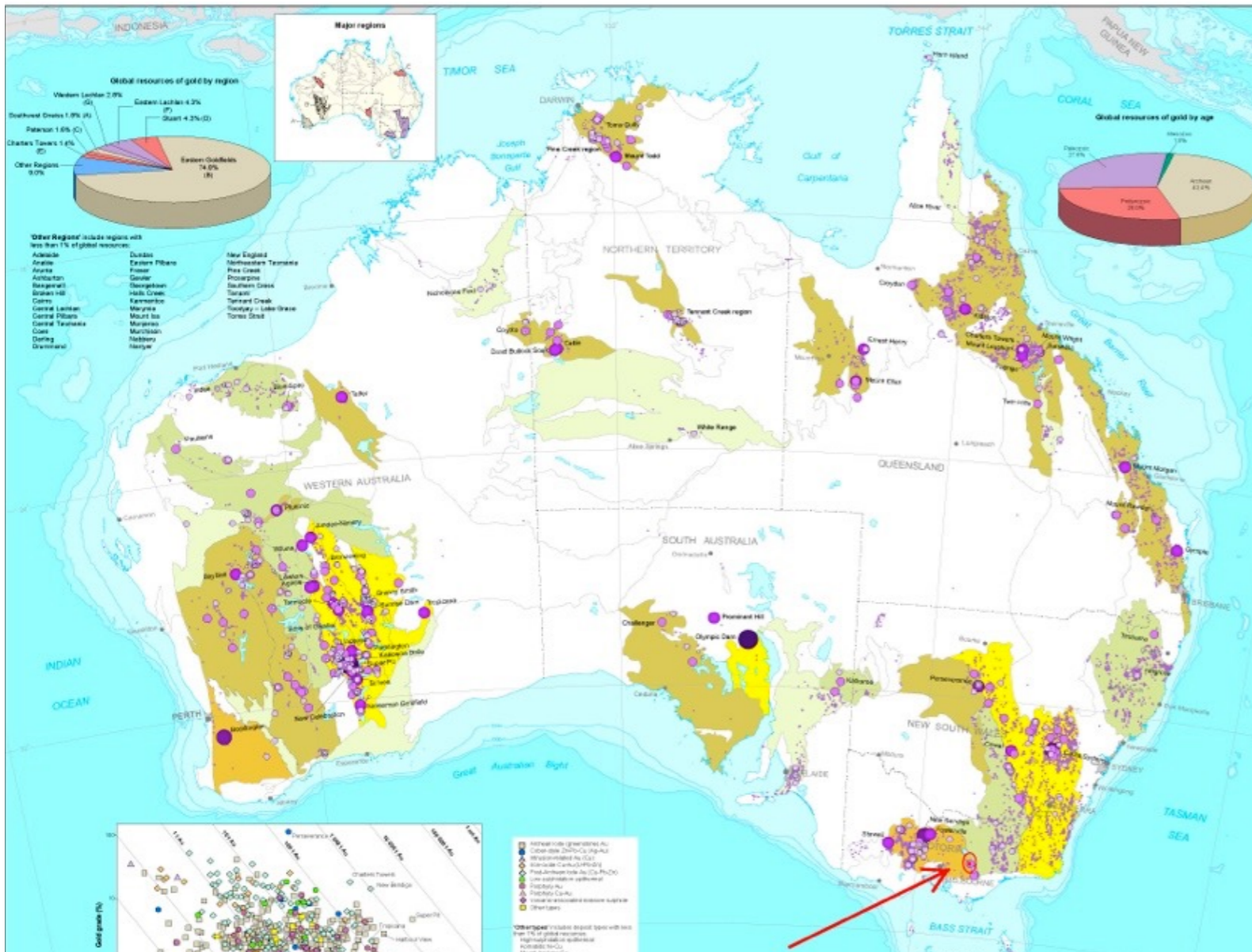


**Artisanal and Small-scale Gold Mining
(ASGM):
local problem, global challenge**

*IPEN NGO briefing - INC7
Dead Sea, 08 March 2016*

*Yuyun Ismawati - yuyun@balifokus.asia
Senior Advisor, BaliFokus Foundation
IPEN lead for ASGM/Mining*

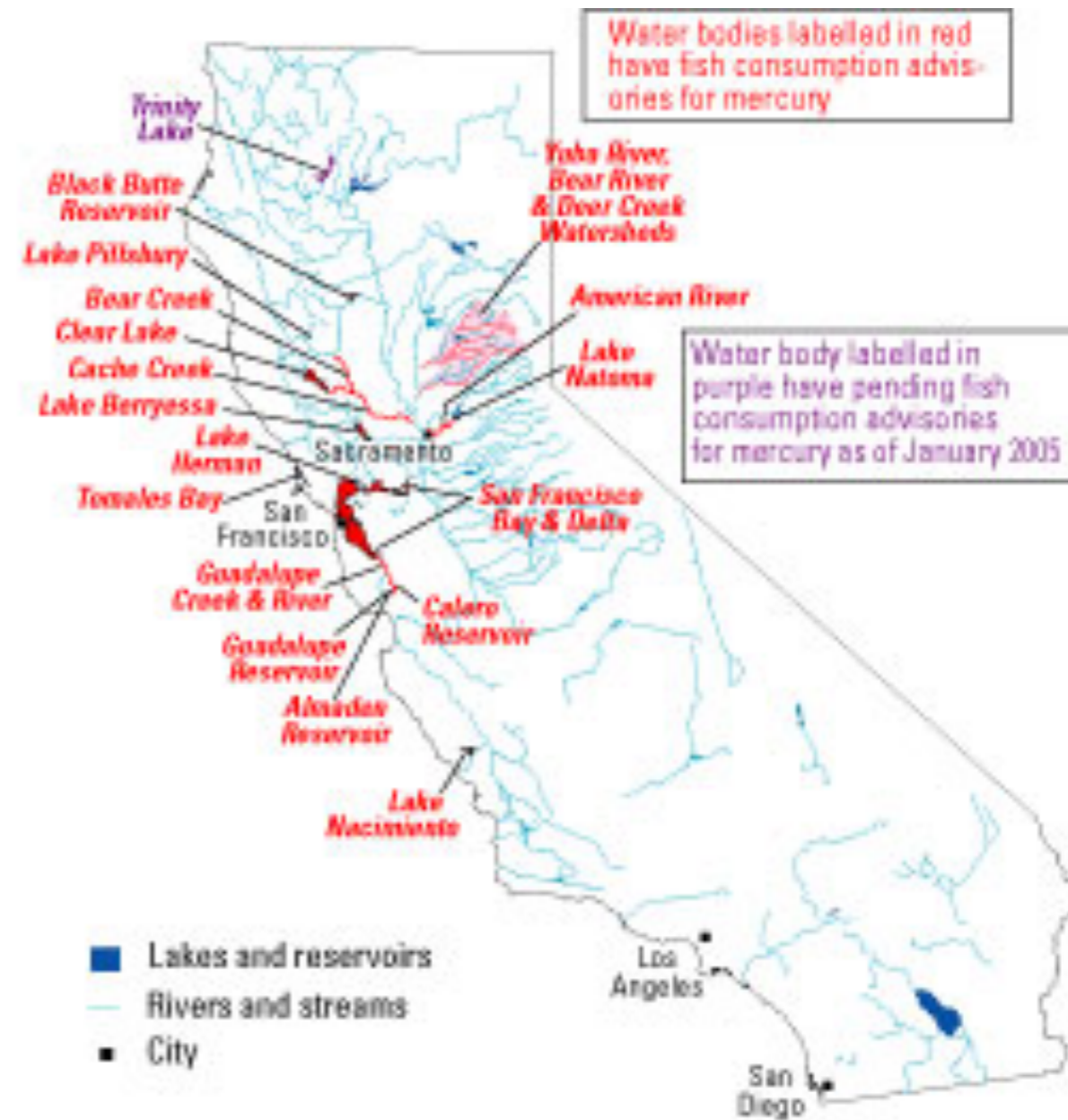
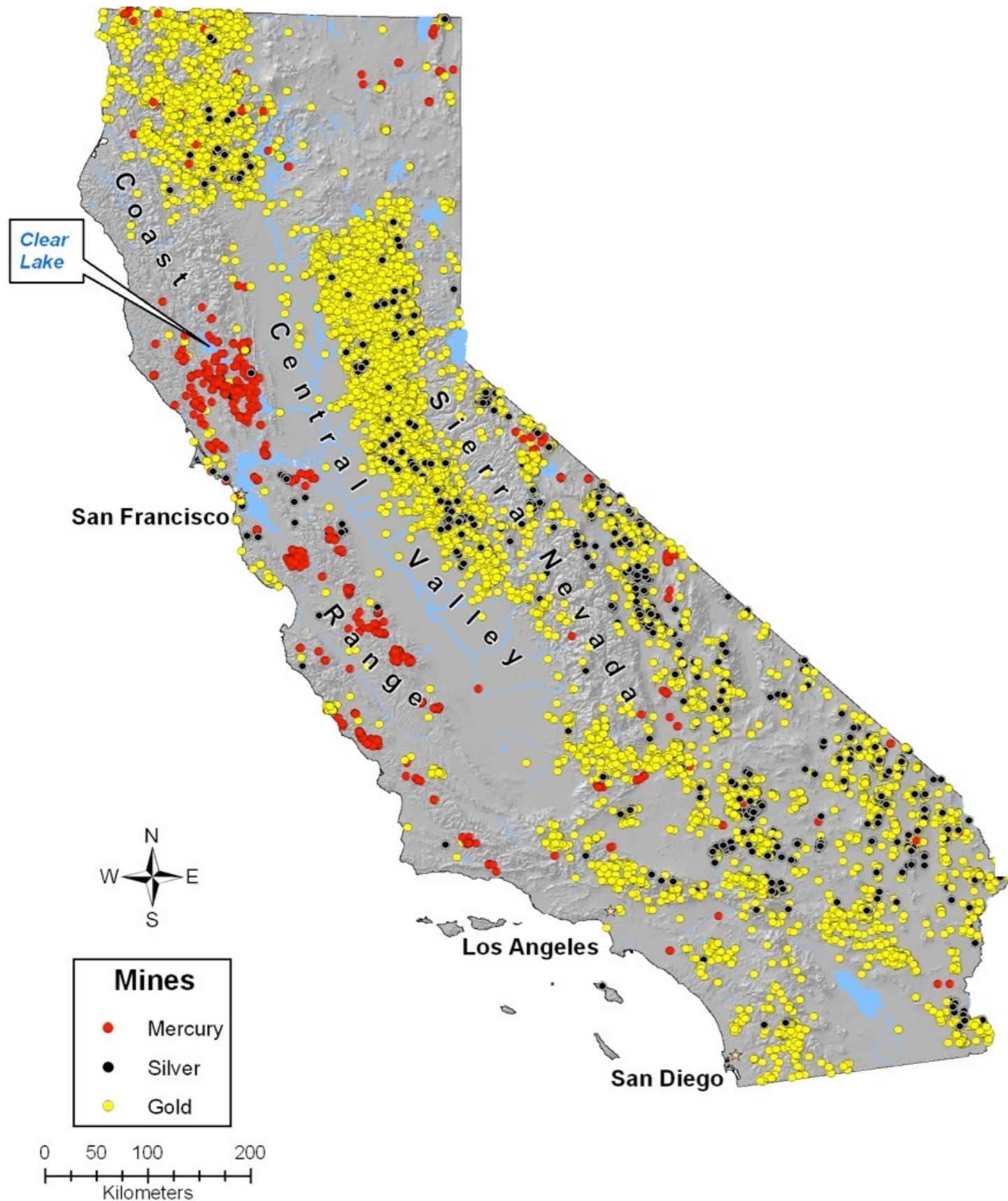
Gold Rush Legacy 1800s - Australia



- Ferral mercury: about 400,000 metric tonnes mercury released to the environment
- Pre-gold mining levels were in the range of 2-4 ng/m² or 2-4 x 10⁻⁹g/m²
- Post-gold mining levels (circa mid-1970's post Hg usage) could be as high as 0.08 g/m² (or 20-40 million ng/m²), a 10⁷ times increase across the entire Australian continental land surface

Huleatt, M.B., Jaireth, S., 2009, Australian Gold Resources (Sheet 1), January 2010 edition, 1:10,00,000 scale map, Geoscience Australia, Canberra, Australia. Geocat. No. 70063 ISBN 9781921672644

Gold Rush Legacy 1800s - California, USA



The mercury legacy in the red spots remained as big problems for communities, until now, especially the Indigenous Peoples - the native American Indians

Gold Rush Legacy 1980s Serra Pelada, Brazil

Mined by 100,000 people in 6 years



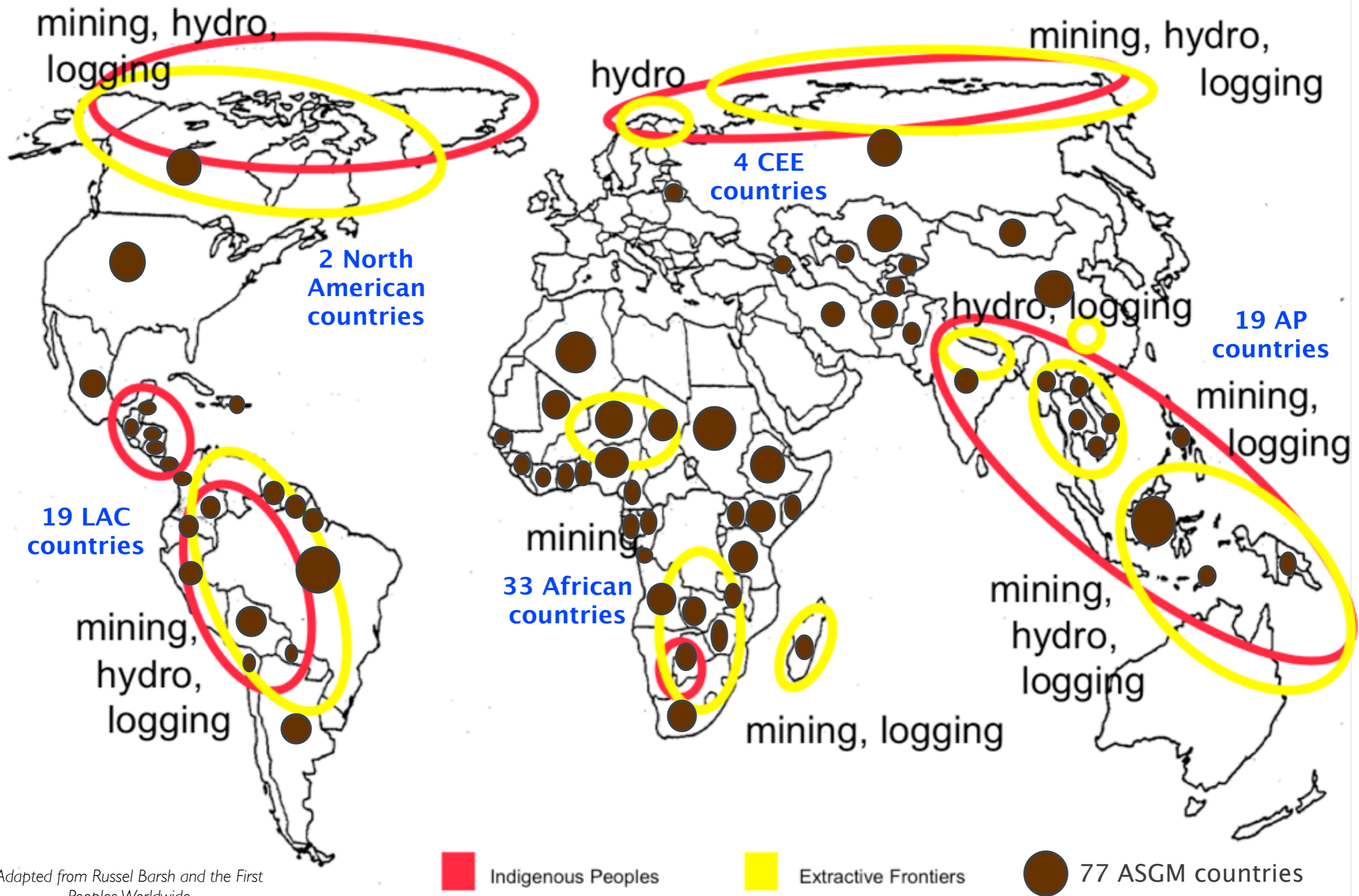
Serra Pelada garimpo. The largest South American gold rush. Bernadelli (1983)

Gold Rush Legacy 1980s - Serra Pelada, Brazil

Closed in 1986, now becomes the most contaminated lake in Brazil

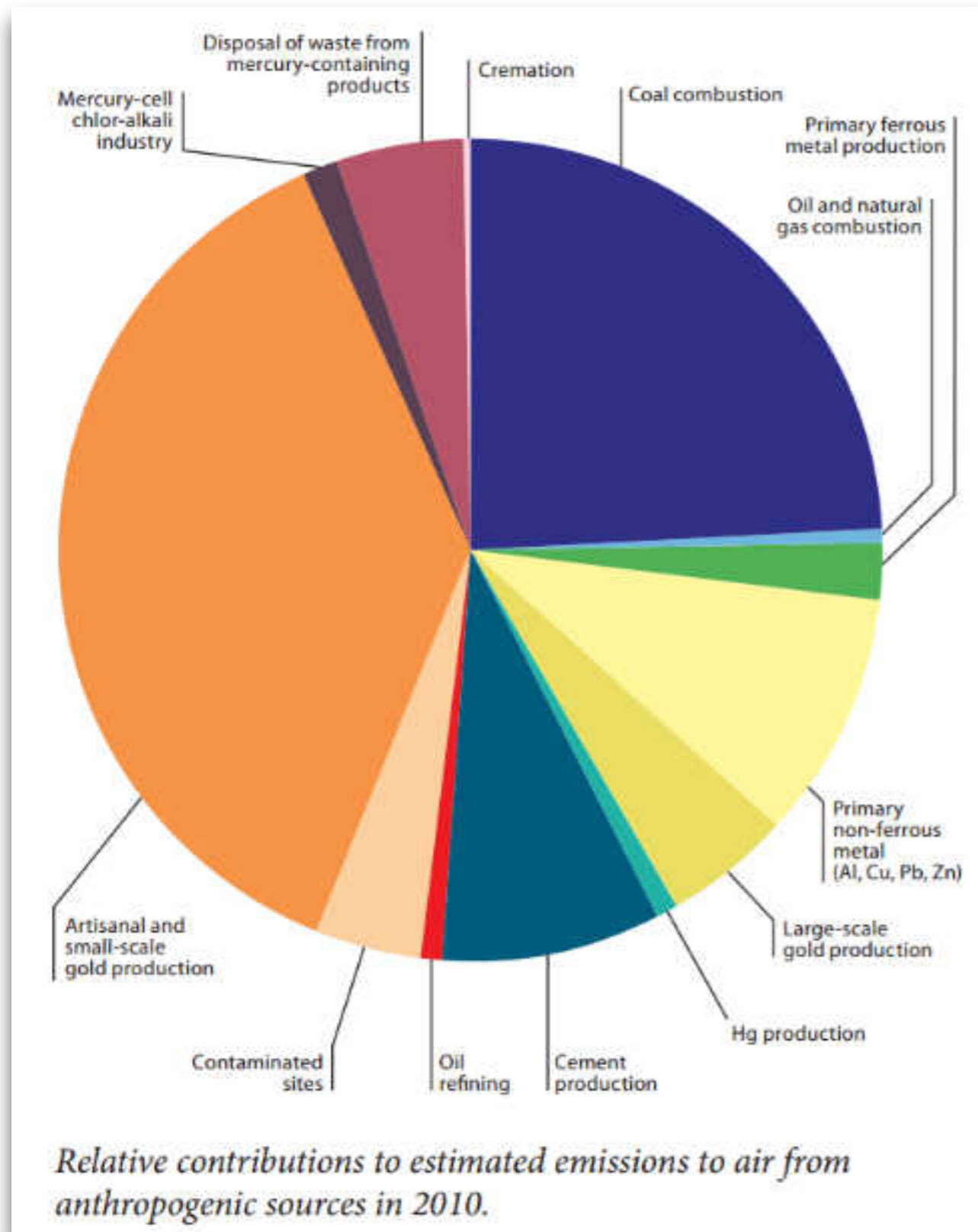


MODERN GOLD RUSH



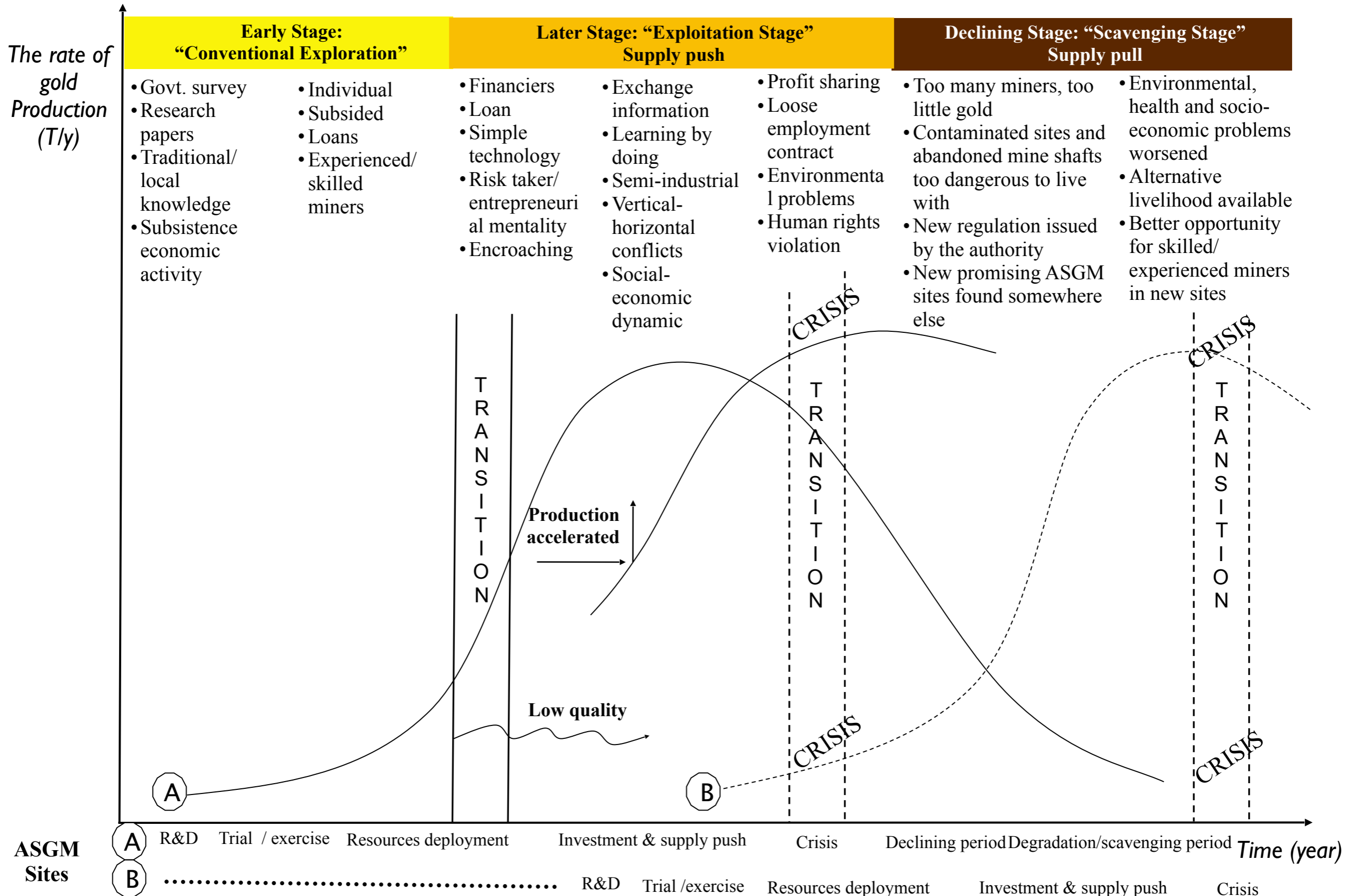
Adapted from Russel Barsh and the First Peoples Worldwide

GOLD RUSH IN THE 21ST CENTURY



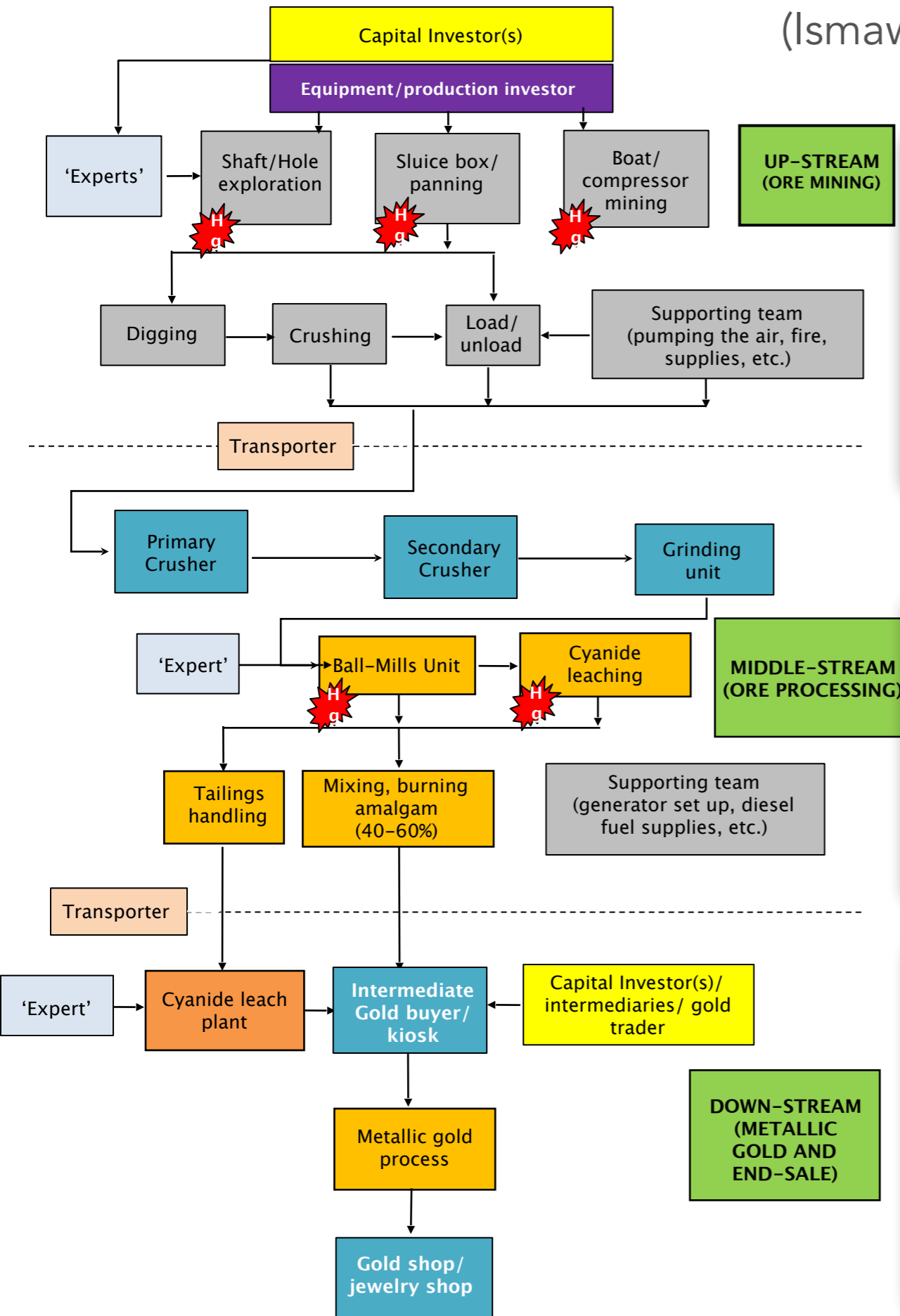
- 37% of the global emission (727 Ton/year in average)
- Employed >20 millions people in impoverish communities, >3 million women and children
- By the end of 2013, produced approx. 15-30% of the global gold production
- Resulting production of gold:
 - 400 tons of gold/year - 15% of the global gold production
 - USD 20 Billion
 - USD 2000 miner/year

AN EMPIRICAL CYCLE OF ASGM PRACTICES



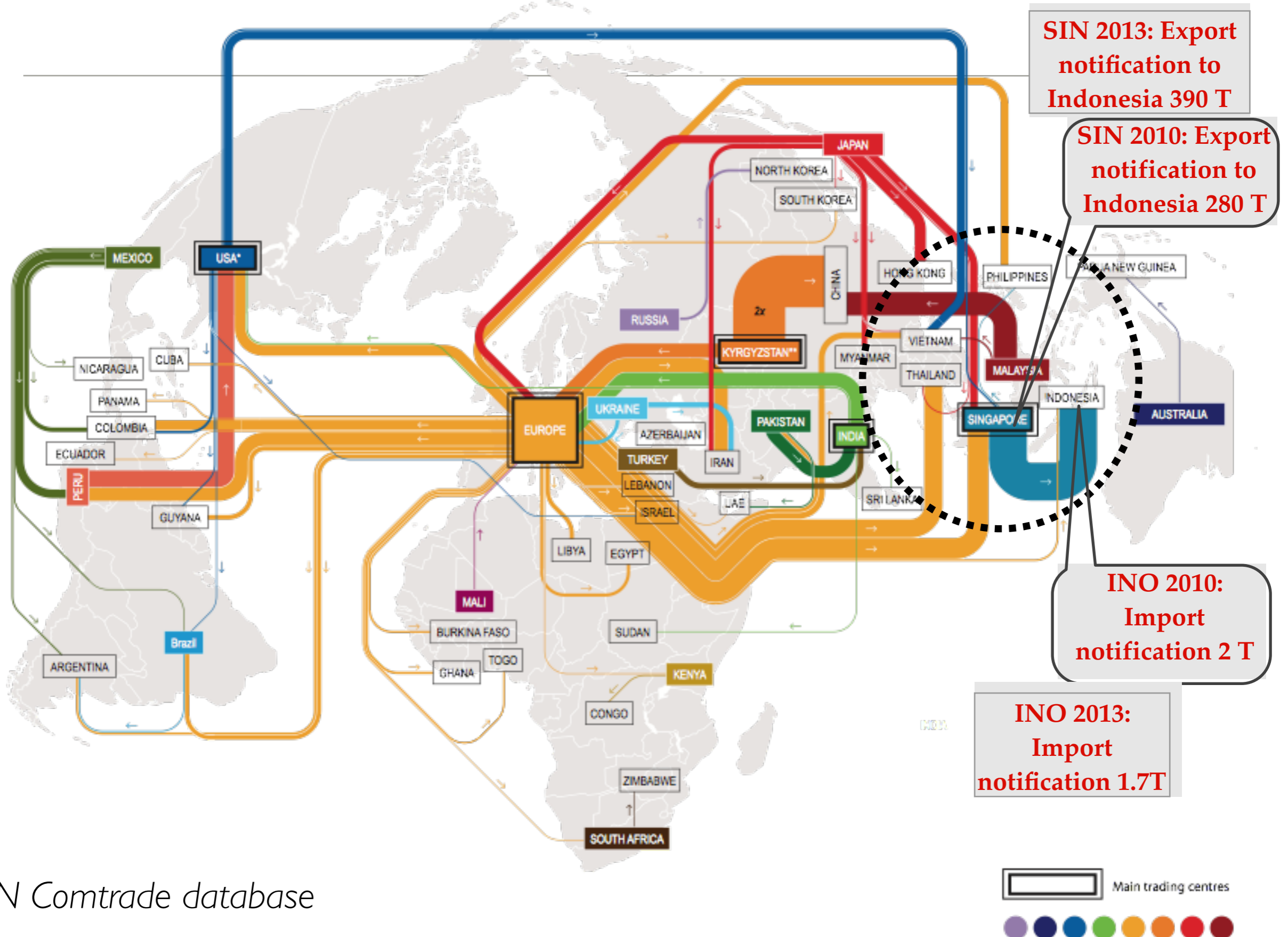
THE LIFE CYCLE APPROACH OF ASGM

(Ismawati, 2011)



Global Mercury Trade (2011)

<http://www.zoinet.org/web/sites/default/files/publications/MercuryTradeMap2011.pdf>



Data: UN Comtrade database

Table 9

Comparison of adult Hg levels in blood, urine and hair between this study and three other gold mining areas (Tanzania, Zimbabwe and the Philippines) versus the German Environmental Survey (GerES III) (Becker et al., 2002; Becker et al., 2003; Bose-O'Reilly et al., 2004; Drasch et al., 2001; Drasch and Bose-O'Reilly, 2004).

		Gold mining areas										Germany
		Control areas				Mining areas						Random sample
		Indonesia – Sulawesi	Philippines	Tanzania	Zimbabwe	Indonesia – Kalimantan	Indonesia – Sulawesi	Philippines – Monkayo	Philippines – Mt. Diwata	Tanzania	Zimbabwe	Germany
Hg urine [$\mu\text{g/l}$]	Number	21	39	38	28	165	95	75	123	175	154	4741
	Minimum	<0.2	0.25	<0.2	<0.2	0.29	0.44	0.25	0.25	<0.2	0.44	<0.2
	Median	0.73	1.66	0.34	0.10	5.86	14.36	1.04	8.64	1.73	32.31	0.43
	Maximum	3.16	7.59	6.78	8.78	5240.00	564.00	8.55	294.20	224.00	1530.32	134.8
	Mean	0.90	2.06	0.70	0.65	89.71	37.63	1.42	23.05	9.11	86.12	3.3
	95th percentile	2.75	7.59	2.05	3.32	197.60	177.20	3.81	111.80	33.30	342.50	0.89
Hg urine [$\mu\text{g/g creatinine}$]	Number	21	39	38	28	165	95	75	123	175	154	4730
	Minimum	<0.2	0.39	<0.2	<0.2	0.46	0.48	<0.2	0.27	<0.2	<0.2	<0.2
	Median	0.40	1.62	0.24	0.11	3.55	5.27	1.22	5.64	0.94	23.38	0.34
	Maximum	1.35	9.31	1.99	3.57	1697.39	232.82	5.15	196.28	106.59	547.42	16.0
	Mean	0.43	2.56	0.34	0.38	36.02	21.65	1.40	14.89	4.46	50.30	2.0
	95th percentile	0.66	8.55	1.55	2.82	127.54	161.43	4.14	55.12	17.91	196.45	0.59
Hg blood [$\mu\text{g/l}$]	Number	21	39	38	28	165	95	75	123	175	154	4645
	Minimum	2.36	0.72	0.22	<0.2	1.45	3.42	0.25	1.22	0.45	0.60	<0.2
	Median	4.47	9.26	1.07	0.43	9.25	11.72	6.88	10.10	1.91	9.20	0.58
	Maximum	10.12	31.30	2.35	1.79	429.00	186.00	47.50	107.60	33.30	97.60	12.3
	Mean	4.92	10.44	1.16	0.52	25.12	21.38	9.11	14.44	3.50	16.23	2.5
	95th percentile	9.16	24.48	2.29	1.55	128.00	78.40	21.48	42.60	12.88	51.60	0.86
Total Hg hair ($\mu\text{g/g}$)	Number	21	39	38	28	165	95	75	123	175	154	
	Minimum	0.83	0.98	0.08	0.02	0.33	0.58	0.68	0.10	0.12	0.39	
	Median	1.53	2.72	0.37	0.08	3.08	3.57	2.98	2.81	0.59	3.31	
	Maximum	3.72	34.71	0.68	3.25	792.45	239.04	13.17	37.76	48.74	112.18	
	Mean	1.64	4.02	0.38	0.26	17.75	9.72	3.52	5.28	2.06	9.36	
	95th percentile	3.03	9.94	0.65	1.01	60.09	38.89	10.05	16.57	6.88	33.86	

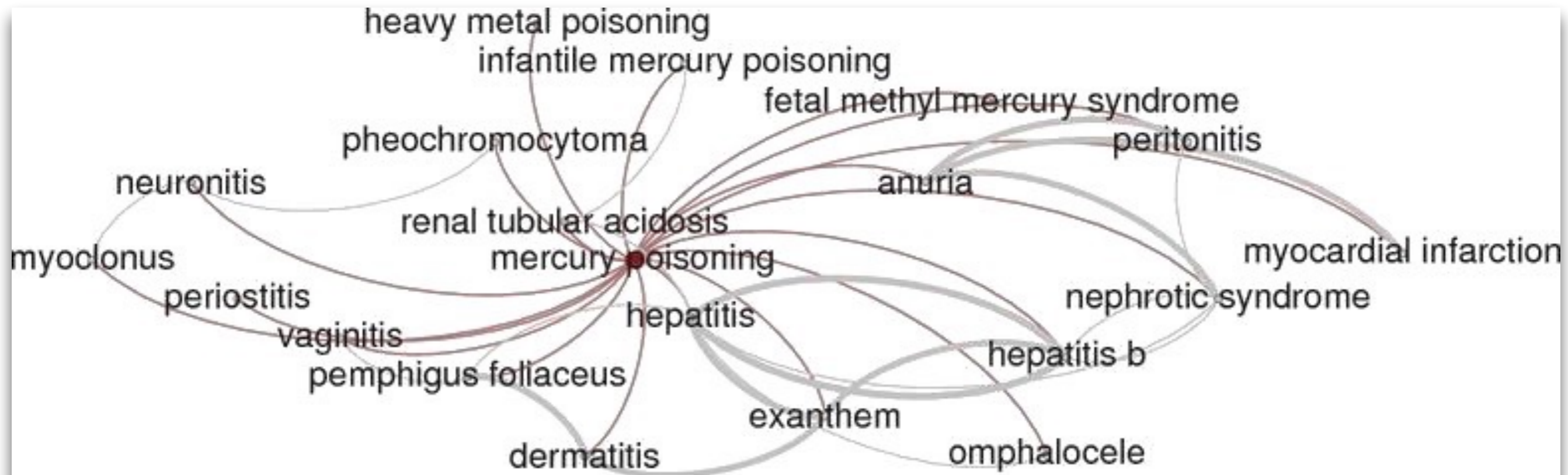
Mercury In Gold-Mining Environment

SOURCE: WILCKE, J. & MERKLE, M. (2002)

Remarks	Phases of mercury action in the environment		
	Phase 1: Hg pollution	Phase 2: CH ₃ Hg accumulation	Phase 3: CH ₃ Hg poisoning
	10—20 years	Appr. 20 years	> 150 years
Hg-use in gold-mining			
Hg poisoning the miners			
Distribution of Hg-vapour down-wind			
Metallic Hg pollution in waters			
Hg accumulation in sediments			
Metallic Hg transformed to CH ₃ Hg			
CH ₃ Hg accumulation in fish			
Downstream Community poisoned by CH ₃ Hg			

Malacard of mercury poisoning

Graphical network of the top 20 diseases related to Mercury Poisoning



Copyright © Weizmann Institute of Science - www.malacards.org

Source: http://www.malacards.org/card/mercury_poisoning

Minamata Disease dan Congenital MD



(Photo credit: Masazumi Harada)



Fig. 4. Forced laughter, a condition resembling akinetic mutism. Female aged six years, born in 1956, died in 1977.

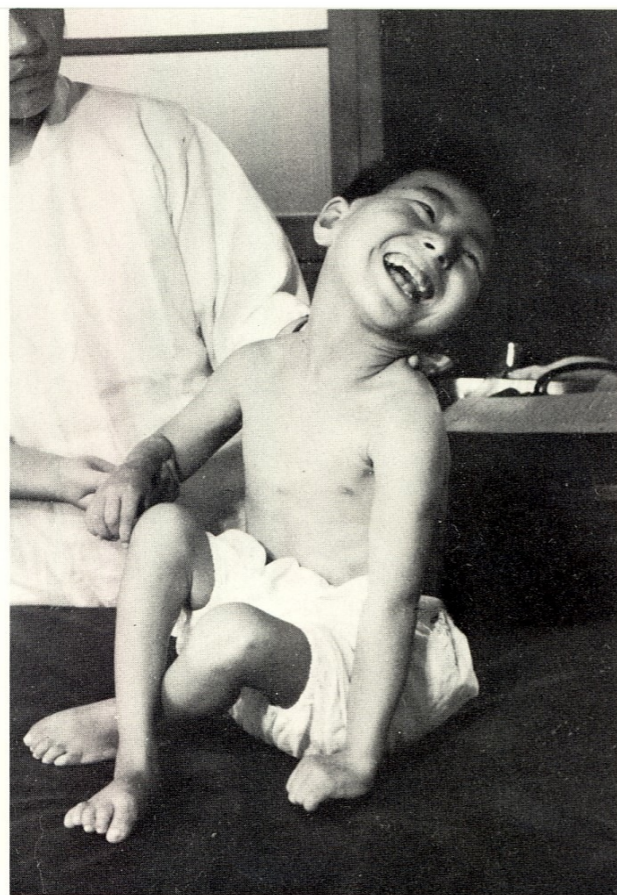


Fig. 2. Neck is unsteady, inability to sit up. Male aged six years, born in 1956, died in 1969 without any improvement of symptoms.



Fig. 1. Congenital Minamata disease patients in Minamata area. The patients showed very similar clinical picture to each other. (Photographed by M. Harada in 1962).

Mercury poisoning suspects from ASGM sites



D, 9, Bombana, Southeast Sulawesi



R, 15, Bombana, Southeast Sulawesi



All photos credit: Yuyun Ismawati/BaliFokus & Medicuss

MERCURY TREATY

Art. 2 - definitions

(k). Use “**allowed**” means any use by a Party of mercury or mercury compounds consistent with this Convention, including, but not limited to, uses consistent with Articles 3, 4, 5, 6, and **7**;

Art. 3 - supply sources and trade - inventory toolkits, import and export of mercury, no sunset date of hg use in ASGM;

Art. 7 - ASGM - with the associated Annex C on ASGM’s National Action Plan, elimination of 4 worst practices, health strategy, hg trade and supply control, need to include LAP (Local Action Plan) including identification and promotion of sustainable alternative livelihoods.

Art. 8 & 9 - Emissions and releases to land and water - safe level standard, contamination in food chains, fish advisory

MERCURY TREATY (2)

Art.10 - interim storage of mercury - hg imported for ASGM, tight control, potential hotspot;

Art.12 - contaminated sites - on-going and at the abandoned sites/water;

Art.16 - Health aspects - no guidance on early detection of mercury poisoning, treatment, biomarker monitoring;

Art.17 - Information exchange - lessons learned, guidance, advisory;

Art.20 - Implementation plan - consisted of several sectoral NAPs.

THANK YOU FOR YOUR ATTENTION

