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Small-Scale Mining in Indonesia

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Summary

Ancient Sanskrit documents translated by the Dutch, reportedly mention Sumatra rich in gold. Small-scale gold mining is deemed to have begun before the Dutch East Indies Company at the beginning of the 17th Century. The evidence is reported from alluvial workings, tunnels, diggings, shafts, aqueducts and sluices.

Gold mining in Kalimantan was active during Hindu times, but more active between the 4th to the 18th century within the so-called Chinese Districts of West Kalimantan, although not necessarily on a continuous basis.

Alluvial diamonds have been known in Kalimantan since the 7th century and occur over a wide geographical area within that island. Traditionally diamond mining has historically been done on a small scale by family units. Dutch attempts to recover diamonds on a large scale failed. Production figures are reported as incomplete and unreliable. The most active period is reported to have been in the 18th Century.

Although the Dutch colonized Indonesia for 350 years prior to Indonesian Independence in 1945, and carried out limited mining operations in tin, gold and coal, the country did not become a real mining nation until after 1967. Today Indonesia is a leading mining country in Asia for its tin, nickel, copper-gold and coalmines. This has been done with the help of foreign companies and foreign investment.

The paradox is that today, regulated mining is well an organized industry, while small scale, mining is not. This fact is an irony of small-scale mining in Indonesia to day. It represents a complete waste of human resources, natural resources, and loss of government revenue.

Small-scale mining today is completely unregulated, is hurting the environment as well as polluting Indonesia's rivers with mercury, and for the most part is "tax exempt." This is because 90% of small-scale mining in Indonesia is regarded by the authorities as "illegal."

In this year 2001, Indonesia is now in transition to a democracy, and by all indications, the country is moving in the right direction. The Indonesian small-scale miners could be a tremendous resource to Indonesia if only they could be organized and managed by the government, or agents of the government. The problem is the government not only lacks funds, but also expertise. The government also has many other pressing matters to correct.

What is definitely needed as more proactive in-put by the regulated mining companies operating in Indonesia, under a program of tax incentives. Mining companies, the Indonesian Mining Association and government, centrally and regionally, must now work

closely together to solve the challenges of small-scale mining in Indonesia, and tap into this very valuable natural resource of minerals small-scale miners.

The following report tries to highlight some of the major challenges.

Introduction

Small Scale Mining (SSM) in Indonesia essentially consists of four major sectors:

- Gold mining
- Diamond mining
- Coal mining
- Tin mining

Other sectors includes industrial minerals such as zeolite mining, kaolin clay mining, and collecting of boulders and rocks from rivers for landscaping.

In writing this report, the writer frequently used real examples from gold mining areas Talawaan, Tatelu and Ratatotok in North Sulawesi. These examples are reported from field studies by 1) URS Dames & Moore 2001 final report, 2) CIDA 2000 report. Both reports are listed in section 10. Research Task V & VIII.

This report is also based on the writer's experiences and observations in the SSM gold and diamond fields of Indonesia, from 1974 to present.

This study deals primarily with gold SSM, and secondarily with tin, while only touching on coal and diamonds.

No fieldwork was carried out during this research since this was not a requirement.

Current Legal Status and Definitions of Small-scale Miners in Indonesia

"Official" definitions are open to interpretation. It should be noted unofficially almost all miners are often referred to as illegal miners, even though they may have the required papers from the local authorities. This is a hangover from President Soeharto days, when all SSM operations, (except for diamonds,) were essentially regarded as illegal.

Table I. Small-scale Gold Mining in Indonesia. Partially Regulated and Non-regulated. (2001)

Small scale mining Regulated	Status	Financing	Regulatory Requirement	Estimated workers
National groups	**Co-operatives,** or KUDs, are operatives operating locally with provincial/.regional permits **Pertambangan Rakyat** or Peoples Mining in	Small	Some	20,000 1,000

	diamond fields.			
Small scale miners Non-Regulated	Status	Financing	Regulatory Requirement	Estimated workers
Nationals only	**PETI- or illegal miners**, mining gold and coal 1. PETI category I. Traditional Miners from mining location area. (casual workers) 2. PETI category II. Traditional Miners and those from out-side area (casual to full time) 3. PETI Category III. Traditional/Outsiders with out-side backers (full time)	 Nil Some A lot	Not Enforced “” ””	 5,000 15,000 60,000

Koperasi Unit Desa or KUDs - are local village cooperatives operating locally with local permits. The process for applying for a permit is very bureaucratic, and until the economic crisis in 1997, the number of permits granted was quite limited. In 1994 there were 15 permits granted to village cooperatives. In 2001, there are 4,350 Units operating in the Bangka and Belitung tin fields. In order to alleviate the economic situation on Bangka and Bilitung the national tin company, PT. Timah allowed local people to mine their former tin concessions, thus the increase in the number of permits. Problems relating to this new SSM tin situation are outlined later.

Pertambangan Rakyat or Peoples Mining - are gold or diamond SSM operators who work under a permit, or who as a group are allowed to mine the alluvial diamond fields in South Kalimantan and parts of West and Central Kalimantan. Specific areas with alluvial diamond potential were decreed to “Peoples Mining” by President Sukarno during the 1960’s. No commercial mining or commercial operators can work in these areas.

Traditional miners - This group is essentially gold or diamond seekers, and may not have a specific category name. They are villagers with a natural instinct to pan for gold when river conditions are right. Small-scale mining is carried out on a casual basis. In Kalimantan this group generally live in remote villages and work their gardens for food. After it rains, rivers swell and sometimes flood. New fine gold is usually deposited on the up-stream side of sandbars and river ox-bows. After the flooding subsides, these traditional miners, men women and children pan these gravel bars. The entire operation resembles a picnic affair, a day on the river, than anything else. These SSMs cause no conflict with commercial mining companies or government.

Illegal miners - (or PETI- **Pe**rtambangan **T**anpa **I**zin, or mining without permits) are not only called illegal because the do no have permits. They also operate within mineral tenures of legal companies (Contracts of Work CoWs, Coal Contracts of Work, or Kuasa Pertambangans, KPs) Besides operating without any care for the environment, this group of illegal miners are causing the biggest problem of all to commercial mining operators and government alike. They are subdivided further into three groups. Please note:

- There are no legal codes and regulations in place for small-scale miners other than in mining law 11 of 1967, (11/1967).
- The Indonesia of 1998 is not the same as Indonesia of 2001. Indonesia is now emerging as a democracy, with multiple new laws coming into place. A complete new structure of government is in process, from centralized to decentralized government. This will take years to restructure and perfect.
- A new mining law is still in draft form. It has not been passed by parliament yet, so is not official. The new mining draft law is supposed to make changes to old law 11/1967. In the mean time all the decentralized governments, (that is 34 provinces, 268 regencies and some 72 municipalities) are making their own laws and interpretations to raise revenue. It is anticipated they will be making new provincial/regional laws and legislation regards small-scale mining.

The 11/1967 mining law states:

Article 1. Control of Minerals. All minerals found within the Indonesian mining jurisdiction in the form of natural deposits, as blessings of God Almighty are national wealth of the Indonesian people and utilized by the State for the maximum welfare of the people.

Article 5. Mining can be conducted by:

1. A Government agency appointed by a minister
2. A State enterprise
3. A Regional enterprise
4. An Enterprise with joint capital between the State and the Region
5. A Cooperative
6. A private body or individual who is qualified as referred to in article 12 paragraph 1
7. A Enterprise with joint capital between the State and/or the region and a cooperative and/or the qualified person as referred to in article 12 paragraph 1
8. By way of Peoples Mining

Article 11. Peoples Mining:

1. The objective of Peoples mining is to give the local population opportunity to exploit minerals in their efforts to participate in the development of the state in the field of mining under the guidance of Government.
2. Peoples Mining can only be carried out by local people holding a Mining Authorization (permit) for Peoples Mining.
3. Provisions on Peoples Mining and methods and conditions of obtaining a Mining Authorization (permit) for Peoples Mining shall be regulated by Government Regulation.

Chapter VI - Procedures and Requirements for obtaining a Mining Authorization.
Article 17 - Application for a Mining Authorization shall be submitted to the Minister.

Article 18 - The application for a Mining Authorization will only be considered by the Minister after the applicant has proved his ability and capability with regard to the intended mining activities.

Chapter VII - Termination of Mining Authorization
Article 20 - Mining Authorization, terminates:

1. By its returning
2. By cancellation
3. Due to the expiration of its term

Article 30 - After completion of the mining for minerals in a certain mine, the holder of the relevant Mining authorization is obliged to restore the land in such a condition so as not to evoke any danger of disease or any other danger to the people living in the environment of the mine.

Chapter XI - Penalty Provisions
Article 31
Anyone carrying out mining activities referred to in Articles 14 and 15 without holding a Mining Authorization is liable to imprisonment not exceeding 6 years and/or a fine not exceeding five thousand Rupiah, (Note: in 1967 this would have been US$1,000.00. In August 2001 was worth US$58.00).

Table II. Comparison of Law 11/1967 and New Draft Mining Law

Issues	Law No. 11/1967	New Draft Law, 25th May 2001 version
1. Control of Minerals	• National asset • Controlled by the State • Explored and utilized to the fullest for the prosperity and welfare of the people • Control held by central Government	• National asset • Controlled by the state • Explored and utilized to the fullest for the prosperity and welfare of the people • Control held by the state and local governments
2. Authority in Mining Management	• Central government's authority • Is very dominant • Local governments authority is minimum	• Central governments authority is reduced • Local governments authority is clearly defined
3. Categorization of Minerals	• Strategic • Vital	• Radioactive • Metal

	• Category C	• Non-metal • Coal, Peat, and solid peat • Geothermal • Groundwater
4. Permit and Agreement	• Mining Right • Local Mining Permit • Peoples Mining Permit • Contract of Work	• Mining operation permit (IUP) • Peoples Mining Permit • Mining Operation Agreement • (PUP)
5. Mining Operators	• Domestic investors • Foreign investors • ***Peoples Mining***	• Domestic investors, (IUP), (PUP) • Foreign investors (IUP), (PUP) • ***Peoples Mining***
6. Issuance of mining permits	• Central Government (Commercial foreign+Domestic) • Regional Government, (Local only)	• Regency/Minicipality • Provincial Governor • Depending on certain specifics
7. Community Development	• Not Regulated	• Regulated

Source: Department of Energy and Mineral Resources/Directorate-General of Geology and Mineral Resources. 2001

Characteristics of Status, and Role of Importance of Artisanal and Small-scale Mining in Indonesia

The following data is taken from the CIDA Project and the URS Dames and Moore reports on North Sulawesi.

Work Force

Work force involved in mining at three sites studied in North Sulawesi is outlined in Table III.

Table III. Surveyed Work Force at Three Gold SSM sites in Northern Sulawesi, 2000

3 Areas of gold SSM in North Sulawesi	Number of workers	Specific Jobs
Talawaan Area	2,700 to 3,000	Mine workers = 1,250 Trommel workers =1,080 Transporters = 250 Miscellaneous = 120 On site at any given time= 1,500

Tatelu area	299	
Ratatotok area	47	
Total	**3,346**	

Characteristics of Miners

- *Origin*: 75% of laborers come from outside the community
- *Age*: Range in age from 14-69
- *Education*: No trends: equal numbers ranged from primary school, middle high, to high school.
- *Previous Work History*: Miners or farmers
- *Current (Year 2000) mining activities of workers*: 1) Mining 2) Manual crushing of ore; 3) Processing of ore, (loading and unloading activities) 4) Roasting the amalgam
- *Wages*: Rp100, 000 to Rp400, 000 per month. (Current Exchange rate = Rp9, 200). Therefore wages range from US$10.86 per month to US$43.47 per month
- *Children*: Some children help with manual crushing activities.

SSM Illegal Mining Operational Costs and Revenues

The impetus to start an illegal SSM operation tends to come from:

- A capital investor may for instance be an Indonesian Chinese local storekeeper, restaurant owner. They could be an Indonesian businessman, military man, or policemen. Some investors may even be rich Jakartans, Surabayans or other distant city dwellers. They themselves likely know nothing about mining, and less likely even visit the mining site.
- These investors provide seed money for the operation, stamp mill and/or trommels, water pumps etc.,
- The investor generally provides technical expertise persons or expert mine workers.
- Land owner provides the operational site.

SSM Operational Expenses Liable to the Investor

- Permit fees for mining and milling operations, (i.e. illegal permits from police, army government agents, etc.,)
- Participation and site entry fees, (paid for by the investor to private land owner,)
- Trommel and/or stamp mill capital costs.
- Daily wage rates.
- Ore transports costs.
- Milling costs

The investor will then receive capital returns on his investment. Generally, he will maximize his own profit by "squeezing" the pay of workers.

It can become more complicated when investors simply fund the stamp mills and/or trommel processing plants. The investor then collects an NSR equivalent as well as user charge for the stamp mill/trommel facilities. Ore in 50 kg sacks delivered by groups of workers from their own shaft or trench to the investors processing plants.

In this case, the standard is the plastic or fibreglass ore sack, originally containing fertilizer in most cases, to transport the ore. A sack of ore, sometimes termed a *rempel,* abbreviated to *remp,* weighs up to 50 Kg. The standard is not placed on the 50 kg but the gold content. An ideal *remp* should produce at least 4 gms of gold to cover costs, ideally in the first mill and trommel cycle. This is the "toll" charge for other *remps* to follow. One *remp* may take 4 hours to process in a trommel unit drum, followed by a second cycle of 30 minutes.

Estimates of operations are given in Table III IV and V below. Some of these detailed estimates are taken from real situations in Talawaan, North Sulawesi. (after the URS Dames and Moore final report, 2001), while others are estimates of the writer. However, in all cases the numbers are accepted as being very fluid.

Table III. Non-official Statistics of Miners, Location, Types of Mining, Estimated Production, and Revenues

Types of Minerals being mined	Estimated* number workers	Island	-Types of small scale mining	Processing	Estimated ** Annual production	Estimated ** Annual Average Revenue
Gold-alluvial	50,000	Java, Sumatra, Kalimantan, Sulawesi, *Irian Jaya*	-Traditional panning -Sluicing-monitoring river bank areas using water pump -Dredging in main rivers using raft dredges with water pump suctions	-Panning Mercury	25 tonnes	US$120 US$400
Gold-Artisan	10,000	Java, Sumatra, Kalimantan, Sulawesi	-Epithermal quartz veins down to 10 metres or more -Working in commercial mining pits	-Panning -Stamp mills -Mercury in trommel -Amalgamation -Roasting	5 tonnes	US$120-US$400
Diamonds-alluvial	1,000	South Kalimantan West Kalimantan Central Kalimantan	-Panning in rivers -Shafts and underground drifts	-Panning and hand sorting	33,600 carats	US$350 to US$3,360
Coal	20,000	East Kalimantan	-Digging -Bulldozing -Back-hoe digging working in commercial mining pits	-Stockpiling and shipping by truck or by boat	4,000,000 tons	US$150-US$500
Tin	20,000	Bangka Bilitung *Singkap, East Sumatra*	Not certain	-Selling to PT. Timah and private concerns	42,000 *** tonnes	US$150-US$400
Clays	2,000	Java, West Kalimantan	1) Trenches, open pits and cuts	-Stock piling and shipping by truck To ceramic factory in West Java	Not known	Not Known
Zeolites	3,000	West Java South Sumatra	1) Trenches, open pits and cuts	-Stock piling and shipping by truck and ship	Not Known	Not Known
Landscaping boulders, fossilized wood, Carving stone	3,000	West Java West Sumatra	-Searching river banks -Diving in rivers	-Stock piling and shipping by truck for processing and polishing	Not Known	Not Known

*Source: Based on educated guess when traveling through these areas, and revised after official figures. Official figures give 65,000-75,000 small-scale miners in Indonesia **Source: Indonesian Mining Association, and revised by this writer. *** Tempo Magazine, Sept: 2001.

Table IV. Theoretical budget, Using Estimates from Talawaan, North Sulawesi

Item	Units	Assumption/Calc		Item	Units	Assumption/Calcul	
		Min	Max			Min	Max
General				Processing-outputs			
Gold Price	US$	265	265				
Exchange Rate	Rp/US$	9,000	9,000	**Mercury**			
Gold Price	Rp/g	76,680	76,680	Total Hg Lost	Kg/day	99	291.60
Work Force	Persons	2,700	3,000	Hg lost to Air	Kg/day	6.624	12.96
				Hg Re precipitated	Kg/day	3.31	6.48
Mine Prod'n				Hg lost to Enviro't	Kg/day	96.05	285.12
Operating shafts	Shafts	50	100	Hg lost to Enviro't	T/year	35.06	104.07
Production	Bags/shaft/d	21	21	Hg in Tails	Kg/day	94.39	184.68
Bag Weight	Kg	45	45				
Mine out put	T/day	47.25	94.5	**Through-put**			
				Capacity	T/day	149	292
Processing				Capacity	T/year	32,640	63,860
Plants base	Number	138	138				
Plants Remote	Number	0	132				
Total Plants		138	270	**Waste Water**			
Drum Capacity	L water	10	10	Total Water	L/day	2,760	5,400
Drums/plant		12	12	Hg Load	Kg	0.552	1.08
Mercury Used	Kg/drum	0.75	0.75	**Revenue**	US$		
Mercury Lost	Kg/shift/drm	0.05	0.075	**Gold**			
Waste Water	Mg/L Hg	0.2	0.2	Production max.	G/day	1,610	6,229
Amalgamation	Au/Hg ratio	2	2	Production max.	Oz/yr	18,889	73,914
Hg Precip		50%	50%	Production min.	G/day	851	3,402
Hg tails grade	Mg/kg	475	475	Production min.	Oz/yr	9,981	39,923
No. Shifts/day		2	2				
Plant avail'ty	%	60%	75%	**Capital Exp.**	US$		
Head gold grade	G/t	30	60	Shaft	US$	2,222.2	3,333.3
Grade/bag Au	G/bag	1.35	2.7	Plant Equipment	US$	2,777.7	3,333.3
Gold fineness	Ppt	640	640	**Operational Exp**	US$		
Gold Recovery	%	60%	60%	Mining	$/bag	5.555	8.333
Years operating	Years	1	1	Transport	$/bag	1.111	2.222
				Crushing	$/bag	2.222	2.222
				Labour	$/mth	111.111	1,33.333
Revenue Max				Reagents	$/bag	2.222	2.222
Sales-Process'g	US$/year	5,005,603	19,587,142	Fees Landowner	$/mth	55.555	55.555
Sales-Mining	US$/year	2,644,869	10,579,475	Fees-Govt	$/mth	27.777	27.777
				Fees-Security	$/mth	11.111	11.111
				Production	Bag/m	438	438
				Processing charge	$/bag	0.46	0.52
				Subtotal bag costs	$/bag	11.111	15.00
				Total Operational	$/bag	11.580	15.52
				Breakeven grade	G/t Au	1.36	1.82
				Break even Costs	US$/d	166.76	223.49

Key statistics
Hg loss estimates (t/year)……35t to 104t
Tailings produced t/yr……..32,640t/yr to 63,860t/yr
Estimated Max Revenue (US$/Yr)……..US$ 5,005,603 to US$19,587,142

Source: URS Dames and Moore Woodward Clyde. March 2001

Table VI. Number of Women and Number of Children below 12 Years Working in Small-scale Mining, Dependents, and Multiplier Effects.

No. estimated Small-scale miners	No. of women	No. of children, under 12 years old	No. of dependents supported by small scale mining, not including workers	No. benefiting from multipier effects	No. depending totally or partially on SSM for their livelihood
Based on NGO figures of 75,000	Based on 10% of total SSM workers of 109,000	Based on 2% of total SSM workers of 109,000	Based on 400% of total SSM workers of 109,000	Based on 20% of total SSM workers of 109,000	A+B
A) 109,000	10,900	2,180	B) 436,000	21,800	566,800

Source: Estimates by the writer, after data from Indonesian Mining Association, Indonesian mining companies, CIDA and URS Dames and Moore studies, and writers field observations, in 2001.

Roles of Women and Children

The role of women in small-scale gold mining is changing. Women are now involved at all levels, but limited in number. Traditionally the most significant way by which women participate in small-scale mining in North Sulawesi was through the marginal activity of cooking, and possibly playing the role of doctor and "mother" to the younger workers. Women in the Tatelu area have become involved primarily in the processing of gold ore. Initially all work was done by men, but now it is common to see 4 to 6 women crushing ore at the plant. They work under a canopy that is usually connected to the main processing area, or at least near the area where amalgams are roasted. Several women are also owners and/or managing operators, in which capacity they spend considerable time of each day at the plant.

While the women are not directly involved in the roasting of the amalgam, they and their children who happen to be present are exposed daily to the toxic fumes.

Quantifying the Negative Impacts on the Environment and Health of Surrounding Communities.

There are 713 locations, (official estimates of Department of Energy and Mineral Resources, 2000) of illegal small-scale miners in Indonesia, covering Sumatra, Java, Kalimantan and Sulawesi. The majority of these are small-scale gold operations.

Their impacts are categorized here as: general negative impacts on environment and health; and detailed negative impacts on environment and health.

General negative impacts on environment and health

The following information has been translated from government document: Penanggulangan Masalah Pertambangan Tanpa Izin, (PETI). Ref: Research Task V &VIII.

- *Destroys the living environment*: In Kalimantan alone, over 1,000,000 ha. are deemed to have been destroyed (made sterile) by local illegal miners. This amount is being added to by an estimated 10,000 ha. each year. In addition, these miners create pits and tunnels which make this land subject to landslides and erosion, hurting both lives of people and animals, including the lives of future generations.
- *Destroys riverbanks, and pollutes river water*: These activities also destroy rivers. As an example, it is estimated the illegal miners dumped 150Kg Mercury each day into the Cikinaki River, near Pongkor in West Java between years 1997-1998. Sluicing and pressure hose monitoring on riverbanks in open pits has and is causing lots of environmental damage. Oil from the water pumps and machinery, as well as mercury after gold clean-ups all goes into the river. Visible oil slicks on these rivers are now a common sight.
- *Tailings piles, pits, and quicksands*: Non-regulated sluice monitoring causes tailings piles, which often flow back into the river, polluting the water. Hundreds of pits dug alongside the rivers hurt farm and grazing land. Often tailings debris flows back into these pits, or low areas, which develop into quick sands, therefore dangerous to unsuspecting domestic animals and humans.
- *Mine Accidents*. Although there are no statistics on illegal mining activities, (PETI), mine accidents causing death, wounds and sickness are believed to be high. These accidents give a bad image internationally of Indonesians.
- *Wastes Mineral Resources*. Recovery methods of illegal miners (PETI) are low, recovering only 60% of the minerals while leaving 40% in the tailings. This actually destroys the value of the deposit. In addition, by only taking the high grade of a deposit, this also ruins the economic value of the deposit. By following good mining practices, the low grade would also be economic.
- *Anarchy*. Illegal mining breeds anarchy, because these miners do not understand the law for a variety of reasons. This attitude makes it difficult for the government to build the economy.
- *Social Unrest*: Where ever the activities of illegal mining (PETI) occur, they generally cause social unrest. This is because the PETI mining camps become "Wild West" situations. The workers may work hard during the day, but at night gambling and prostitution takes over. Stabbings and killings happen. Social diseases are common around these camps. This situation is generally contrary to Indonesian norms, who are either strong Islam or strong Christian. Therefore, these camps create social unrest with any local and traditional inhabitants in nearby villages.

Detailed negative impacts on environment and health

The biggest problem to down stream community health is mercury pollution. Using the Talawaan example, Table VII and following calculations illustrates the problem.

Table VII Local and Remote Processing Plants, Talawaan Area, North Sulawesi.

Processing	Unit	Minimum	Maximum
Number of Workers	Men and women at 9:1 ratio	2,700	3,000
Plants at base using Hg	Number	138	138

Plants in Remote areas Hg	Number	0	132
Total Plants		138	270
Drum Capacity	L water	10	10
Drums/plant		12	12
Mercury Used	Kg/drum	0.75	0.75
Mercury Lost	Kg/shift/drm	0.05	0.075
Waste Water	Mg/L Hg	0.2	0.2
Amalgamation	Au/Hg ratio	2	2
Hg Precip		50%	50%
Hg tails grade	Mg/kg	475	475
No. Shifts/day		2	2
Plant avail'ty	%	60%	75%

Source: URS Dames and Moore Woodward Clyde

Calculation 1: Daily mercury loss in Talawaan area

Above data in Table VII is used for calculating daily mercury loss into the environment.

Immediate Talawaan environment and 2) Remote Talawaan environment is calculated as follows:
1) 0.055Kg/Hg . 2 work shifts. 12 drums. .138 unit trommels. 75% availability = 137 kgs/Hg
2) 0.055Kg/Hg. 2 work shifts. 12 drums. .132 unit trommels. 75% availability = 131 kgs/Hg

Total 268 Kgs/Hg
Lost to air (0.075%) (0.2 kg/Hg)
Total estimated daily loss of Mercury to environment in Talawaan area
267.8 kg/Hg

Calculation 2: Hypothetical daily mercury loss across Indonesia

1) Talawaan 3, 000 gold SSM workers loss 267.8 kg/Hg
2) Indonesia 60,000 gold SSM workers loss X kg/Hg X = 5,356 kg/Hg

Summary of Mercury Level in Talawaan Area, North Sulawesi

The following details are selected from chemical analysis reports, carried out by ASL Indonesia, Jalan Raya Puncak KM 72.6, Cibog, and Bogor, 16750.

Table VII. Typical Mercury Excesses from Talawaan and Vicinity, (mg/l or mg/kg)

Sample	Location	Unit	Mercury Level	Standard	Excess %	Degree
Surface water SWM02	Tatelu River	T-Hg	0.00603	0.002	200	3
Ground water GWH04	Talawaan	T-Hg O-Hg	0.00498 0.00233	0.001 0.001	398	5
Tailings TLCP	Talawaan	T-Hg	0.467	0.2	134	2

TM01						
Fish Pond SW12	Tety Pond	T-Hg	0.161	0.002	7,950	81
Waste Water LH01	Tatelu Rondor	T-Hg O-Hg	0.102	0.005	1,940	20
Fish FTM-01	Umbohs' Pond	T-Hg	1.41	0.5	182	3
Snail KH02	Wasian	T-Hg	3.56	0.5	612	7
River Sediment SEM01	Wasian River	T-Hg	6.82	0.9	658	8
Fish pond sediment SEH05	Umbohs pond	T-Hg	4.4	0.9	389	5

Source: URS Dames and Moore Woodward Clyde

Range of Practices in Mining, Processing and Environmental Control, and Changes that have Occurred over the Past 10 Years

The Method of Processing Ore

The following is mostly taken from CIDA and URS Dames and Moore reports, North Sulawesi.

Vertical shafts and tunnels are dug by hand to a maximum depth of 30 m. to mine gold bearing veins. Crude assay methods are used to estimate the gold recovery and guide the direction of the underground excavation. The ore pulled out of the shafts is packed into sacks and transported, usually by oxen to a processing plant a number of kilometers away.

Processing plants, each with a number of trommels is usually situated near a riverbank or near a stream for easy access to water. In some cases, as in the relocated plants of in the Tatelu area, water is obtained from shallow wells.

The first step is to crush the ore in the traditional way, which reduces (by about one half) the processing time in the mills. This is usually done by hand using a hammer and a large rock as a platform. A few process plants use a home-built crusher to replace manual labor,

Approximately 30-40 Kg of crushed run-of mine ore, water, mercury (1kg or more, depending on mill size), and balls (hard lava rocks) are loaded into the ball mill (metal drum) and rotated for 3-4 hours to break down the ore into a fine sand to release the gold and other precious metals.

Mercury is added and the mills rotated for another half an hour for amalgamation of the gold with mercury. The entire contents of the mill are then dumped into a large tub where the tailings are separated from the amalgamated mercury. The mercury is separated from the amalgam through filtering, i.e., forcing the mercury through a fine woven cloth

(parachute cloth is best) by twisting the cloth. The residue, which remains in the cloth, the mercury/gold amalgam, is then roasted to vaporize the mercury, leaving the gold bullion.

Tailings management was superior in the newly built processing plants in the Tatelu area. Almost all of the majority plants surveyed had constructed dugouts, lined with wood planking, where the majority of tailings sand settled out. Tailings solids (sand) retrieved from these ponds are stored, usually in sacks for reprocessing.

Table VIII. Characteristic of Processing plants at Tatelu and Ratatotok, (North Sulawesi)

Processing plant attribute	Tatelu N=133	Ratatotok N=42
No.Units operating/plant – average (range)	13 (6-27)	6 (4-10)
Kg mercury purchased per month-average (range)	15(10-30)	2.6(1-10)
Roasting amalgam	Retort (12) Open air (120) Fume hood (5)	Open air
Length of time operating	< 12 months	1-7 years
Distance of plant: to dwellings to river	10m-2.5 Km 10m-2.5 Km	5m-2km 10m-3km
Disposal of tailings water	On land (93) To river (22) Ponds (13) Rice paddy (5)	On Land (16) To river (7)
Disposal of tailing solids	In Sacks (131) On Land (2)	On land
No of workers per plant	3.5 (2-13)	1(1-3)

Source: CIDA Project 472/18270

Mining and Processing Technology: Method 1

This method applies to gold and diamond panners. In Indonesia the "gold pan", a shallow conical wood device is called a dulang. This dulang is carved from one piece of wood, generally a section from a tree trunk.

For gold, the angle on the basic dulang is about 25 degrees, and the outer diameter of the dulang rim can be as much as 50-60 cms. The advantage of these dulangs is they float, and so the gold miner, (or diamond miner) standing in a metre of water can use the river current to his best advantage.

There is a small gold dulang, which has a flatter angle and is almost like a flat fruit dish. This dish style dulang is 30-40 cm in diameter. It is best used for panning gold fines, and is preferable for calm flowing streams. A good gold panner usually takes 3-5 minutes to pan five kgs of gravel to a black sand-gold concentrate

This type of gold mining usually takes place after the river has flooded and then subsided, on the upstream side of river sand or ox-bow bars.

The diamond panners are less numerous than gold panners, however the same individuals may practice both types of mining. The diamond pans are also carved from wood, cone

shaped with about 40 degree angle at the cone, and have a 50 cm diameter. A good diamond panner generally takes 4-5 minutes to wash 4-5 Kgs of gravels to quartz-zircon-corundum-chrome-concentrate.

The diamond miners may work the gravels of large streams or creeks for diamonds. They rarely work the major rivers. They also dig round pits up to one metre deep on the sides of hills near the streams and creeks, and take these gravels and clays to wash in the local rivers or streams.

Diamond miners, usually a man and wife, may spend up to three months at one locality to pan one or two carat diamonds, before leaving the area.

These dulangs, unless used constantly, or kept in water, may not last long, (2-3 months) before they crack and rendered useless.

Mining and Processing Technology: Method 2

High-pressure water pumps, used for hosing down river and open pit banks (monitoring) are causing a great deal of environmental damage in West and Central Kalimantan. The loosened gravels and mud are then diverted into sluice boxes lined with bath towel material, before being panned using a flat dish shaped 30-40 cm dulang mentioned above.

These monitor pumps are often operated by family small-scale mining groups, including boys from ten years old to men in their forties. Women present in these operations are generally looking after any young babies present.

One of the methods of winning gold from the heavy mineral concentrate is by amalgamation in a home made gold trommel.

Mining and Processing Technology: Method 3

Rafts-dredges, (or dredge platforms) slashed together using rattan and 60-100 cm logs, about 6 metres by 3 metres in size, compose state of the art homemade raft dredges in Kalimantan. It is possible there could be up to 6,000 of these rafts operating in rivers in Kalimantan. A bamboo shelter, plus a 40 horse power water pump, sluice box and holding tank, on board are manned by a crew of up to four men, usually ages late teens to mid twenties. No women have been seen working on these raft dredges by this writer.

About 1000 raft-dredges are presently operating on the Kahayan River in Central Kalimantan. (personal estimates for year 2001). Observations by others range between 3,000 to 5,000 raft-dredges seen in years in past years on this river. Others raft-dredges are reported on the Kapuas I River in West Kalimantan, (http:/www. miningindo.com. August 2001). Other major rivers in Kalimantan are the Barito, Kapuas I, Kapuas II, Mahakam, and Redeb. There could be up 6,000 rafts and up to 24,000 small-scale miners working this style of operation in Kalimantan.

On the Kayahan River, these dredges process between 5-10 grams per day. Working in groups up to 20 rafts, they dredge both the center of these major drainage systems or close

to the riverbanks. Sand and gravel is sucked up by water pumps to the holding tanks on the raft before being allowed through the sluices lined with towels or other material to act as baffles. These baffles collect the heavy minerals from the aggregate including the gold particles.

This heavy mineral residue is then washed and panned for the gold content. Alternatively, the, depending on the source of the material, the aggregate is washed and processed (amalgamated) with mercury so that the gold is bonded with mercury. After processing, the mercury is simply "burnt" off with the gold and other metals left behind. The wastes are disposed into the river, which is becoming polluted.

These raft dredges usually work the Kahayan River between flooding, but rarely during flooding. There is too much tree debris coming down the river during flooding. Surveys are not carried out before hand, other than crude panning tests. The method is to "blanket" dredge the river indiscriminately.

In discussing this matter with one river resident on the Kahayan River earlier this year, he volunteered 10 gms per day was the normal raft-dredge production 5 years ago, but it now it is around 5 gms day per raft.

Mining and Processing Technology: Method 4

This method is hard rock vein mining, and may take place at:

- Old mines
- Mining prospects
- Presently operating mines

Examples:

1. Old Mine-Salido gold mine, West Sumatra, (estimated 300 workers-1989)
2. Old Mine-Batu Emas, Central Kalimantan (estimated 100 workers, 1996)
3. Prospect-Marsupa Ria, Central Kalimantan, (estimated 15,000 workers-1988)
4. Prospect-Sungai Kuatan, Central Kalimantan, (estimated 1,500 workers-1987)
5. Prospect-Sampanahan, South Kalimantan, (estimated 7,000 workers-2001)
6. Prospect-Talawaan North Sulawsi, (estimated 3,000 workers-2001)
7. Active mine-Kelian Gold Mine, East Kalimantan, (estimated 300 workers-2001)
8. Active Mine-Indo-Muro, Central Kalimantan, (estimated 15,000 workers-1987)

On a visit to the old Dutch Salido gold mine in West Sumatra, September 1989, the following was noted by the writer. The trommels were called gelondongs in West Sumatra.

- A total of 300 local small scale miners present

- Working colluvial-alluvial debris from hill slopes below epithermal veins
- Working selective waste dump tailings from original mine workings
- Working Quartz veins from pits
- Working former underground adits
- Ore hand carried to 50-60 gelondongs working in 3 "batteries"
- Estimated 500 tonnes of hand selected ore processed each month in above gelondongs
- Estimated 100-150 oz of gold produced monthly
- Estimated 500-3000 oz of silver produced monthly
- Estimated recovery grade of hand sorted ore to be 6.2-9.3 g/t Au
- Estimated recovery grade of hand sorted ore to be 30-190 g/t Ag

Support Activities

In Indonesia, there are no support activities for small scale mining, because the majority of small-scale mining is illegal, or at least called illegal.

Financing or credit schemes

Other than individual investors, there are no credit schemes. An individual gold minor or gold mining group may receive credit from his/their local store for a water pump, hardware supplies, food etc. In this way, the storekeeper or businessman becomes an investor in the SSM venture.

Producer associations

(Examples from North Sulawesi): Small scale mining associations, whether registered locally or not are beginning to emerge at the regional level. The Tatelu Miners Association is a good example. This is a voluntary organization with goals to minimize environmental effects of their mining and processing activities. However, they lack technical and legal support to achieve their goals. They do however promote the use of retorts and good tailings management, and currently looking into the construction of an ore concentrator.

Technical assistance projects

(Examples from North Sulawesi):

- There has been little done by government since 1967. However, with regional decentralization taking place in Indonesia provincial and regional governments are becoming more active, and now providing guidelines. Guidelines have been developed for handling tailings and the burning of amalgam. The construction of an efficient system of tailings ponds is encouraged, so is the re-cycling of water is encouraged. Guidelines for the burning of amalgam need to be revised. The construction of a fume hood is recommended to carry mercury vapour out of the immediate process area. If

used, this would protect the worker from the direct effects of mercury vapour. In a few instances fumes hoods are being used in Tatelu, but were not vented through the roof. Whether the regulations/guidelines are entirely appropriate or not, compliance is poor and must be improved, particularly with respect to burning of amalgam. Recently, the governor of North Sulawesi announced he was going to introduce a cyanide process plants to replace the mercury plants. However, funding will be a basic problem. Very few provinces and regions have any money.

- NGO technical assistance projects appear to be emerging, but the problem is funding.
- Private and independent surveys have made for mining companies on small-scale mining, ref: URS Dames and Moore Final Report 2001.
- CIDA, a Canadian government foreign agency carried out through a Canadian environment consulting firm, *"A Case Study at Small Scale Gold Mining Sites in Ratatotok and Tatelu Districts of North Sulawesi, Indonesia, on Mercury Pollution and Awareness Control, in 2000."* Ref: CIDA Project 472/18270. This project studied the mercury problem at two sites in north Sulawesi. Besides recommendations, this project made and distributed posters, pamphlets addressing mercury and the environment, good and bad practices of processing ore and roasting the amalgam, mercury retorts. The project also produced information (stickers) for mercury storage containers, a video CD on mercury poisoning for local government. The big plus about this project is it developed mercury retort, which is now being produced locally. It is believed twenty such retorts have been built, of which twelve have been sold on a credit scheme to local mining groups, and eight have been distributed to government for demonstration purposes.

Assessment of Support Activities

The CIDA project identified the pollution problems in North Sulawesi, and introduced remedies, the Sulawesi provincial government will find it difficult to solve SSM related problems. This applies to all provincial and regional governments. Aid agencies such as CIDA are time limit studies operating with a limited budget, while the problems of small-scale mining (Illegal Mining) are on going. Promising new approaches is that the regional governments in North Sulawesi have indicated they are going to introduce a supervised cyanides plants to replace the mercury plants, and the governments of South Kalimantan plans to register its gold miners.

What is needed is for government to provide incentive to commercial mining companies to come up with solutions to provide technical assistance. For instance, if mining companies provided indirect assistance through certified mining NGOs, (say, the Indonesian Mining Association special branch for small scale miners) the companies would then receive a 175% right-off against taxes on such monies paid-out. As an example, if a company operating in East Kalimantan funds a certified Mining NGO to provide technical assistance as well as equipment in mining and environmental engineering work to SSM's in East Kalimantan to the amount of US$100,000 per year, it would then receive a tax right-off of US$175,000 for that year.

The system would best work if individual companies formed their own NGO groups or cooperatives, and staffed it with hand-picked experts of their own choice. It would be up to

this unit to then operate independently, as long as they operated within the same jurisdiction as the sponsor company. This unit would best be diversified to look after community development and affairs, as the company's public relations at the grass roots levels. To be effective, these units would have to come operative from the very beginning of exploration to the end of reclamation. It would be assumed after 15-30 years of operation within the companies jurisdiction, SSM would then have more friendly impact on the environment.

The key to making this possible would be the government providing the tax incentives. Indonesia does not have the technical resources or the money to fund or introduce such schemes at the present time.

Interactions over Past 10 Years Between Small-scale Miners, Exploration, and Mining Companies

Interaction between the mining companies and the SSMs began around 1986, some 20 years after regulated mineral exploration was encouraged by the government. Initially these interactions were between the gold mining companies and the SSM gold operators, but since 1998 and the Asian monetary crises have spread to the coal and tin mining operations. There are no conflicts with the commercial diamond explorers and the diamond exploration companies

Interactions have been ones of conflict. This is because until decentralization, mining tenements have been arranged through the Central government in Jakarta. There was no dialogue between the central, provincial, regional governments and local people. During the President Soeharto period, when the mineral tenure holding mining companies showed up on site with their tenement certificates, the SSMs would continue normally…until they were forcefully driven off their sites by the army or police. Such practices created a lot of resentment between the mining companies and the local SSM groups throughout Indonesia. Since 20th May 1998, when President Soeharto stepped down from the Indonesian presidency, so too went the strong armed action of removing SSM groups off company mineral tenures. Typical situations in the past have been as follows:

- *Kelian Gold Mine. East Kalimantan. Operated by Rio Tinto Group.* Original ore reserves at 124 million tonnes averaging 1.97 Au/t. From 1976 to present, SSM operations have always been concern for the company. Since intensive exploration operations commenced in 1986, SSM in small groups have encroached on the company's tenements, until (repeatedly) removed by the police. With ore reserves ending in about 2004, the company reports there are now 500 alluvial miners have been operating within the company's mine tenure. This causes concern as the company is planning reclamation, (see commentaries on tin mining below).
- *Marsupa Ria Gold Project, Central Kalimantan.* Formally operated by BP in 1987, however BP pulled out in1988, due to new corporate strategy. About 7,000 SSM's were operating around BP's project in 1988.

- *Indo-Muro Gold Mine Central Kalimantan.* Total Reserves: 1,138,000 oz Au equivalent. Operated by Aurora Gold Ltd (Australia). In 1986, there were 15,000 illegal miners on site. Forcefully removed several times by army and police. Some imprisoned. Continual problems until 1998, when illegal miners invaded company's open pits, forcing company to close down for several weeks. Company negotiated and agreed to allow illegal miners to mine in selected company open pits on Sundays. Company plans to close mine by 2003/4 and move out of Indonesia.
- *Talawaan Gold Prospect in North Sulawesi.* Operator Aurora Gold Ltd (Australia). Total resources: 5.1 million tonnes at 3.6 Au/t equivalent. Since 1998, company has been having problems with illegal miners, and even though the company found the deposit to be viable, they have decided to sell the project, because of the active 3,000 SSMs.
- *Pongkor Gold Mines, West Java.* Proven and Probable Reserves of 5,398,900 t grading 12.1 g/t Au and 130.9 g/t Ag. Operated by Aneka Tambang, a national company. In 1998, the company buildings were vandalized by illegal miners causing some US$1.4 million in damages. The problem partially corrected, is believed on going.
- *PT. Arutmin's Coal Mine. Operated by BHP Billiton.* South Kalimantan. Ore reserves 2,742,070,000 tons Since 1998 has been experiencing illegal miners mining coal within their coal contract areas. In the year 2000, it is estimated 2,000,000 tons of coal was illegally mined from this contract area by illegal miners. Illegal miners in Coal contracts of work use trucks, excavators and even put up security gates within their areas of operations. The problem is on-going.

Basically, since the demise of the strong arm governance of President Soeharto, where the army was used, sometimes ruthlessly against illegal miners, mining companies have not found a solution to SSM operatives in or around their mineral tenures. Mining companies with operating mines are trying to contain the situation. Some have stepped-up their mining operations to complete the mining operation earlier than planned. Others have stopped exploration, intending to sell their developments or projects and leave Indonesia, permanently. An example is Aurora Gold Ltd.

Changes and successful interventions? You be the judge.

The following articles are copied directly from Tempo Indonesian Weekly News Magazine, September 3-10, 2001.

Biting the hands that feed

This is like raising a tiger cub, once it has grown-up, it may eat you. That is what is happening to PT. Timah Tbk. The company's policy of allowing communities to mine tin in areas in Bangka and Belitung previously belonging to them has backfired.

PT. Timah's policy, intended to help the Bangka Bilitung community out of the economic crises (in Indonesian from 1997-present), has had a negative impact on the companies performance. If the problem is not is not immediately resolved, the state-owned enterprise may face bankruptcy

Is it that bad? The financial statement for the first semester in year 2001 seems to suggest that. The mid-semester profit dropped 50% compared to the same period last year. During the first six months of year 2000, Timah earned a profit of US$25.01 million. This year only US$12.62 million.

The plunge of world tin prices has caused Timah's performance to deteriorate. In January 2001, the price of tin was still at US$5,200-5,400 a ton. It has been gradually falling, but in July 2001, it was US$4,900 a ton. Suddenly in August, it was only US$3,630 a ton.

The economic slowdown in developed industrial countries such as the United States and Japan is a significant contributing factor to the plunge. They are after all tin main consumers. However, this is not the only problem. Amid feeble demand for tin, market conditions are made worse by an oversupply, suspected to have come from Indonesia.

PT. Timah's Tbk President Director Erry Rijana Hardjapamekas does not refute this. He blames the situation on illegal mining in Bangka Bilitung, which is producing more than Timah. Today, illegal mining in 4,350 (cooperative) units yield more than 42,000 tons per year, compared to Timah's 40,000 tons.

That means a total of 82,000 tons a year. Indonesia, as one of the largest tin-producing countries in the world, is only allocated 50,000 tons a year. "More than that, and the market will be shaken" says Ali Darwin, President Director of PT. Tambang Timah (a subsidiary of Timah Tbk).

The total figure has shocked other tin producing countries, such as China, Peru, Bolivia, Brazil and Australia. They're probably wondering: what is happening in the tin mining business in Indonesia? Aren't there only two companies from Indonesia supplying tin: Tambang Timah and Kobatin (a joint venture company between Timah Tbk and a mining company from Australia)?

It turns out the private sector has become a player in exporting tin as well. Yet according to Ali Darwin, the government has never has never issued for them to manage and export tin. Only Tambang Timah and Kobatin have a licence.

As such, how did the private sector manage to export tin to the world market? This is where regional autonomy comes in. In this era, many regents (regions) feel they are entitled to issue their own regulations, even though they may be in contradiction with central government policies. This applies to tin mining also. The central government may not have issued a permit, but as the power in the region, the Bangka and Belitung regents seem to feel they have the right to issue business licenses for mining, including processing and exporting.

As far as the Regent is concerned, the illegal miners can be relied upon as source for original regional revenue, (PAD). He (the Regent) probably does not think to deeply about impacts on world prices, and subsequently on state revenues. The Bangka Regency Regional secretary Usman Saleh has indirectly acknowledged this. According to him in granting, a mining business and export license to the private sector is intended to increase PAD.

The mines-although called illegal, they actually possess a license from the regional government-do give a significant contribution to the local governments coffers. As stated in the regional regulation, the Bangka regency government receives US$1.00 for each kilogram of tin powder produce. If the total production of illegal tin mining processed from tin powder reaches 42,000 tons a year, a considerable amount of money goes into the regional government's coffers. Then there are the fees for each license. For a large scale mining (processing plus export) these are as high as US$25,000. For a small-scale business, (processing only) these are US$800. In addition, there are taxes for digging and export.

With such revenues in mind, it is no wonder the Bangka Regency government doesn't seem to care about Timah's anxiety over pervasive illegal mining.

Bangka Belitung-Environmental Disaster

The people of Bangka and Belitung islands are fond of referring to their regions as "Babel". However, to environmental activities the term has another other meaning: "Babak Belur" (severely ruined). In connection with the environment issue, the term is spot on.

The soil in Bangka Belitung is truly severely ruined due to uncontrolled mining. Huge holes with standing turbid water-referred to as kolong-as well as mounds of dirt resembling deforested and barren hills are everywhere. It's a common sight in Bangka Belitung villages.

Reclamation and re-vegitation, which should have been done immediately after the kolongs have been emptied of their tin sand, are almost never done. Especially in tin areas where tin is illegally mined-at the blessing of the Bangka Belitung Regent-have mushroomed for the past three years.

The rapidly increasing number of illegal mining, which reached 4,350 units for the past three years, is being as a large contributor to the destruction of the Bangka Belitung soil. This charge may be true. Lets consider: if one unit of illegal mining digs an average of two holes, there are 8,700 kolongs. That does not include those dug by PT. Tambang Timah and PT. Kobatin.

The two legal companies are not blameless either in the destruction of the environment. According to the former head of the environment office at the Bangka Regency government, Yan Megawandi, few former mines were reclaimed and re-vegetated by PT. Timah and Kobatin. The few that were, unfortunately were dug up again by the illegal miners. Consequently, the newly planted trees died.

The damage to the environment caused by tin mining spreads to the sea as well. According to tin mining observor Eka Mulya Putra, Bangka Belitung coast area is suffering from abrasion due to the number of holes at the bottom of the sea set off by coastal mining, (sea dredging). "Also may coral reefs are destroyed" he says.

The severity of the environment condition has prompted the government of Bangka Belitung province is making this issue a priority. Acting Governor Amur Muchsim says the

problem can be handled in stages. Keep in mind there are thousands of illegal "Kolongs" that provide an income to 14.5% of the province's population.

In addition, rehabilitating the environment will require a huge amount of money. "Even if Timah assets were sold, it still wouldn't be enough to repair the extensive damage," he says.

Timah and Kobatin usually had a budget for reclamation and re-vegetation. However, for the year 2001 they may not set aside a single cent. The reason is simple: after reclamation and re-vegetation, illegal miners will dig the soil again. So, what is the point?

To find a solution to overcome the environment problem, Timah has taken several steps. One of them is to register illegal mines, which will be conducted from September 1-15. Illegal miners who have violated the rule by mining a reclaimed and re-vegetated area have until September 10,2001, to stop activities. "If they don't, we will take legal action," says Ali Darwin, Tambang Timahs President Director.

Positive Changes to SSM will not Happen any Time Soon, But Since 1998 Indonesia has Begun to Move in the Right Direction

The SSM operations in Indonesia are mainly regarded by government as illegal operations, (even though some may be legal-see previous story). They have undergone no positive changes over the past 10 years. In fact, since 1998, the situation has got worse. This means there has been more damage to the environment, more damage to Indonesia's rivers, more mercury pollution, more damage to Indonesia's resources.

Until 1998, all mining matters were controlled by the Department of Energy and Mineral Resources in Jakarta. That is, centrally. When problems arose concerning SSM activities, the provinces and regions would simply say, "This is a central government problem, and not ours". In many instances where conflicts of interest occurred, the central government would resort to force, using armed troops and police.

When autonomy was implemented on 1st January 2001, there had been no preparation and no guidance from the central government to the provinces and regions. In fact, provincial and regional governments were very confused as to any course of action in all their administrative matters.

This lack of leadership from the top to bottom, and allowed anarchy to become law of the land. Consequently, SSM operations have continued to conflict with regulated mining operations, in all sectors except diamonds. The latter is because there are no commercial diamond operations.

It there is any positive changes to come, it is that government and the Indonesian people are becoming to realize the environmental damage being done by SSMs. In addition, despite the lack of preparation for autonomy and decentralization, the provinces and regions will eventually be in a better position to handle their affairs than hitherto. This will include SSM operations and its regulation. They will still need expertise, guidance and funding.

Summary of Small-scale Mining in Indonesia

Over the past 46 years:

1. Initially, during the 1960's it was small-scale diamond mining, which caught the attention of the then President Sukarno, who proclaimed the diamond fields in South and Central Kalimantan strictly for Peoples Mining.
2. During the President Soeharto era from 1966-1998, very little was done for the small-scale miners. This is evident from Mining Law 11/1967 cited in Research Task I. Consequently, almost all small scale mining, with the exception of the Peoples Mining (diamonds) and Traditional Mining (gold panning in rivers near miners villages), is regarded to as illegal mining. Small-scale mining and illegal mining in Indonesia is the same thing, licensed or not licensed.
3. During the Soeharto years, any small-scale mining, which conflicted, with commercial mining was solved by police and the army, generally at the point of the gun.
4. With President Habbie coming to power in May 1998, a new style of governance has taken hold in Indonesia: democracy.
5. Since than, small-scale mining has become more intensive and more diverse in Indonesia. For instance, small-scale mining has expanded from diamonds and gold, to include tin and coal. This is partly due to the economic crisis, which hit Indonesia in 1997, and continues to this day.
6. According to the new laws implemented by the Habbie government in 1999, decentralization of mining administration was made effective on 1st January 2001. It is now going to be up to the thirty-four provincial governments, two hundred and sixty-eight regency governments and some seventy two municipality administrations who will administer small scale or illegal mining in their jurisdictions.
7. The big weakness now is not just lack of funding and expertise to change the system, but how to create law and order among the small-scale miners. By this is meant how will these miners be regulated, how will they be taught to manage mining, pollution and environmental skills, their social interactions, and how will they be taught to become good tax paying citizens?
8. In 1998, the central government admitted it had a problem with illegal mining. That year the newly appointed Minister of Energy and Mineral Resources General Soesilo Bambang Yudhoyono said small scale mining, or illegal mining, was going to be his first priority to solve while he remained in office. However, the general was appointed to a new government position shortly after this statement. He is now the coordinating minister of politics and Safety, and the third in line to the presidency. This actually could prove beneficial for new SSM policies.
9. The present Minister of Energy and Mineral Resources is Dr. Ir. Purnomo Yusgiantoro. Work has involved setting up an office in Jakarta and a team to study small-scale mining (PETI). They have produced a 20-page brochure (see below). It is not sure what powers this team has, and how it will react with the new provincial and

regional governments. The later governments theoretically have also set up teams to study SSMs.

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