Global Mercury Project

Project EG/GLO/01/G34:
Removal of Barriers to Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies

Technical Report:

A Social-health Perspective of the Miners in Talawaan and Galangan, Indonesia, 2003

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Dr.dr. Rachmadhi Purwana SKM

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Executive Summary

The objective of this study was to explore the social- and economic-status and awareness of the small-scale gold-miners about the harm and danger of using mercury in gold-mining. This study was in line with the forthcoming comprehensive survey on health issues of mercury in gold-mining. The study was organized by a coordinative work of the Department of Energy and Mineral Resources Republic of Indonesia and the United Nations Industrial Development Organization (UNIDO) with the assistance of the University of Indonesia, Faculty of Public Health.

The study took place in two islands of Indonesia, the Kalimantan Island and the Sulawesi Island at the Galangan (Hampalit) Village, Central Kalimantan and in the Talawaan Village, North Sulawesi from April to May 2003. The Talawaan mining ground is an underground mining and the Galangan mining area is an alluvial mining type. The two places are widely occupied by the so called 'mining community' a group of miners and gold collectors with no noticeable legal rights to do the mining business.

A brief survey among the mining community uncovered some information about sociological structure including the daily activities of the miners, the family, and related back-ground of their existence in the mining business.

Characteristics of the mining community in the two places (Talawaan and Galangan) are distinctly different. The mining community at Talawaan is living in groups under shelters at the mining area without family members being involved while each of the member of the mining community at Galangan are living in the mining area with their family in their simple homes with limited provision of basic sanitation facilities. Besides, the group at Galangan has a longer experience in mining business than that of Talawaan.

In both places, the variety of foods they consumed is meager. Instant noodle, vegetables, and rice are the most relied on foods for the miners in Galangan. Water supply in Galangan is mainly from pools of water formed by rain that accumulates in abandoned mining craters. Other choice of water supply is rain-water and dug-well. The abandoned mining craters also function as excreta disposal facility. In Talawaan, water for daily use is obtained primarily from dug-wells, while the main facilities for excreta disposal are bushes and forest or the rivers and dug-pits. Foods for the mining community in Talawaan include rice, fish, vegetables, dried fish, instant noodle, and milk.

Dealing with mercury, the miners in Talawaan primary tasks are digging and excavating ores from underground. They do not directly work with mercury, since amalgamation process takes place in centers for sluicing operated by gold-collectors. On the other hand, the miners in Galangan operate sluice-boxes in the mining (dredging) sites and they work directly with mercury. Besides, the families of the miners in Galangan are potentially exposed to mercury due to the storage of mercury at their homes. Nevertheless, disposals of excess mercury both in Galangan and Talawaan create a health and environmental threat to the community in the vicinity of the mining area.

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1. Introduction

The present survey is a preliminary study for a project on the Removal of Barriers to the Introduction of Cleaner Artisanal Gold Mining Extraction Technologies run in several countries including, Laos, Indonesia, Brazil, Sudan, Tanzania, and Zimbabwe. Two sites were selected in Indonesia, the Galangan (Ampalit) in Central Kalimantan and Talawaan in North Sulawesi.

The two places have seen the intensive small scale mining activities with uncontrolled disposal of mercury to the environment. In light of the mobile nature of the miners, these mining activities are important economic factors in the areas and in 2001 as many as 4700 miners and 150 sluicing units from the adjacent Tatelu village were operating in the Talawaan gold mining site. In the report of 2003 the figures are reduced to 1200 miners and 58 sluicing units (Report from the Tatelu village office, 2003). Meanwhile, the Galangan gold mining site has no up to date record of the total miners in the area. An approximately 12,000 illegal gold miners have been active since the 70s, according to a recent report (Veiga, Back-to-office Mission-report, UNIDO 2003).

A total of 400 miner-community members from the two sites are sampled in this survey to explore a collection of data of their family characteristics, basic sanitation of their homes, mining activities, and some social economic issues. Despite some similarity of the small scale mining operations in the two sites, the Galangan and the Talawaan show different characteristics of miner-community working in the two different sites.

For practical reason, in this study the miner-community are presented in two groups, first as miners, a group of men that mainly rely their work on manual labor and use simple methods in digging and/or crushing the ore and some do also the sluicing and burning of the amalgam. Sluicing, and/or burning the amalgam are mostly done by the collectors, the second group in the miner-community that provides equipments and capital for mining, collects the gold, and/or collects the amalgam. Collectors may have their sluicing place at the mining sites or just do the burning of amalgam at their shops outside the mining sites.

2. Talawaan, North Sulawesi

Talawaan is the name of a village in the subdistrict Dimembe, North Sulawesi, Indonesia. The name stems from the name of a river, the Talawaan River that runs through six other villages. The village Talawaan is adjacent to the Samratulangi airport near Manado, the capital city of North Sulawesi Province. According to a report in 2002, the village covers an area of 14,000 hectares with a population of 3817 inhabitants. The area is a watershed area for the Talawaan River and 2 other rivers. The Talawaan watershed is primarily dominated by agriculture and plantation including the rice-field, coconut, cinnamon, and nutmeg. Downstream areas are dominated by fresh-water fisheries. The watershed area also accommodates dug-wells for the source of water for the people. This is the place where the gold mining activity is found.

Of the 200 respondents that are chosen in Talawaan, 182 are miners and 18 are collectors. Factors around their daily life are studied including their level of educations, dietary feature, and other social life. Since the miners and collectors in Talawaan are living in

groups right over the pits of mining sites no figure of their family is obtained. Other factors among the miners are practically similar to those among the collectors.

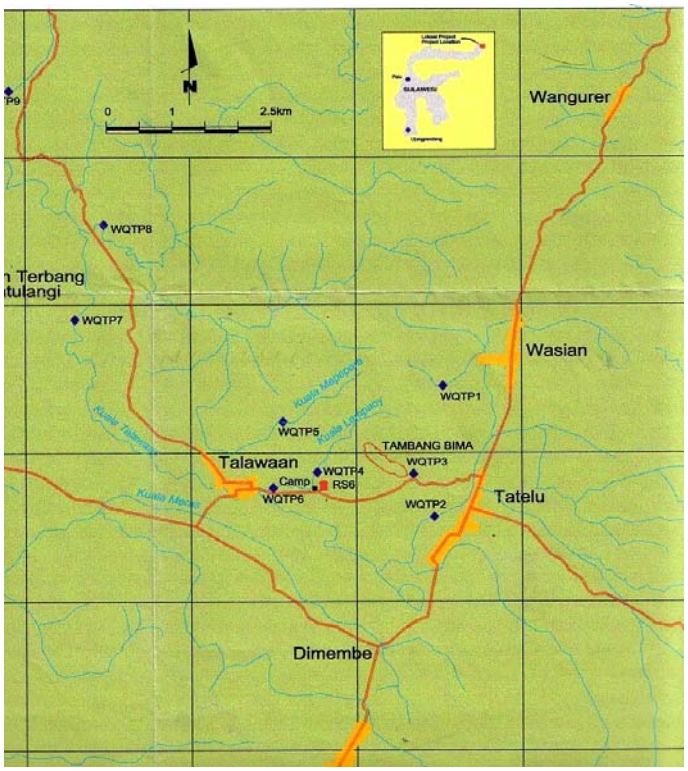

Figure 2-1 **The Talawaan Gold Mining Area, 2003**
(Source: PT. Tambang Tondano Nusajaya)

The Mining Site

The Talawaan mining site is located in a forest on an approximately 12 hectares stretch of high-land. Since the spread of story about the presence of gold ore in the area of Tatelu, by miners of a mining company, since 1998 the operation of the so called people's mining activity began to flourish in Wasian, Taelu, Tatelu Rondor, Tatelu Warukapas, Talawaan, Kolongan, and Tetey villages. This is even so due to the close proximity of the mining area of the company to the paddy field and agricultural areas of the villages. In the year 2000, 200 units of mining operated in the whole area. This growth of people's mining activity raises a negative response from local inhabitants that cultivate fisheries and fruits plantations. The government tried to control the area by restricting the mining area not closer than 700 meters from the rivers or springs and the villages, but the mining activity operates uncontrollably. In 2002, the Board for Environmental Impact Control recorded 3 units of mining points owned by local inhabitants operating in the Talawaan mining site. At that time at least 100 miners were known working in those places.

The gold mining site in Talawaan is an underground mining type and is carried out in pits dug all over the area. A group of men work as a team of approximately 10 persons in each pit under a shelter built over it. These are the miners. All of the miners are from local and surrounding areas in Sulawesi. They also do manual crushing of ore taken from

the pit under the shelter. Bags of crude-crushed-ore are sent to sluicing places nearby where 8 to 12 tumblers powered by generators at each of the sluicing places crush the crude ore into a finer sand that later is cleaned with mercury to extract gold by the operators of the tumblers. Water for sluicing is taken from the adjacent creeks and rivers that run in the vicinity.

Figure 2-2 Activity in a Pit under a Shelter, Talawaan 2003

Figure 2-3 Tumblers in a Sluicing Place, Talawaan, 2003

The cleaning of the finer sand, now called 'tailing', is repeated several times (around 7 times) to extract further the remaining gold before it is dump into the creeks that ultimately run into the Talawaan River.

After the process of amalgamation, to separate gold from mercury, the amalgam will then be burned either at the site for sluicing where the tumblers operate or at other place by collectors that have their own shop in the vicinity. At the sluicing site, the whole operation of amalgam smelting and cleaning of ore are done by men that otherwise operate the tumblers.

A. Demographic Information (Bio-data)

Groups of miners, all male, work in shifts under team leaders. Every team forms a group of miners working a whole day in an underground hole under a shelter. A group of miners work for a capital provider (collector) that rents the land sites and provides operational equipments and facilities on the shared-based production of gold with the team of miners. As has been mentioned before, some of them also operate sluicing site and receive ores from their team of miners or from other groups of miners. Fights and drunks in the area have been reported quite frequently. Fights between the groups are primarily due to the conflicting of interests on the mining spots.

Age

The miners are young, most of them are 22 years old and half of them are less than 26 years old. On average, their age is approximately 27 years ranging from the youngest of 17 years to the oldest of 56 years. The age average of the collectors is more than 32 years ranging from the youngest of 21 years to the oldest of 50 years.

Marital Status

They do not reveal their marriage status and in the mining area they live in a group where all male miners flock together under their shelters and sleep in rows, shoulders to shoulders. They are either reluctant to speak about their family in their home-villages or they are just not married. Most of the collectors also live alone in the mining site, only one of them lives with his family of three persons.

Education

About half of the miners (53.3 %) are educated up to the level of secondary-school and 28.3 % are from the primary-school. Some 18.3 % of the miners have been educated up to the high-school level. Among the collectors, 44.4 % reach the level of education of secondary school, 27.8 % high school, and 27.8 % primary school.

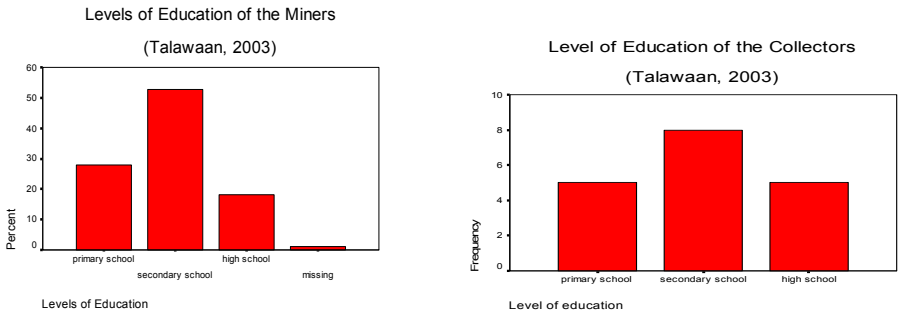

Figure 2-4 Levels of Education

Some of the miners start working in mining since 1979, but most of them start in 2003. In the period from 1999 to 2003, 74.0 % of the miners and 76.5 % of the collectors start their mining business. Their places of origin are villages around the Talawaan mining site or from other parts of Sulawesi Island. No miners or collectors come from outside Sulawesi.

Table 2-1 Demographic Information of the Miners and Collectors (Talawaan, 2003)

	Miners		Collectors	
	Frequency	Percent	Frequency	Percent
N	180		18	
Age Distribution (year)				
Missing	2		0	
Mean		27.11		32.11
Median		26.00		30.50
Mode		22		28
Std. Deviation		7.18		7.32
Minimum		17		21
Maximum		56		50
Levels of Education				
Primary-school	51	28.3	5	27.8
Secondary-school	96	53.3	8	44.4
High-school	33	18.3	5	27.8
Total	180	100.0	18	100.0
Missing	2		0	
Work in Mining since				
1979--83	6	3.3	2	11.8
1984--88	4	2.2	0	0.0
1989--93	12	6.6	1	5.9
1994--98	25	13.8	1	5.9
1999--03	134	74.0	13	76.5
Total	181	100.0	17	100.0
Missing	1		1	

B. Household Structure

Uses of the House

Merely cooking and resting are done in the shelter by 96.2 % of the miners and 94.4 % of the collectors. The shelters are also used for mercury storage besides cooking, resting, and washing by 1.8 % of the miner and 5.6 % of the collectors.

Hygiene and Sanitation

The miners and collectors lives in barracks-like shelters; made of tarpaulin with no partitions, no decent standard home facilities, or specific provision of basic sanitation. Various facilities for excreta disposal are used in the area, including **bush** and **forest**, **lawn**, **dug-pit**, **creeks**, **rivers**, and **water-sealed latrine**. Of all, 53.0% of the miners and 50.0 % of the collectors do it at the bush or sometimes at the forest, dug-pit, and/or creeks. The dug pits facilitate 18.2 % of the miners and 22.2 % of the collectors for excreta disposal. Rivers are also used for excreta disposal. Of the miners, 20.1 % prefer either the Talawaan River or the Tatelu River other than the water-sealed latrine, dug pit, and/or lawn. Only 8.7 % of the miners and 5.6 % of the collectors really use the water-sealed latrine for their excreta disposal.

Table 2-2 Household Structure of the Mining Community in Talawaan, 2003

		Miners		Collectors	
		Frequency	Percent	Frequency	Percent
	N	182		18	
Uses of the house					
Rest (sleep), cooking, bath/wash		174	96.2	17	94.4
Amalgam burning, mercury storage		7	3.8	1	5.6
	Missing	1	.	0	
Hygiene and sanitation (adults)					
Water-sealed latrine		14	8.7	1	5.6
Dug-pit and other		33	18.2	4	22.2
Bush and forest and other		96	53.0	9	50.0
Rivers (Talawaan and Tatelu river)		38	20.1	4	22.2
Missing		1		0	

C. Socio-economic Life

Earnings

The capital providers or collectors have sluicing places and receive sacks of ore either from the group of miners they organized or from other relatively free-lance groups of miners. There is scarce difference of earnings between the collectors and miners, but no miner informs an earning of more than 2 million rupiahs a month. Out of 17 collectors, 12 persons (70.6 %) earn between half to one million rupiahs every month and 53.7% of the miners earn the same. Among the miners, 40.7 % earn from Rp 300,000 to Rp500,000 every month.

Expenditure

On average, the main expenditure of the mining community is for food. The miners pay an average of Rp 170,000 and the collectors Rp 862,500 a month for food. Basically, food for the miners is supplied by the collectors.

Besides food, the collectors also spend Rp 500,000 for rent and Rp 200,000 a month for servants. Other expenditure includes clothing, transport, fuel, and medical purposes. A total average of Rp 372,428.57 is spent by the miners and Rp 1,641,250.00 by the collectors every month.

Table 2- 3 Earning and Expenditure of the Mining Community in Talawaan, 2003

		Miners		Collectors	
		Frequency	Percent	Frequency	Percent
	N	182		18	
Earnings/month					
Less than Rp 300,000		6	3.4	1	5.9
Rp300,000-500,000		72	40.7	3	17.6
Rp500,000- 1million		95	53.7	12	70.6
Rp 1- 2 million		4	2.3	0	0.0
More than Rp 2 million		0	0.0	1	5.9
Total		177	100.0	17	100.0
	Missing	5		1	
Average main expenditure per month (Rupiah)					
Food		170,000.00		862,500.00	
Water		0.00		0.00	
School		0.00		0.00	
Rent		0.00		500,000.00	
Clothing		60,000.00		0.00	
Transportation		32,428.57		40,000.00	
Fuel		60,000.00		0.00	
Servants		0.00		200,000.00	
Illness/medicine		50,000.00		38,750.00	
Total		372,428.57		1,641,250.00	

Water-supply and Water Fetching

Besides the dug-wells, Tatelu River is also used for washing, bathing, and other domestic purposes. Water for daily use is mainly taken from **dug-wells** by 98.4% of the miners and by 94.4 % of the collectors. Two minor sources of water for drinking are **rain** and **spring** waters. It seems that the quality of the water is quite acceptable to the respondents. All the collectors (100.0%) and most of the miners (98.9 %) use the water for drinking without doing any water treatment. Water is fetched by 93.8 % of the miners and 83.3 % of the collectors; the rest of water fetching is done by servants.

Food

The staple food for the mining community in Talawaan is rice, and it is taken every day. Other than **rice**, **fish** is the main source of protein for the miners and collectors. Fish is taken every day by the collectors and only 3 days in a week by the miners. Most of the collectors and the miners do not take **meat, eggs, and fruits** as part of their diet. Both the collectors and miners take **vegetables** every day in a week for their diet. At least two days in a week, most of the collectors and the miners consume **dried fish**, while **instant noodle** is taken by most of the collectors for two days in a week. Milk is consumed by most of the collectors and miners once a week.

Source of Energy

For fuel, **fire-wood** is used primarily by both groups. Up to 79.1% of the miners and 83.3% of the collectors use fire wood for cooking and/or boiling water. Others use alternate fueling of fire wood and kerosene (13.2% of the miners and 5.6 % of the collectors) and only 6.6 % of the miners (11.1 % of the collectors) use only kerosene.

Figure 2-5 Fire-wood Stove at the Mining Site Talawaan, 2003

For lighting, the majority of the community uses the **generator**. Of the miners 87.8 % use this facility and so are 94.4 % of the collectors. Kerosene lamp is an alternative of lighting for 11.6 % of the miners and 5.6 % of the collectors.

Figure 2-6 Kerosene Stove at a Mining Site Talawaan, 2003

Source of General Information

For general information, **radio** is the most favored mean of information for the mining community in the mining site of Talawaan. Of them, 63.7% of the miners and 61.1 % of the collectors say that radio is their most important mean of information. Other sources of information are newspaper, TV, and/or community leader while 16.5% of the miners and 16.7 % of the collectors say that they do not have any source of information.

Figure 2-7 A Miner and His Radio, Talawaan, 2003

Table 2- 4 Basic Needs and Information Source of the Mining Community in Talawaan, 2003

	Miners		Collectors	
	Frequency	Percent	Frequency	Percent
N	182		18	
Source of water for…				
Domestic use				
Dug-well	179	98.4	17	94.4
Rain-water, dug-well	1	.5	1	5.6
Spring-water	2	1.1	1.1	100.0
Bath/wash				
Dug-well	148	82.7	15	83.3
Tatelu river	27	15.1	1	5.6
Creek	4	2.2	2	11.1
Total	179	100.0	18	100.0
Missing	3		0	
Sluicing				
None	150	82.4	17	94.4
Tatelu river	31	17.0	1	5.6
Dug-well	1	0.5		
Source of clean water supply				
dug-well	180	98.9	17	94.4
spring-water	2	1.1	1	5.6
Treatment of drinking water resources				
No treatment	180	98.9	18	100.0
Sedimentation	2	1.1	0	0.0
Water fetching				
Miners/collectors	165	93.8	15	83.3
Servants	11	6.3	3	16.7
Total	176	100.0	18	100.0
Missing	6		0	
Diet (days/per week, mode)				
Rice	7		7	
Fish	3		7	
Meat	0		0	
Vegetables	7		7	
Dried fish	2		2	
Eggs	0		0	
Milk	1		1	

Fruits	0		0		
Instant noodle	0		2		
Missing	0		1		
Lighting					
Kerosene lamp	21	11.6	1	5.6	
Gas lamp	1	0.6	0	0.0	
Generator	159	87.8	17	94.4	
Missing	1		0		
Fuel for cooking					
fire-wood	144	79.6	15	83.3	
charcoal	1	0.6	0	0.0	
kerosene	12	6.6	2	11.1	
fire-wood, kerosene	24	13.3	1	5.6	
Missing	1		0		
Information Media					
None	30	16.5	3	16.7	
Radio	116	63.7	11	61.1	
Radio, TV	6	3.3	1	5.6	
Newspaper and/or radio	28	15.4	3	16.7	
Community leader & radio	2	1.1	0	0.0	

D. Artisanal Mining Information

Working Schedule

The miners work in shifts for 24 hours a day; on average the miners and the collectors work more than 6 hours a day. The minimum they work is 4 hours a day and the miners work a maximum of 12 hours while the collectors work a maximum of 8 hours a day.

Mining Association

Mining for the miners and collectors is an occupation of their own choice. They do their daily work for a period of time in a year. The length of stay in the mining site is highly variable. During the planting seasons they will go back to their hometown to work in the plantation either picking the clover or tilling the paddy fields. Except the collective type of work, in the Talawaan mining site no Mining Association is organized for the mining community. Support in term of food, mining equipments, generators, and medical facilities are given by the collectors. Every group that works in a mining hole has one person as their leader who may also act as a mediator to the collectors in collecting ore and sharing the profits. No member of the family or other relatives is involved in the mining work.

Table 2 – 5 Artisanal Mining Information, Talawaan 2003

Working time hour/day	Miners	Collectors
N	178	18
Missing	4	0
Mean	6.29	6.17
Median	6.00	6.00
Mode	6	6
Std. Deviation	1.16	1.04
Minimum	4	4
Maximum	12	8

E. Equipment and Inputs

Mercury

Mercury used for amalgamation is bought from the shops. In doing their daily activities both the miners and the collectors declare that they do not face serious problem except some minor difficulty in sluicing, uncertain income, and safety or blackmailing.

Table 2- 6 Equipment and Inputs (Talawaan, 2003)

	Miners		Collectors	
	Frequency	Percent	Frequency	Percent
N	182	100.0	18	100.0
Source of mercury				
Shop	10	100.0	18	100.0
Missing	172		0	
Problems in work				
None	179	98.4	18	100.0
Sluicing	1	0.5	0	0.0
Blackmail, high risk, safety	1	0.5	0	0.0
Uncertain income	1	0.5	0	0.0
Effects of mercury on health				
Do not know	82	45.1	9	50.0
Respiratory disease	52	28.6	5	27.8
Skin disease, itch	19	10.4	2	11.1
Mix (skin, hair, respiratory, sight, and/or poisoning)	29	15.9	2	11.1
Effects of mercury on the environment				
Do not know	76	41.8	6	33.3
Damaging the plants	73	40.1	7	38.9
Soil, sewage, (water) pollution	26	14.3	5	27.8
Mix (plant, soil, water pollution, and/or fish)	7	3.8	0	0.0
Sources of Mercury Information				
Just know	91	50.0	11	61.1
Brochures	7	3.8	0	0.0
Friends	31	17.0	3	16.7
Newspaper	27	14.8	0	0.0
Personal experience	25	13.7	4	22.2
TV	1	0.5	0	0.0

Health and Environmental Issues

Awareness of the health effect of mercury among the miners varies. Nearly half of them (45.1%) admit that they do not know what form of damage mercury will do to their health. The rest have only scanty knowledge that mercury may afflict respiratory system, skin, eye, hair, or simply causing illness and poisoning.

Mercury Effect towards the **environment** is also not very popular among the miners. Approximately half of the miners (41.8 %) state they do not know that mercury has any effect on the environment. The other half of respondents has scarce knowledge that mercury may damage plant, water, soil, and fish.

Information sources for the miners about mercury are indistinct. Half of the respondents (50.0%) claim that they just indifferently know (hear-say) about the mercury effects on health and the environment. Others say that they just know it from brochures (3.8%), friends (17.0%), newspaper (14.8%), personal experience (13.7%), or television (0.5%).

The collectors also do not think much about mercury effect on health as well as environment. Fifty percent of them do not know the effect of mercury on health and 33.3% do not know the effect of mercury on the environment. Their knowledge about mercury effect on health and environment is limited to the ill effects on respiratory tract, skin, hair, sight, plants, soil, fish, and water. For the collectors, their sources of information about mercury are vague. They claim that they just know it (61.1 %), or from their own experience working with mercury (22.2 %) or from friends (16.7 %).

F. Property Ownership

Both the collectors and the miners declare that they do not own the gold pits. With their present job at the mining site, they are denied of the ownership of livestock, house, farm equipments, even vehicles.

G. Decision Making on Income and Expenditure

Family expenditure is decided by the 4.0 % of the wives among the miners and 5.6 % of the wives among the collectors. The rest, the miners and the collectors decide their own income and expenditure.

Table 2 – 7 Decision Making on Income and Expenditure, Talawaan 2003

Decision-maker on family expenditure	Frequency	Percent	Frequency	Percent
Respondents	168	96.0	17	94.4
Wife	7	4.0	1	5.6
Total	175	100.0	18	100.0
Missing	7		0	

H. Market

Gold Market

All gold produced is sold to the collectors, except one miner that sell gold directly to a shop. By and large no difficulty is encountered by both the miners and collectors in selling gold. A minor problem of transportation is mentioned by one miner.

Job Preference

Not all have any particular plan for their future job other than what they have been doing just now. Only 41.6 % of the miners have a plan to change the present job to other job namely, their previous job or the alternative job than mining. Most preferred alternative job for the miners is farming (77.1 %). Commerce and construction are other job alternatives for 11.2 % of the miners. Of the collectors, 77.8 % do not plan of changing job and in case that the mining is stopped 88.9 % of them plan to go back to farming and the rest will have commerce as their job of choice. Most of the miners and all the collectors admit that they like working in the gold mining. In general, gold mining is only an alternative job other than their work in the home villages for the miners.

Table 2- 8 Market Scheme at Talawaan, 2003

		Miners		Collectors	
		Frequency	Percent	Frequency	Percent
	N	182		18	
Gold sold to/collected by…					
Collector		104	99.0	14	100.0
Shop		1	1.0	0	0.0
Total		105	100.0	14	100.0
	Missing	77		4	
Problem in selling gold					
None		181	99.5	18	100.0
Transportation		1	0.5	0	0.0
Total		182	100.0	18	100.0
Plan of changing job					
No plan of changing job		101	58.4	14	77.8
Planning to change job		78	41.6	4	22.2
Total		179	100.0	18	100.0
	Missing	3		0	
Job alternatives					
Do not know		16	8.9	0	0.0
Other mining group/agent		4	2.2	0	0.0
Commerce, construction (carpenter)		20	11.2	2	11.1
Farming		138	77.1	16	88.9
Back to home-land		1	.6	0	0.0
Total		179	100.0	18	100.00
	Missing	3		0	
Partiality towards gold mining					
Dislike		2	1.1	0	0.0
Like		179	98.9	18	100.0
Total		181	100.0	18	100.0
	Missing	1		0	

I. Training

Only 2.2 % of the miners admit that they have been trained in mining. The rest, both the miners and collectors have had no training in mining. Nevertheless, no specific benefit of training is declared by the respondents and no information of whom has given the training. Most of the miners and collectors do not show particular interest in training. Only 2.2 % of the miners mention about the need for training in mining but without any recommendation to improve the training.

Comments on license, taxation show that the miners and collectors do not care about the topics. Most of them declare that they do not know about license and taxation. Regarding hygiene and sanitation, 52.2 % of the miners and 27.8 % of the collectors stated that they do not know or without any comments on the subjects. However, 46.2 % of the miners and 66.7 % of the collectors express their concern about hygiene and sanitation. Only 1.6% of the miners and 5.6 % of the collectors are indifferent towards hygiene and sanitation issues. Nevertheless, pollution issue has got a little attention among the miners and collectors. Many of the miners (96.2 %) and the collectors (83.3 %) admit that either they do not know about pollution or just do not have any comment on the issue.

Table 2- 9 Training and General Knowledge, Talawaan 2003

		Miners		Collectors	
		Frequency	Percent	Frequency	Percent
	N	182		18	
Training in mining					
	no	178	97.8	18	100.0
	Yes	4	2.2	0	0.0
Recommendation to improve training					
	None	178	97.8	18	100.0
	Need for training	4	2.2	0	0.0
Comments on					
License					
	Do not know/no comment	181	99.5	18	100.0
	Concern	1	0.5	0	0.0
Taxation					
	Do not know/no comment	180	98.9	18	100.0
	Concern	2	1.1	0	0.0
Hygiene and sanitation					
	Do not know/no comment	95	52.2	5	27.8
	Indifferent	3	1.6	1	5.6
	Concern	84	46.2	12	66.7
Pollution					
	Do not know/no comment	175	96.2	15	83.3
	Indifferent	1	0.5	0	0.0
	Concern	3	1.6	2	11.1
	Against	3	1.6	1	5.6

J. Attitude toward Improvement of Mining Technology

Improvement of mining technology issue is readily accepted by 50.0 % of the collectors and 41.2 % of the miners. Up to 70.3 % of the miners and 72.2 % of the collectors are willing to learn the new technology. Only 12.6 % of the miners refuse to learn the new technology.

Demonstration is a form of training preferred by 54.1 % of the miners and 66.7 % of the collectors. A mix of demonstration and short training is chosen by 35.9 % of the miners and 33.3 % of the collectors.

Regarding problem that may arise with the new technology, 74.7 % of the miners and 55.6 % of the collectors are certain of not having any problem while 17.0 % of the miners and 33.3 % of the collectors are worried about the application of or their inexperience in the new technology. Only 2.2 % of the miners and 11.1 % of the collectors anticipate the problem of using new equipments.

Table 2- 10. Attitude towards Improvement of Mining Technology, Talawaan 2003

	Miners		Collectors	
	Frequency	Percent	Frequency	Percent
N	182		18	
Comments on Improved Technology				
No comment	92	50.5	9	50.0
Indifferent	15	8.2	0	0.0
Good, accept, interested	75	41.2	9	50.0
Willingness to learn				
No	23	12.6	0	0.0
Yes	128	70.3	13	72.2
Indifferent	31	17.0	5	27.8
Form of training				
Do not know	11	6.1	0	0.0
Short training	7	3.9	0	0.0
Demonstration	98	54.1	12	66.7
Demo + short training	65	35.9	6	33.3
Total	181	100.0	18	100.0
Missing	1			
Problem anticipated in new technology				
None	136	74.7	10	55.6
Do not know	11	6.0	0	0.0
Application/inexperience	31	17.0	6	33.3
Use of new equipments	4	2.2	2	11.1

3. Galangan, Central Kalimantan

Galangan or Hampalit Village lies in the Katingan Hilir Subdistrict, District of Katingan, Central Kalimantan, in Kalimantan Island. The District covers an area of 17,500 kilometers square, where a population of 8056 people or 2172 households dwells in the Hampalit Village (office of the Hampalit Village, 2003). **Agriculture** and **plantation** dominate the place with, rice, coconut, pepper, clove, rubber, coffee, and variety of other crops.

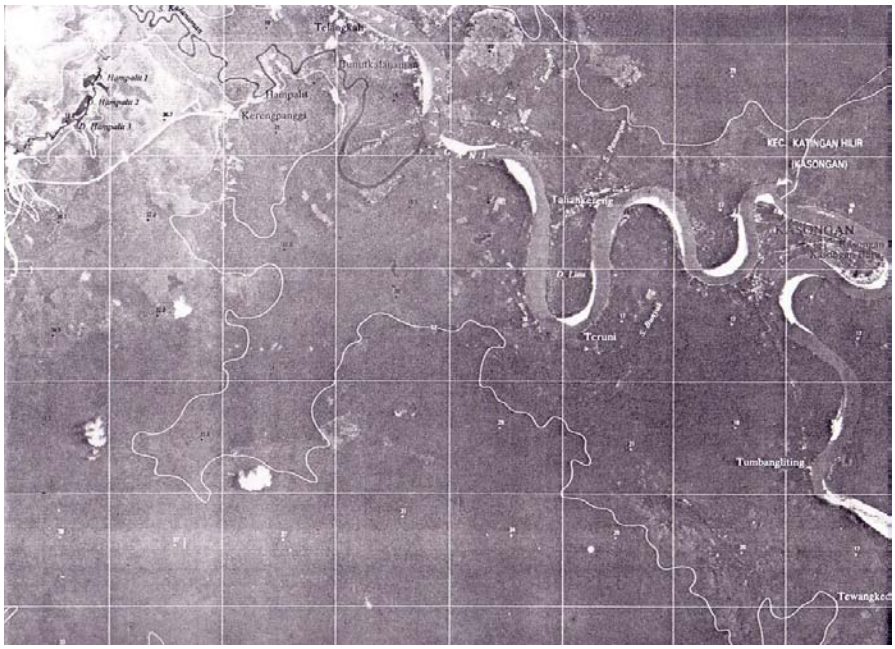

Figure 3-1 Map of Galangan (Hampalit). Central Kalimantan, 2003

Based on the Report in 2002, the Katingan Hilir Subdistrict accommodates 4,648 households with 8,849 male and 8,205 female inhabitants. The district Katingan occupies 11 sub-districts covering a total of 33,143 numbers of house-holds with 120,694 inhabitants (Report of the Bupati of Katingan, 2002).

Table 3-1 Distribution of House-holds by Sub districts in the District of Katingan, 2003

	Sub-districts	Number of house-hold	Inhabitants		
			male	female	Total
1.	Katingan Kuala	8696	12609	11387	23996
2.	Mendawai	1998	4012	3153	7165
3.	Kamipang	1676	3341	3135	6476
4.	Tasik Payawan	1553	3084	2836	5920
5.	Katingan Hilir	4648	8849	8205	17054
6.	Twg. S. Garing	2183	4452	4157	8609
7.	Pulau Malan	1614	3185	3172	6357
8.	Katingan Tengah	4447	9600	8424	18024
9.	Sanaman-Mantikel	2968	6437	5895	12332
10.	Marikit	1336	2795	2626	5421
11.	Katingan Hulu	2024	4716	4624	9340
	Total	33143	63080	57614	120694

Source: Report of the Bupati of Katingan, 2002

The Mining Site

The Galangan or Hampalit mining site is an **alluvial gold mining** type. Mining is carried out in a sandy area among gravels and rocks where man-made craters are spread all over the place. At present, approximately 500 units are operating in the place with 2500 persons involve in the mining business (Ginting, 2003). The place lies approximately 100 km from the Palangkaraya city, the capital of Central Kalimantan. The nearest place to

the mining site is Kereng Pangi, a small town for around 10,000 inhabitants that lies around 7 km from Galangan (Veiga, Back-to-office Mission-report, 2003).

Every day in each of the crater, a group of 4 – 5 men work as a team of miners in a hollow ground they make under the open air. Mud, sand, gravels, and rocks in the crater are dredged with jet of water pumped by a diesel pump. They also do manual crushing of ore at the site. Their working schedule is relatively stable. All the mining activity is done during the day with no shift-work during the night. The miners and collectors are available for survey after their working hours. Nights at the Galangan mining site are tough time when gambling, drinking, prostitution, and fighting take over.

Figure 3-2 The Galangan Gold Mining Area, 2003

Figure 3- 3 Dredging in a Gold-mine Crater, Galangan 2003

A. Demographic Information (Biodata)

Age

All the head of the household interviewed are male; they incorporate the collectors and miners. The collectors are mostly mature; they are on average 35 years old, ranging from the youngest of 20 years to the oldest of 55 years. Most of the miners are 25 years old, ranging from the youngest 17 to the oldest 60 years.

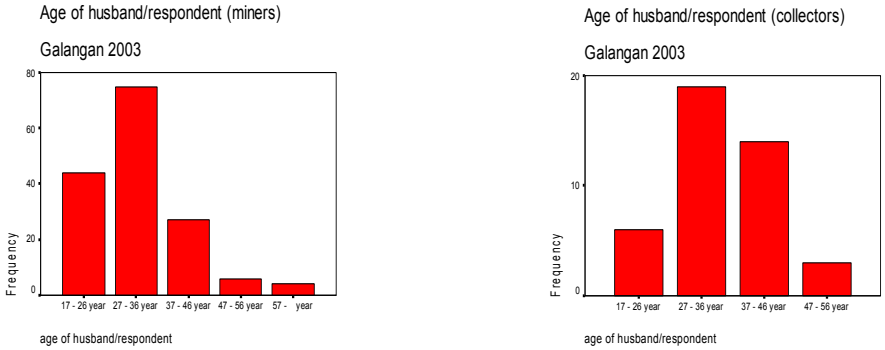

Figure 3 – 4 Age of the Head of the Family

Marital Status

Of the miners, 19.0 % claim that they live with no wife and of the collectors 25.6 % claim the same. Of all, 3.8 % of the miners' wives and 16.7 % of collector's wives are pregnant. One family (2.4 %) of the collectors and 7 families (4.5 %) of the miners have a baby at their homes.

Number of Children

Most of the collectors and the miners have a three-person family-size. The maximum family-size of the miners is 10 persons and the collectors' is 8 persons. Some of the collectors and the miners have children aged less than 3 years and 5 years; one, two, or up to three children in a family.

Highest Level of Education

About half of the collectors (45.2%) are of the level of primary-school and 14.3 % are from the secondary-school. Approximately one third of the collectors (38.1 %) of the collectors get the high-school level of education. The majority of the miners (64.5%) get the primary-school level of education. Only 27.6 % are from the secondary-school.

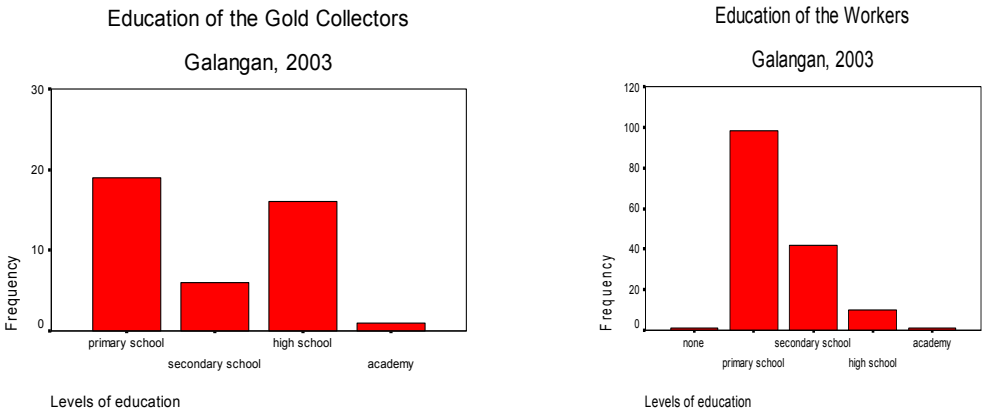

Figure 3 – 5 Levels of Education

The levels of education of the miners' spouse are primary-school (72.5 %), Secondary-school (24.8 %), and High-school (2.8 %). Compared to the worker's, the spouses of the gold collector are more evenly distributed in term of education. Their levels of education are primary-school (38.2 %), secondary-school (35.3 %), and high-school (26.5 %).

Formal education scheme for the children at the mining site of Galangan varies from the level of primary-school, secondary-school, and high-school. Among the collectors, there is one child that has a higher-education.

Length of Stay and Place of Origin

The miners and collectors of Galangan are quite well experienced in mining. Some of them have been working in mining business since 1993 and most of them start their career at the Galangan site since 2002, a year that reflects a beginning of significant increase of mining activity at that place.

Unlike the mining community in Talawaan, who comes from the surrounding areas, the mining community in Galangan includes villagers from local provinces of the surrounding areas of Kalimantan (51.5 %) and migrants from Jawa and Sulawesi Islands.

Of the miners, there are 52.6 % miners from outside Kalimantan and 47.4 % miners from places in Kalimantan working in the mining site of Hampalit. Among the collectors, most of them (66.7 %) are from Kalimantan, only 33.3 % of the collectors are from outside Kalimantan.

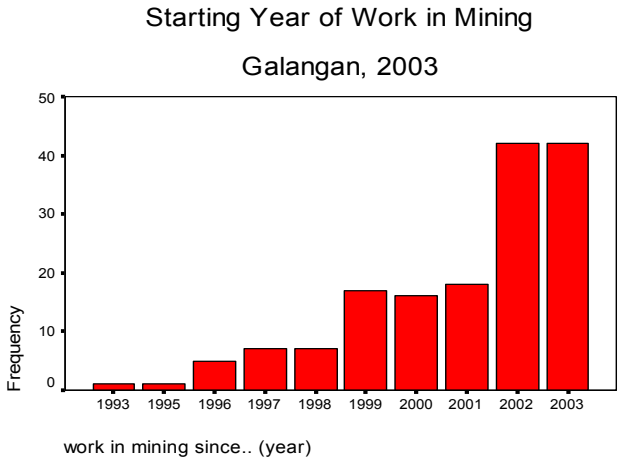

Figure 3- 6 Starting Years of Work

Table 3-2 Demographic Information of the Collectors and Miners (Galangan, 2003)

	Collectors		Miners	
	Frequency	Percent	Frequency	Percent
N	42		157	
Age Distribution (husbands, year)				
Mean		34.95		31.71
Median		35.00		30.00
Mode		35		25
Std. Deviation		7.78		7.97
Minimum		20		17
Maximum		55		60
Missing	0		1	
Range				
17 - 26 year	6	14.3	44	28.2
27 - 36 year	19	45.2	75	48.1
37 - 46 year	14	33.3	27	17.3
47 - 56 year	3	7.1	6	3.8
57 – 60 year	0	0.0	4	2.6
Total	42	100.0	156	100.0
Missing	0		1	
Family:				
Children under 3yrs				
none	35	83.3	129	82.7
1 child	7	16.7	26	16.7
2 children	0	0.0	1	0.6
Total	42	100.0	156	100.0
Missing	0		1	
Children under 5yrs				
None	33	78.6	121	77.6
1 child	8	19.0	30	19.2
2 children	0	0.0	4	2.6
3 children	1	2.4	1	0.6
Total	42	100.0	156	100.0
Missing	0		1	
Levels of Education				
Husbands				
None	0	0.0	1	0.7

Primary-school	19	45.2	98	64.5
Secondary-school	6	14.3	42	27.6
High-school	16	38.1	10	6.6
Academy	1	2.4	1	0.7
Total	42	100.0	152	100.0
Missing	0		5	
Wives				
Primary-school	13	38.2	79	72.5
Secondary-school	12	35.3	27	24.8
High-school	9	26.5	3	2.8
Total	34	100.0	109	100.0
Missing	8		48	
1st child				
None	10	40.0	58	73.4
Primary-school	8	32.0	16	20.3
Secondary-school	4	16.0	4	5.1
High-school	2	8.0	1	1.3
Higher-education	1	4.0	0	0.0
Total	25	100.0	79	100.0
Missing	17		78	
2nd child				
None	6	14.3	16	69.6
Primary-school	6	40.0	6	26.1
Secondary-school	1	6.7	0	0.0
High-school	2	13.3	1	4.3
Total	15	100.0	23	100.0
Missing	27		134	
3rd child				
None	2	28.6	2	40.0
Primary-school	3	42.9	3	60.0
Secondary-school	2	28.6	0	0.0
Total	7	100.0	5	100.0
Missing	35		152	
4th child				
None	1	25.0	1	50.0
Primary-school	2	50.0	1	50.0
Secondary-school	1	25.0	0	0.0
Total	4	100.0	2	100.0
Missing	38		155	
Family-size (persons)				
Mean	3.38		2.92	
Median	3.00		3.00	
Mode	3		3	
Std. Deviation	1.72		1.52	
Minimum	1		1	
Maximum	8		10	
Missing	0		1	
Pregnancy				
No mother/wife	8	19.0	40	25.6
Pregnant	7	16.7	6	3.8
Not pregnant	27	64.3	110	70.5
Total	42	100.0	156	100.0

	Missing	0		1	
Total babies					
	None	41	97.6	149	95.5
	1 baby	1	2.4	7	4.5
	Total	42	100.0	156	100.0
	Missing	0		1	
Work in mining since... (year)					
	1993 -- 1998			21	13.4
	1999 -- 2003			135	86.6
	Total			156	100.0
	Missing	0		1	
Place of origin					
	Kalimantan	28	66.7	74	47.4
	Outside Kalimantan	14	33.3	82	52.6
	Total	42	100.0	156	100.0
	Missing	0		1	

B. Household Structure

The living pattern of the mining community in Galangan is different from that in Talawaan. While the Talawaan mining community lives apart from their family, most of the mining community in the Galangan mining site lives with their family either at homes away from their working place or right at the mining locations.

Figure 3 – 7 A house at the Galangan mining site, 2003

Place of Living

Only 26.6 % of the miners and 12.2 % of the collectors claim that they stay at the mining site. A majority of the mining community choose to live with their family at homes located in various distances from the mining locations. On average, the miner's homes are closer to the mining sites than those of the collectors'. The average distance of the miner's homes is 391 meters with a maximum of 2 kilometers and the average distance of the collector's homes is 4.592 kilometers with a maximum of 25 kilometers from the mining sites. Of all, most of the mining community lives at the distance of 100 meters from the mining sites.

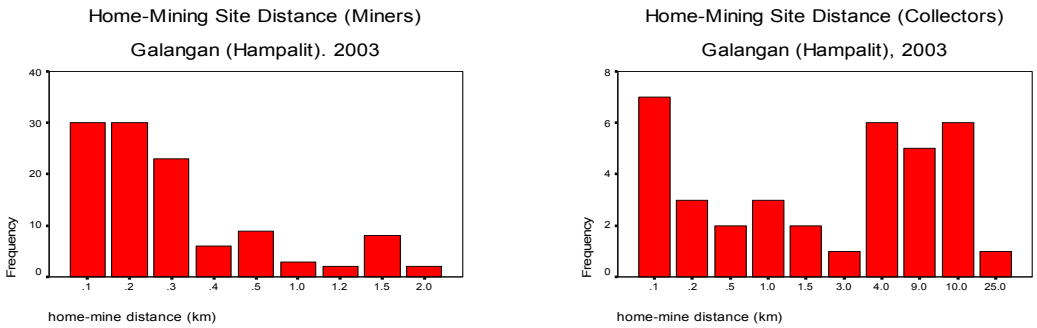

Figure 3-8 Distance of the Mining Site from Place of Living

Uses of the House

The use of some of these houses is for mercury storage and **amalgam burning** which causes a potential problem of mercury exposure to the family. Besides functioned as a place for daily activities (rest/sleep, cooking, and washing) and for children, 81.0 % of the collectors' house and 48.7 % of the miners' house also serve as places to store mercury and/or amalgam burning.

Hygiene and Sanitation

Provision of basic sanitation is also poor. Most of excreta disposal of the adults (73.5 %) and children (78.3 %) among the miners are done at **abandoned craters** which are filled by rain water. **Bushes, forests, lawns,** and **rivers** are substitute places for excreta disposal. Besides bushes, forests, and rivers, abandoned craters for excreta disposal are also used by adults (40.5 %) and children (25.8 %) among the collectors. However, the main facility for excreta disposal among the collectors is **water-sealed latrines**. Water-sealed latrines are used by 50.0 % of adults and 61.3 % of children of this group. None of the adults and children of the collectors use the lawn for excreta disposal.

Table 3 – 3 House-hold Structure of the Collectors and Miners in Galangan Mining Site, 2003

Characteristics		Collectors		Miners	
		Frequency	Percent	Frequency	Percent
	N	42		157	
Place of living					
Home		36	87.8	113	73.4
Mining-spot		5	12.2	41	26.6
Total		41	100.0	154	100.0
	Missing	1		3	
Home-Mining site distance (km)					
N			36		113
Missing			6		44
Mean			4.592		.391
Median			3.500		.200
Mode			0.1		0.1
Std. Deviation			5.303		.437
Minimum			0.1		0.1
Maximum			25.0		2.0
Home use for:					
Rest (sleep), cooking, bath/wash		8	19.0	95	51.3

Children						
Mercury storage and other daily activities		34	81.0		60	48.7
Total		42	100.0		155	100.0
Missing	0			2		
Excreta disposal						
Adults						
Water-sealed latrine		21	50.0		0	0.0
Abandoned crater		17	40.5		112	72.3
Bush/forest		2	4.8		39	25.1
Lawn		0	0.0		2	1.3
River		2	4.8		2	1.3
Total		42	100.0		155	100.0
Missing	0			2		
Children						
Water-sealed latrine	19		61.3	0		0.0
Abandoned crater	8		25.8	72		78.3
Bush/forest	2		6.5	17		18.4
Lawn	0		0.0	2		2.2
River	2		6.5	1		1.1
Total	31		100.0	92		100.0
Missing	11			65		

C. Socio-Economic Life

Earning

There is a distinct difference of earnings between the collectors and the miners. Out of 41 collectors interviewed, 25 collectors (61.0 %) claim income of more than 2 million rupiah every month, while 58.4 % of the miners earn between 500,000 and 1 million rupiah every month. Among the collectors none has an earning in a month less than 500,000 rupiah, but earnings less than 300,000 rupiah in a month is found among the miners.

Expenditure

The **main expenditure** of the family of the mining community in Galangan is for food. Among the miners, 72.3 % of the expenditure is for food while the collectors spend 76.5 % of the expenditure for food.

Water-supply

The use of abandoned craters for excreta disposal poses a potential health problem. Besides rain water and water from the river, 57.6 % of the miners collect water for drinking and daily use from the **abandoned craters**. Water from abandoned craters is also used by 19.1% of the collectors.

Nevertheless, there are alternatives of water sources in the Galangan gold mining site. **Dug-wells** and **rivers** are also used for water supply source by 21.5 % of the miners and 21.4 % of the collectors. Commercially available **bottled water** is also used alternately with other means of water supply by 20.3 % of the miners and 28.6 % of the collectors.

Figure 3 – 9 Abandoned Mining Crater used as a Source of Water-supply, Galangan, 2003

Regarding water quality, 78.0 % of the collectors and 78.8 % of the miners are aware of the **poor quality of the water supply**. They claim that the water is not as clear as it should be. Sedimentation of water is done by 65.9 % of the collectors and 71.8 % of the miners. Some even go on to the **treatment of water** with sand filtration and coagulation. In relation to the water quality, boiling water before its consumption is considered a necessity among the mining community in Galangan. All respondents say that they boil the water for drinking.

Water Fetching

The sources of water are not significantly distant from the dwellings. Usually, fathers take the responsibility of fetching the water. Among the collectors, water fetching is done by 35.9 % of fathers, while among the miners the task is done by 46.8 % of fathers. Mothers take part in water fetching in 17.9 % of the collectors. Some of the water fetching also involves boys, girls, and/or servants.

Food

Most frequent foods consumed by the miners are **vegetables, instant noodle,** and **rice** (staple food). Other choice of foods taken by the miners and their family are fish and dried fish. Meat, milk, egg, and fruits are scarcely consumed. Among the collectors, most frequent foods consumed are **fish, vegetables, dried fish, eggs, milk** and **rice**. Meat is eaten scarcely while fruits and instant-noodle are not favorite foods.

Source of Energy

Source of energy for the household is meant for cooking and lighting. Fuel for cooking varies in Galangan. For cooking, **kerosene** is the main fuel besides **fire wood** and **charcoal**. Kerosene is used by 88.1 % of the collectors and 47.4 % of the miners. Fuel alternative is fire-wood taken from the surrounding places. An alternate use of fire-wood and kerosene for fuel is done by 30.1 % of the miners and 7.1 % of the collectors. Fire-wood alone is used by 19.9 % of the miners. Other types of fuel for cooking are charcoal and gas.

For lighting, **kerosene lamp** is the most favored lighting among the miners and **electric generators** is the most favored among the collectors. Kerosene lamps are used by 57.7 % of the miners and generators are used by 61.9 % of the collectors. Among the miners, 14.7 % use pressured kerosene lamp for lighting.

Source of General Information

For general information and communications, community leader and/or radio, TV, and newspaper play a dominant role for the collectors and miners in the community. Among the collectors, 58.5 % claim that their main source of information and communication are **community leader**. In the miners group, 58.7 % of them claim community leaders as their source of information and communications. Radio is also a potential source of information (18.1 %). But, another 18.1 % of the miners claim that they have no source of information.

Table 3 – 4 Socio-economic Life of the Collectors and Miners at Galangan, 2003

Socio-economic Characteristics	Collectors		Miners	
	Frequency	Percent	Frequency	Percent
N	42		157	
Earning/month				
less than Rp 300,000	0	0.0	3	1.9
Rp300,000-500,000	0	0.0	16	10.4
Rp500,000- 1million	4	9.8	90	58.4
Rp 1- 2 million	12	29.3	31	20.1
more than Rp 2 million	25	61.0	14	9.1
Total	41	100.0	154	100.0
Missing	1		3	
Average main expenditure/month (Rupiah)				
Food	1,905,142.86	76.5	423,065.69	72.3
Water	77,857.14	3.1	0	0.0
School	30,000.00	1.2	5,802.92	1.0
Transportation	200,000.00	8.0	62,992.70	10.8
Fuel	197,142.86	7.9	69,514.71	11.9
Illness/medicine	81,428.57	3.3	23,649.64	4.0
Total	2,491,571.43	100.0	585.025.66	100.0
Missing	7		20	
Source for drinking-water				
Abandoned crater and/or rain, river	8	19.1	90	57.6
Dug-well and/or rain, river, abandoned Crater	9	21.4	33	21.5
Rain, water-pump	9	21.4	1	0.6
Bottled-water and/or rain, river, abandoned crater, dug-well	12	28.6	32	20.3
Tap and/or water-pump	4	9.5	0	0.0
Total	42	100.0	156	100.0
Missing	0		1	
Drinking-water needs clearance				
No	9	22.0	33	21.2
Yes	32	78.0	123	78.8
Total	41	100.0	156	100.0
Missing	1		1	
Treatment of Drinking water Resources				
No treatment	7	17.1	33	21.2
Sedimentation	27	65.9	112	71.8

Sediment with sand-filtration	1	2.4	0	0.0
Coagulant with/without sedimentation	6	14.6	11	7.1
Total	41	100.0	156	100.0
Missing	1		1	
Water fetching				
Father	14	35.9	72	46.8
Mother	7	17.9	0	0.0
Father and/or mother	7	17.9	43	27.9
Boys and/or girls, father, mother, servants	11	28.3	39	25.3
Total	39	100.0	154	100.0
Missing	3		3	
Diet (days/per week, mode)				
Fish	7		2	
Meat	1		0	
Vegetable	7		7	
Dried fish	7		3	
Egg	7		0	
Milk	7		0	
Fruits	0		0	
Instant noodle	0		7	
Rice	7		7	
Fuel for cooking				
Kerosene	37	88.1	74	47.4
Fire-wood, kerosene	3	7.1	47	30.1
Fire-wood	0	0.0	31	19.9
Charcoal, kerosene	1	2.4	2	1.3
Charcoal	0	0.0	1	0.6
Gas, kerosene	1	2.4	0	0.0
None	0	0.0	1	0.6
Total	42	100.0	156	100.0
Missing	0		1	
Lighting				
Kerosene lamp	8	19.0	90	57.7
Pressured kerosene lamp	4	9.5	23	14.7
Kerosene & pressured kerosene lamp	0	0.0	3	1.9
Liquid Pressured Gas lamp	0	0.0	1	0.6
Generator	26	61.9	19	12.2
Generator & kerosene lamp	4	9.5	20	12.8
Total	42	100.0	156	100.0
Missing	0		1	
Source of Information/Communication				
Community leader and other	24	58.5	91	58.7
Radio and other	8	19.5	36	23.2
TV and other	7	17.1	0	0.0
Handphone and other	2	4.9	0	0.0
None	0	0.0	28	18.1
Total	41	100.0	155	100.0
Missing	1		2	

D. Artisanal Mining Information

Working Schedule

On average, the miners work at the mining site about 7 hours a day. They do not work at night. They start the work in the morning until evening. Some of the miners may work only for two hours and some up to 9 hours in a day while the collectors work at least for 6 hours with a maximum of 10 hours a day. In the evening they return home.

Mining Association

With the exception of some miners that are motivated by their relative and the capital provider, 93.5 % of the miners and all the collectors have chosen the mining business by their own. Additionally, they do not belong to any Mining Association since no such association exists in the site. Hence no support whatsoever is given them by any association. Every group that works in a mining crater has one person as the leader or collector. The collectors collect the gold amalgam (bullion) and sell it to the gold shops in the town of Kereng Pangi and/or Kasongan.

In their daily activity, some member of their family are involved in the mining business including wife and son or daughter (5.7 % of the miners and 5.0 % of the collectors), son (2.5 % of the miners), relative (31.2 % of the miners and 5.0 % of the collectors), and seasonal employers (8.3 % of the miners and 7.5 % of the collectors). On the other hand, 51.6 % of the miners and 82.5 % of the collectors work by their own.

Table 3 – 5 Artisanal Mining Information of the Collectors and Miners of Galangan, 2003

		Collectors		Miners	
		Frequency	Percent	Frequency	Percent
	N	42		157	
Working hours/day					
Mean		7.13		7.18	
Median		6.50		8.00	
Mode		6		8	
Std. Deviation		1.28		1.71	
Minimum		6		2	
Maximum		10		9	
Total		40		145	
	Missing	2		12	
Motivation to work in mining					
Self-decision		40	100.0	145	93.5
Relative		0	0.0	9	5.8
Equipment owner		0	0.0	1	0.6
Total		40	100.0	155	100.0
	Missing	2		2	
Persons employed/working in the enterprise					
Nobody		33	82.5	81	51.6
Wife and/or son, daughter		2	5.0	9	5.7
Son		0	0.0	4	2.5
Relative		2	5.0	49	31.2
Seasonal employment		3	7.5	13	8.3
Total		40	100.0	156	99.4
	Missing	2		1	

E. Equipment and Inputs

Mercury

Miners obtain mercury primarily from the collectors (74.5 %) or shops (25.5 %) in the vicinity. In doing their daily activities most of the miners claim that they do not face any **problem**. Some of the miners complain of equipment (10.4 %), uncertain level of income (7.8%), change of mine locations and/or some other problems (10.4 %). For the collectors, 69.0 % of them do not have any problem in their work, 26.2 % feel the problem of uncertainty income and 4.8 % have the problem of capital and cost.

Health and Environmental Issues

Awareness of the danger of mercury seems very **low** among the miners. Up to 86.5 % of them do not know the danger of mercury on health. Also, 82.8 % of the miners do not aware of the effect of mercury on environment. Other miners are aware of scarce information about mercury causing illness and poisoning besides ill-effect on blood, skin, eye, and hair. To the environment they also know that mercury may damage plants and pollute water.

Information on Mercury

The existing source of information on mercury is **not effective** for the miners. Most of the miners (82.7 %) stated indifferently that they just know about all those effects of mercury on health and environment. Information about mercury also comes from brochures, friends, personal experience, TV, nurse, and village authority.

Table 3 – 6 Equipment and Inputs of the Miners (Galangan, 2003)

		Collectors		Miners	
		Frequency	Percent	Frequency	Percent
	N	42		157	
Problems in work					
None		29	69.0	110	71.4
Equipment		0	0.0	16	10.4
Change of location etc.*		0	0.0	16	10.4
Uncertain income		11	26.2	12	7.8
Capital, cost		2	4.8	0	0.0
Total		42	100.0	154	100.0
	Missing	0		3	
Effects on Health					
Do not know		36	87.8	135	86.5
Blood, hair		1	2.4	1	.6
Skin disease, itch		0	0.0	2	1.3
Eye damage		0	0.0	1	.6
Illness, poisoning		4	9.8	17	10.9
Total		41	100.0	156	100.0
	Missing	1		1	
Effects on the Environment					
Do not know		40	97.6	130	83.3
Damaging the plants		0	0.0	16	10.3
Sewage, (water) pollution		1	2.4	10	6.4
Total		41	100.0	156	100.0
	Missing	1		1	
Source of Mercury Information					
Nobody		34	82.9	129	82.7

Brochures	1	2.4	3	1.9
Friends	1	2.4	15	9.6
Personal experience	1	2.4	2	1.3
TV	0	0.0	4	2.6
Nurse	1	2.4	1	.6
Village authority	3	7.3	2	1.3
Total	41	100.0	156	100.0
Missing	1		1	

* including cost, water, high-risk, black-mailing, health, transport, technical know-how, engine trouble, and/or change of location

F. Property Ownership

Gold Pit

Among the miners, 71.0 % claim that they rent the gold pit they work on and among the collectors 23.1 % claim the same. On the other hand, 30.8 % of the collectors and 1.4 % of the miners claim the gold pit as their own property, 2.6 % of the collectors and 0.7 % of the miners claim they hold the license to work on the gold pit, but 26.8 % of the collectors and 43.6 % of the miners admit they do not own the gold pit.

Livestock

The majority of the mining community in Galangan does not own any livestock. Up to 97.4% of the collectors and 90.5 % of the miners claim that they do not own any livestock.

House

Of the miners, 78.8 % of them own their houses while 89.7 % of the collectors also own their houses. Only 5.1 % of the collectors and 8.0 % of the miners claim that they rent their houses and 5.1 % of the collectors and 13.1 % of the miners claim that they just live in their present houses without any proof of ownership.

Farm Equipments and Vehicle

Farm equipments are claimed as their personal property only by 10.2 % of the collectors and 2.6 % of the miners. The rest stated that they do not have any farm equipments. Regarding vehicles, 74.4 % of the collectors have motor vehicles for their own use but only 24.1 % of the miners claim the same.

Table 3-7 Property Ownership, Galangan 2003

Ownership of:		Collectors Frequency	Collectors Percent	Miners Frequency	Miners Percent
	N	42		157	
Gold -pit					
None		17	43.6	37	26.8
Rent		9	23.1	98	71.0
License		1	2.6	1	0.7
Own/property		12	30.8	2	1.4
Total		39	100.0	138	100.0
	Missing	3		19	
Livestock					
None		38	97.4	124	90.5
Own/property		1	2.6	13	9.5
Total		39	100.0	137	100.0
Missing		3		20	
House					
None		2	5.1	18	13.1
Rent		2	5.1	11	8.0
Own/property		35	89.7	108	78.8
Total		39	100.0	137	100.0
	Missing	3		20	
Farm equipment					
None		38	97.4	123	89.8
Own/property		1	2.6	14	10.2
Total		39	100.0	137	100.0
	Missing	3		20	
Vehicle					
None		10	25.6	104	75.9
Own/property		29	74.4	33	24.1
Total		39	100.0	137	100.0
	Missing	3		20	

G. Decision Making on Income and Expenditure

Not all about income and expenditure are decided by the husband alone. Only 43.8 % the husband among the miners and 48.8 % among the collectors decide by themselves about income and family expenditure. In some family of the miners, decision about income and expenditure may be done together with the wife (29.4 %), or together with the wife and the elderly (5.2 %). In other family this decision is made only by the wife (18.3 %) or together with the elderly (2.6 %) or by the husband and the elderly (0.7%). These figures are not so much different in the group of the collectors. Decision about income and expenditure may be done together with the wife (19.5 %), or together with the wife and the elderly (2.4 %). In other family of the collectors this decision is made by the wife alone (22.0 %) or together with the elderly (2.4 %) or by the husband and the elderly (4.9%).

Table 3-8 Decision-making on Family Income and Expenditure, Galangan Mining Site 2003

		Collectors		Miners	
		Frequency	Percent	Frequency	Percent
Husband		20	48.8	67	43.8
Wife		9	22.0	28	18.3
Husband and wife		8	19.5	45	29.4
Husband and elderly		2	4.9	1	0.7
Wife and elderly		1	2.4	4	2.6
Elderly, husband, and wife		1	2.4	8	5.2
Total		41	100.0	153	100.0
	Missing	1		4	
	N	42		157	

H. Market

Gold Selling and Problems

All the collectors claim that they sell the gold to the shops while 97.7 % of the miners do the same. In selling gold 74.8 % of the miners and 87.8 % of the collectors do not face any problem; minor problem seen by the miners and collectors include the price, the long distance of the place to sell the gold, and the difficulty of transportation.

Job Preference

Out of all respondents, 62.2 % of the miners and 53.7 % of the collectors do not plan to change their present job for other job. Most of the miners and the collectors like their present job in mining. In case that the mining business stops, job alternatives chosen by the miners include commerce and carpenter (36.5 %), farming (7.0 %), or finding other mining group (3.2 %). As for the collectors, commerce is the alternative job for 48.8 % of them. Most of the miners (53.2 %) and 51.2 % of the collectors do not know what other job is waiting for them; a suggestion that they have no alternative other than the mining business.

Table 3-9. Market Scheme at Galangan, 2003

		Collectors		Miners	
		Frequency	Percent	Frequency	Percent
	N	42		157	
Gold sold to/collected by…					
Shop		27	100.0	130	97.7
Collector/group leader		0	0.0	3	2.3
Total		27	100.0	133	100.0
	Missing	15		24	
Problem in selling gold					
None		36	87.8	116	74.8
Transportation		1	2.4	8	5.2
Long distant		0	0.0	1	.6
Price		4	9.8	30	19.4
Total		41	100.0	155	100.0
	Missing	1		2	
Plan of changing job					
No plan of changing job		22	53.7	97	62.2
Planning to change job		19	46.3	59	37.8
Total		41	100.0	156	100.0
	Missing	1		1	

Job alternatives					
Do not know		21	51.2	83	53.2
Other mining group/collector		0	0.0	5	3.2
Commerce and/or carpenter*		20	48.8	57	36.5
Farming		0	0.0	11	7.0
Total		41	100.0	156	100.0
	Missing	1		1	
Partiality towards gold mining					
Dislike		1	2.4	8	5.1
Like		40	97.6	148	94.9
Total		41	100.0	156	100.0
	Missing	1		1	

* Only commerce for the collectors

I. Training

No miners and collector have been trained in mining. Therefore, it is not surprising that 84.5 % of the miners and 80.0 % of the collectors have no recommendation to improve any training in mining while 15.5 % of the miners and 20.0% of the collectors express their need in training.

Table 3-10. Training and General Knowledge, Galangan 2003

		Collectors		Miners	
		Frequency	Percent	Frequency	Percent
	N	42		157	
Training in mining					
No		40	100.0	155	100.0
Yes		0	0.0	0	0.0
Total		40	100.0	155	100.0
	Missing	2		2	
Recommendation to improve training					
None		32	80.0	131	84.5
Need for training		8	20.0	24	15.5
Total		40	100.0	155	100.0
	Missing	2	4.8	2	
Comments on					
License					
Do not know/no comment		3	7.5	69	44.5
indifferent		0	0.0	1	0.6
Concern		37	92.5	85	54.8
Total		40	100.0	155	100.0
	Missing	2		2	
Taxation					
Do not know/no comment		3	7.5	83	53.5
Concern		37	92.5	72	46.5
Total		40	100.0	155	100.0
	Missing	2		2	
Hygiene and sanitation					
Do not know/no comment		4	10.0	48	31.0
Indifferent		0	0.0	20	12.9
Concern		36	90.0	87	56.1
Total		40	100.0	155	100.0
	Missing	2		2	
Pollution					
Do not know/no comment		16	40.0	120	77.9
Indifferent		1	2.5	0	0.0
Concern		0	0.0	3	1.9
Against		23	57.5	31	20.1
Total		40	100.0	154	100.0
	Missing	2		3	

Licensing and taxation are well concerned by 92.5 % of the collectors. Among the miners, 54.8 % of them do concern about licensing but 44.5 % do not know about the issue. About hygiene and sanitation, 56.1 % of the miners and 90.0 % of the collectors stated that they concern about the subjects. However, 31.0 % of the miners and 10.0 % of the collectors say that they do not know about hygiene and sanitation while 12.9 % of the miners are indifferent. Regarding pollution, 77.9 % of the miners and 40.0 % of the collectors say that they do not know about the issue but 20.1 % of the miners and 57.5%

of the collectors are against pollution and only 2.5 % of the collectors are indifferent towards the pollution issue.

J. Attitude towards Improvement of Mining Technology

Despite some indifferent and no-comment response, 62.5 % of the collectors and 46.5 % of the miners are interested in the improvement of mining technology issue. No comment response is seen among 52.3 % of the miners and 37.5 % of the collectors, while only 1.3 % of the miners are indifferent. Willingness to learn is expressed by 49.7% of the miners and 62.5 % of the collectors while 49.7 % of the miners and 30.0 % of the collectors are indifferent in learning a new technology. Only 0.6 % of the miners and 7.5 % of the collectors refuse to learn the new technology.

Regarding method of learning, 44.5 % of the miners and 55.0 % of the collectors choose the method of demonstration combine with short training while 43.2 % of the miners and 7.5 % of the collectors prefer demonstration and 5.2 % of the miners choose short training only. However, 7.1 % of the miners and 37.5 % of the collectors do not know what method fit for their learning the new method.

With the introduction of the new technology, 69.7 % of the miners and 75.0 % of the collectors are confident of not having any problem while only 9.0 % of the miners and 22.5 % of the collectors are concern about the application of or their inexperience in the new technology. Others are worried about cost and the use of a new equipment or just do not know whether there will be any problem in using the new technology,

Table 3-11. Attitude towards Improvement of Mining Technology, Galangan 2003

	Miners		Collectors	
	Frequency	Percent	Frequency	Percent
N	157		42	
Comments on Improved Technology				
No comment	81	52.3	15	37.5
Indifferent	2	1.3	0	0.0
Good, accept, interested	72	46.5	25	62.5
Total	155	100.0	40	100.0
Missing	2		2	
Willingness to learn				
No	1	0.6	3	7.5
Yes	77	49.7	25	62.5
Indifferent	77	49.7	12	30.0
Total	155	100.0	40	100.0
Missing	2		2	
Form of training				
Do not know	11	7.1	15	37.5
Short training	8	5.2	0	0.0
Demonstration	67	43.2	3	7.5
Demo + short training	69	44.5	22	55.0
Total	155	100.0	40	100.0
Missing	2		2	
Problem anticipated in new technology				
None	108	69.7	30	75.0
Do not know	22	14.2	0	0.0

Application/inexperience		14	9.0	9	22.5
Use of new equipments		2	1.3	0	0.0
Cost		9	5.8	1	2.5
Total		155	100.0	40	100.0
	Missing	2		2	

4. Conclusion

The social characteristics of the mining community in Talawaan are different from the mining community in Galangan. All of the miners and collectors in Talawaan are from local villages in North Sulawesi while those in the Galangan mining site are from local provinces and surrounding areas of Kalimantan or migrants from Jawa.

Family life as a unit of family is more obvious in the mining community of Galangan than that of the Talawaan. Most of the time, the Talawaan miners and collectors work and stay together with their coworkers in the mining site under shelters that cover the mining pits, while the mining community in Galangan stay with their family in their own homes. In both places, the miners have a rather limited standard of living with poor basic-sanitation provisions.

In relation to their work, the Talawaan miners are mostly newcomers compared the Galangan miners. In their daily work, the Talawaan mining community does not directly work with mercury while the Galangan miners do their amalgamation at the mining sites. These miners inhale mercury fume released from the burning of amalgam.

Therefore, two potential health risks among the mining community in the two sites are identified; they are the risk of communicable disease spread among the mining community and the risk of mercury contamination both for the mining community as well as the community of the surrounding area. Both risks are related to the environmental factors and human behaviour. Regarding the introduction of a new technology, both the Galangan and Talawaan mining community show their interest in the new technology of mining.