is from the tailings, but there could be potential for alluvial gold deposited prior to the Ok Tedi Mining Operation.

The Porgera River used to be a significant alluvial gold mining center. However, because of the drainage of waste and tailings into the Porgera River, it is difficult for miners to continue mining. Some of these people may have been displaced. At the same time there is a continuous influx of people from other parts of the country into the Porgera Valley in search of opportunities brought about by the Porgera Gold Mine.

So far 29 people died associated with illegal mining at the open pit. Some of them were shot dead by security guard during confrontation and others sustained fatal injury while mining or escaping in unsafe mine site environment.

Large Scale Mining Companies who move into alluvial gold districts need to accommodate the existing ASM activity in their mine development and closer plans. They need to support ASM activity as a way of relieving the employment pressure placed on them. During production stages, if original alluvial sites would be covered, the mining company needs to provide alternative sources of income. And during closer large scale operators should identify areas suitable for ASM activity and accommodate ASM in their closer plans.

Dilution of gold grade by waste disposal is another concern for the Artisanal and Small Scale Miner. Large Scale operators should not dump wastes directly into the river containing alluvial ground. Build up of sedimentation would definitely displace alluvial gold miners. Large scale mining operators would need to provide alternatives where feasible.

Some exploration and mining companies responded well and supported the Department of Mining outreach programs. Special requests were made to the Department to assist ASM in their project areas. They sponsored the training programs for the Small Scale Mining Branch to conduct training for miners in the vicinity of their project area. Highlands Pacific Limited and Tolukuma Gold Mine are two classic examples.

### **Mercury Use and Environment Pollution**

Use of mercury for mining and gold recovery is widespread in Wau-Bulolo, Porgera, Mt. Kare and Kainantu Areas. Mercury is placed in sluice boxes for trapping fine gold. It is also used for concentrating and recovering gold. There is high level of mercury present in the mined out locations in the Bulolo and Watut areas. The Bulolo River, Watut River and their tributaries contain mercury from early mining activities.

There is a strong opposition from the community on reckless use of mercury by miners. PNG a very rural based society that is dependent on land and nature for survival cannot afford to contaminate rivers and the natural biodiversity with mercury. The ASM community needs to be responsible in using mercury before the local community turns against them. There is a booklet produced during the AusAid Program that outlines the recommended techniques that miners can adopt.

It is a pity that many people are not aware of dangers associated with mercury use. Extensive educational awareness was carried from 1999 to 2001 during the AusAid funded Outreach program. Most remote locations had no idea about using mercury. We encouraged them not to use mercury. Where mercury is commonly used, the recommended techniques were demonstrated to them.

Miners are seen cooking gold in unventilated huts or just burning over the fire. In some cases it appears to be a behavioral problem. Miners are aware of the dangers and the recommended retorting methods, but yet they like to take short cuts. The 1999-2001 mercury awareness program funded by AusAid was extensive and most probably reached most miners around the country. Its effectiveness is yet to be evaluated in the future.

Miners need to realize the importance of cleaning themselves after being in contact with mercury. They need to change their attitude and keep waste mercury properly buried. Throwing waste mercury into the river or bush appears to become a convenient way out. However, attitude of miners need to be changed to do the right thing. Women and children can be easily affected and reasonable care must be taken to isolate them. Through a survey in the Wau-Bulolo area, men appear to be exposed to mercury more than women and children.

It was revealed during a DoM survey conducted in May 2005 that most amalgamation and retorting are done outside the house. However, people in Maus Kuranga told the survey team that they do burn the amalgam in the house because it is convenient. The usual practice is that miners put the amalgam in an empty tin fish tin and heat it in the open air.

Intensive ASM activity causes considerable amount of damage to the environment if miners do not undertake their mining activity responsibly. In Wau where ASM is intensive, there is high sediment load in the main Bulolo River and its tributaries. There is hardly any settlement pond. Therefore, water discharged from mining sites is usually dirty and highly saturated and is drained directly into the Bulolo River. That is the reason why Bulolo River is dirty and saturated.

People are mining into public assets like roads and bridges. Now mining is entering National Parks and reserved areas. Miners are even cutting down rehabilitated areas and mining the tailing and wastes. Monitoring is becoming difficult with shortage of staff and funding. Most of these miners do not have leases and it becomes difficult to monitor them or penalize them for non-compliance.

Fully mechanized operators that are supposed to adhere to environment and safety codes are living large holes behind. They could be taking advantage of the Department's inability to inspect their operations regularly and punish those that are not compiling with the Law.

Land is important to the subsistence way of life for 80% of the country's rural population. Therefore, undesirable effects of ASM activities on land and the environment would be unacceptable. In order to get community support, miners need to change their attitude and start caring for the environment. More inspection and monitoring is needed to guide miners.

### **Occupational Health and Safety Issues**

The ASM sector records high fatality rate in PNG. Every year about 3-4 miners die from ASM related activities. The main cause of death is falling of overhanging materials on miners while boring or tunneling in alluvial ground. Most ASM miners use hand tools and are not able to remove unsafe overhanging material prior to proceeding. This is the common cause of death in the Kuranga mine site. In most cases miners underestimate the risk of being covered with falling materials and proceed to access the high grade or because it is their only means of survival. Most of this boring is done in alluvial ground and it is not surprising to hear them get killed.

Most miners in the ASM sector lack knowledge and skills on Health and Safety issues. They become blindfolded by the temptation to access the high grade and in the process get killed. Miners do not even take time to identify hazards and risks that could harm them. A fatal accident of such nature occurred in Kuranga, Wau in October 2004. Miners would not report incidents in fear that their mining activity would be stopped by Mines Inspectors.

There is no safety code available to assist miners apart from the Booklet on Health and Safety produced under the AusAid Program. The Mining (Safety) Act is difficult for Artisanal and Small Scale Miners who are usually uneducated or less educated to study and follow. Lack of inspection and enforcement even give miners the freedom to mine in a haphazard manner.

The Department of Mining is critically understaffed. The shortage of staff is leading to collapse in the administration of the sector. Because ASM activity is widespread and scattered all over the area, it is difficult to undertake physical inspections especially when there is lack of staff support.

### **Issues Hindering Small Scale Mining Expansion**

The ASM development trend in PNG is affected by political and development issues, fluctuation of gold price and changes in laws and policies relating to the sector. Since 1888, various parts of the country were prospected and mined. Most of these areas were abandoned due to change in the various factors including gold prices, insufficient resources, remoteness and declining grades.



Quite recently in the late 1960's and early 1970's European miners left due to development on the political front when PNG was preparing for self government and independence in 1975. Following that, there was a decline in gold price that must have chased miners away and they could have ventured into other viable businesses. It is quite important that the younger generation has exposure to ASM. Otherwise, it would become difficult for him/her to get into the art of mining. When a gap is developed, there will be no transfer of skills and knowledge.

Land Access in PNG is quite difficult. Foreigners including other PNG nationals would not easily have access to any land to develop. Customary landowner consultation and approval must be sought first. Customary landowner consultation can be time consuming and expensive. Customary land in PNG is usually a group owned. The whole clan or tribe would have a say and in the process of reaching consensus delay the project. However, customary landowners want to develop their resources, but they want to make sure that they benefit from the development. That is why negotiation before reaching agreement could take more time than anticipated.

Most alluvial gold sites are very isolated. It is risky to take equipment to the site without actually establishing the resources in the area. High Mobilisation and Establishment Costs will be incurred due to unnecessary delays and unpredictable factors. That is the reason why simple non-mechanised techniques are popular because they are easy to mobilize and discard when mining is completed. No maintenance or parts would be needed for non-mechanised techniques.

Access to Finance and Equipment is equally difficult for a Papua New Guinean. Financial organizations do not like to lend money to artisanal and small scale miners. Therefore, when miners ask for loan to undertake mining they would be reluctant to lend. Poor resources definition makes it difficult for miners to project their future cash flows to present to financiers.

Most ASM population lacks the capacity to move into entrepreneurships. Most of them have less or no education. They are satisfied with earning additional income to sustain their livelihood. They lack technical and management skills demanded by mechanised operations. Therefore, more people are involved utilizing non-mechanised techniques because it is the easiest and most convenient option to them.

People from Maus Kuranga in Wau say that they are able to prospect and choose the most idle locations containing alluvial gold deposits, but they are not able to estimate the average gold grade and the total resource. They fear tying themselves to bank loans that they are not able to repay. That is one of their reasons why they do not seek financial services. Most people just mine for the day's consumption and could not afford to accumulate gold and sell it at a later date.

Some of them earn a lot of money from mining, but it is wasted on alcohol and gambling. The money is not used to improve livelihood or upgrade mining techniques. This type of behaviour is working against the government's objective to use ASM to develop rural economy and improve living standards. Most educational awareness is needed to correct such behaviour.

Miners in Edie Creek and Kaindi areas of Wau earn up to K100,000 in one year when they strike gold veins. Some of them became millionaires and bought many businesses and assets. However, due to poor management and social and cultural factors they are broke now.

Government Support has been on the decline and this is becoming critical. If this continues, there will be total collapse in the administration of the sector. Promotional and facilitation activities will be reduced as well.

## Key Drivers Identified for Expansion

ASM activity in the country would expand if the following issues are addressed.

Land access is a concern because it takes longer than anticipated for non- customary landowner to strike a deal with landowning groups to develop small scale mines. This is of concern to the investors who would want to employ fully mechanized small scale mining operations. Resources are limited and investors cannot afford to delay projects. Therefore, there is a need for standardizing the approach that landowners and developers should take which must be efficient and compromising. Similar approach should be taken for non-customary landowners engaged in non-mechanised techniques.

Security of tenure is also a concern and this is also associated with poor resource identification. Some leases that investors mine are 5 hectares or less. These areas have history of alluvial gold mining activity, but because there is inadequate knowledge available about the grade and the total resources, investors are actually taking a risk. This risk can be reduced if government support is provided by way of sampling and grade ascertaining. It would even assist if landowners are assisted to organize themselves and secure leases on viable grounds on the advise of government geologists before investors are attracted to develop it.

It is obvious at present that majority of the people engaged in ASM activities in the country have less or no education. They mine to sustain livelihood. When miners mine a rich ground and make more money, in most cases, they would spend all that proceeds on non-essential consumptions. There is no drive among this group of miners to venture into entrepreneurship. Most miners especially in the Mt. Kaindi area in Wau do not send their children to school as well.

Having more of these groups of people armed with simple mining techniques and engaged in the activity can contribute significantly to the economy of the country. However, to establish a more sustained sector the educated and skilled persons in PNG need to be attracted to venture into ASM. The target group includes experienced miners from large scale mining operations and people with technical and vocational skills. Allowing access to land by non-customary landowners can create useful opportunities for the local community to learn from their close participation with the investors who are usually skilled.

Clear guideline is needed on how landowners should participate and benefit from ASM activity. Since landowners are handicapped with lack of expertise and capital we need to establish a clear guideline on how both parties should reach agreement. We also have non- customary landowners engaged in artisanal mining activities using non-mechanised techniques. The customary landowners regard this as an unacceptable mining activity on their customary land. We still need to accommodate these groups of people for the benefit of both parties.

Financial Resources is another important factor, but the miners need to have the drive to go into entrepreneurship and save money so that financial assistances would be provided. All lending institutions would want their loan repaid with interest within specific period. That would mean that miners would need to have some confidence in the resources that is available to them to mine and repay the loan and create wealth.

The level of funding would also depend on the scale of operations. It may not be possible to secure funding within the country to start fully mechanized operations. However, funding in terms of equipment leasing or monetary assistance to upgrade a small scale mining activity from non-

mechanised operation to semi-mechanised within the K50,000 mark could be available. However, at the same time financiers would be interested to know that the loan is well secured and within income of the borrower.

Personal capacities of miners need to be built in order to expand the sector. Mining training will not be restricted to mining techniques alone as in the past. Instead we need to train people in all aspects to control and manage their destiny. Miners need to be equipped with additional skills in business and management, health and safety, environment and negotiation and dispute settlement skills as well.

Landowner Participation is very important. To begin with, it is fair to say that if customary landowners are not happy, there is no mining. This obstacle needs to be changed into opportunity by either building capacities of customary landowners to become miners or provide clear guidelines for customary landowners to jointly participate and benefit in ASM activities.

Infrastructure Development should be geared towards opening up regions of resource strongholds. When road access is established through various resource centres, it would attract more investors as costs would be reduced. In PNG most alluvial gold districts are not connected by road.

Increase Land Access to potential investors would be a step forward in promoting ASM in PNG. Landowners need to be organized and registration of their customary land would ease difficulties currently faced by investors. Investors do not have the extra money to sit around and spend. As soon as they arrive at the site, they want to develop the resources. The national government through Departments of Mining and Lands and landowners are three key stakeholders that can create the environment for swift development of resources by investors on customary land.

## **Way Forward Projects**

DoM is becoming a Corporate Body called Mineral Resources Authority (MRA) soon. This will give us the flexibility to recruit more people and possibly sufficient resources to facilitate the promotion of the sector. This is not possible now because Department of Personnel Management controls the recruitment and at present there is freeze on all new recruitments. The main source of Department funding at present is from the budgetary allocation that has always been on the decline. The funding for MRA is production based levy which basically means that if the organization is efficient in facilitating mineral resources development more mines will be opened up, thus MRA receiving increased funding to perform its responsibilities.

An AusAid Project was undertaken from 1999-2001. Through that project an advisor, Geoff Crispin was based in Wau and trained local staff in planning outreach and producing educational aids. Seven booklets and videos were produced on aspects of Small Scale Mining. Many of the booklets were sold out on a small price. When funding becomes available and more staff is recruited the teaching materials will still be used again during Outreach Programs.

JSDF Project is funded by the Japan Social Development Fund and managed by Wau Ecology Institute. The project funding is US\$468,300. Through this funding consultants under various terms of references will produce codes for OHS, Environment and provide training materials and training for selected appointees from 16 provinces around the country. This is an exercise to create network of mining communities and build capacities of miners and provincial government officers.

Sysmin Project is funded by the European Union and has allocated a grant of 6.8 million Euros to the Small Scale Mining Branch. This money will be used to build three miners' training centres in Wau, Porgera and Wewak. There is a proposal for a Microfinance facility dedicated to assisting Small Scale Miners with funding needs as well. A women's center will be built under the same funding in Porgera.

## **Conclusion**

ASM is important to rural population and contributes significantly to the economy of Papua New Guinea. About 90% of the mining population engages in the activity to sustain livelihood needs. Another 10% is engaged in the activity as an entrepreneur employing semi-mechanised and mechanized mining techniques.

ASM contributes to the national economy in terms of foreign earnings and employment for the under privileged. Therefore, training and providing of financial products is important to assist the miners to increase their output. Grade ascertaining and resource estimation exercises for ASM is needed to give miners who usually have less capital some leverage and give them the confidence to venture into a scaled up ASM activity.

Corporation from all stakeholders is necessary. Landowners if they participate and get involved in the capacity building programs, they will definitely become a key partner in promoting development and expansion of the sector in PNG. All other miners need to participate in capacity building programs as those that will be provided through the JSDF and Sysmin Projects. Apart from mining and prospecting skills, they need additional training in management, business, law, environment, safety and conflict resolutions.

Miners need to be mindful of expectations from other stakeholders. Customary landowners are important stakeholder who would like mining to be undertaken with minimum environment pollution. They would also like to benefit from mining activities taking place on their customary land. It is important for miners to be aware that they need community support for their mining activities.

The educated and the skilled must be encouraged and attracted to venture into ASM. There is more awareness needed to attract these groups of people to participate in ASM activities.

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