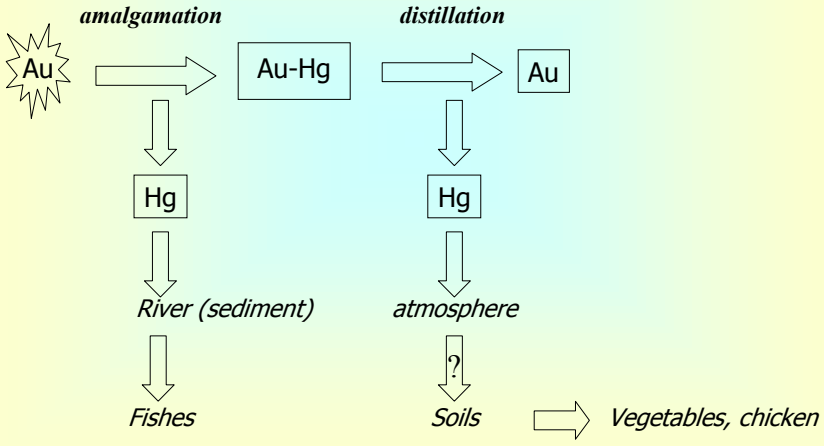
L. Bernaudat / M. Veiga

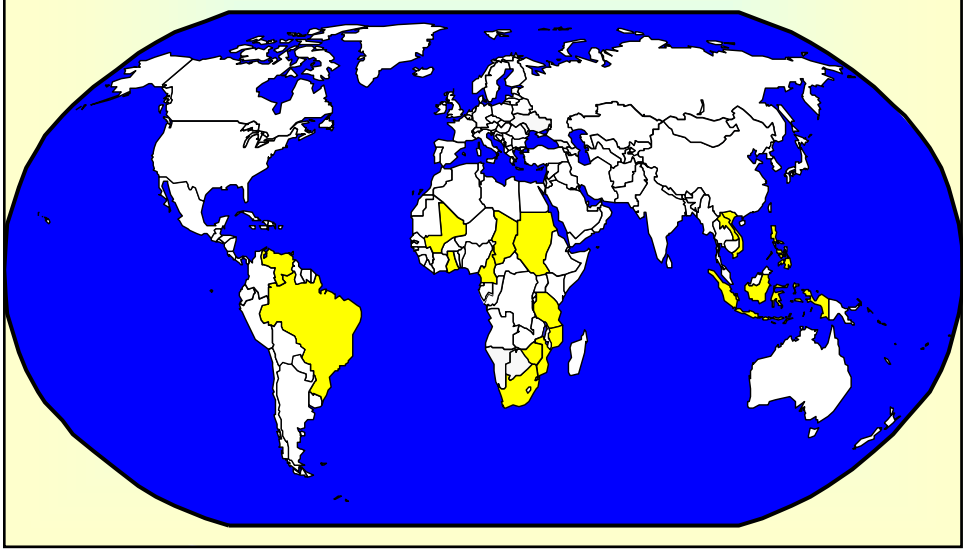
UNIDO's Strategy for Reducing the Impact of Artisanal Gold Mining on the Health and the Environment

- Study case in Ghana -

Release of Mercury during Small-Scale Mining Operation



Countries where UNIDO is developing / Implementing Projects

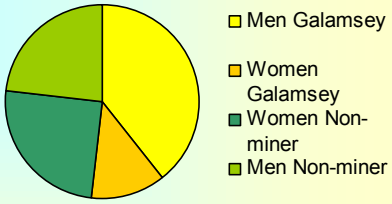


UNIDO's Proposed Actions to Transform Small-Scale Gold Mining into a Clean and Sustainable Activity

- Increase knowledge and raise awareness
- Assessment of the extent of mercury pollution/ contamination
- Establishment of a technology databank
- Introduction and demonstration of efficient, affordable and cleaner technologies
- Development of implementable policies and legislation that would lead to enforceable standards
- Dissemination of information/raising funds for future projects

Mercury Contamination Study in Dumasi (Hard Rock Mining)

187 people from the community participated in the survey



Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau
M. Babut, CEMAGREF

Study in Dumasi (Hard Rock Mining)

-Biological samples analyses –

Hg content in	Blood ($\mu g.l^{-1}$)	Urine ($\mu g.l^{-1}$)	Urinary Creatinin ($\mu g.g^{-1}$)	Hair ($\mu g.g^{-1}$)	Nails ($\mu g.g^{-1}$)
Mean	24.4	23.85	15.54	3.85	3.99
Maximum	96	252.9	193	44.6	55.7
Minimum	1	1.1	1	0.39	0.66
Stand.deviation	*16.9*	*40.3*	*25.4*	*4.67*	*5.44*
Number N	*180*	*102*	*102*	*148*	*161*
Reference for non-exposed population	*<10*		*<5*	*<2*	*<2*
Biological limits	*15 (BEI)*	*100 (BAT)*	*35 (BEI)*	*10 (WHO)*	*10 (WHO)*

Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau
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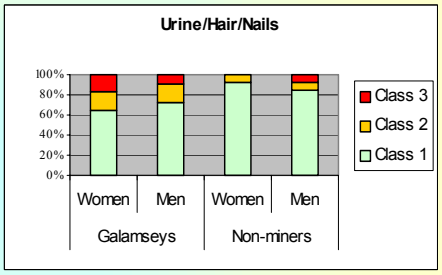
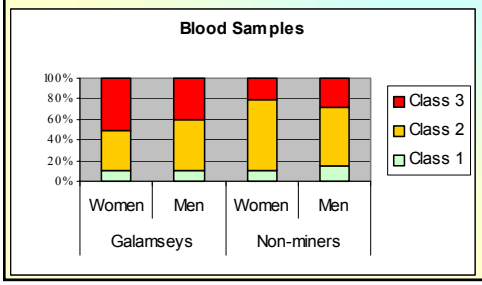
Study in Dumasi (Hard Rock Mining)
- Biological samples analyses -





Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau
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Study in Dumasi (Hard Rock Mining)
- Water and sediment analyses -

Hg content in	Borehole water ($\mu g.l^{-1}$)	Surface water ($\mu g.l^{-1}$)	Well water ($\mu g.l^{-1}$)	Sediments ($\mu g.g^{-1}$)
Mean	0.165	0.28	0.34	13.47
Maximum	0.27	0.76	0.5	93.1
Minimum	0.12	0.14	0.18	0.64
Stand.deviation	*0.05*	*0.27*	*0.23*	*28.1*
Number N	*8*	*5*	*2*	*10*
Threshold level 1	*0.07*	*0.07*	*0.07*	*0.13*
Threshold level 2	*0.7*	*0.7*	*0.7*	*0.7*

Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau
M. Babut, CEMAGREF

Study in Dumasi (Hard Rock Mining)
- Food samples analyses -

Hg content in	Fish ($\mu g.g^{-1}$) ww	Plantain ($\mu g.g^{-1}$) ww	Cassava / Sugar cane ($\mu g.g^{-1}$) ww	Chicken ($\mu g.g^{-1}$) ww
Mean	0.93	0.05	0.011	0.045
Maximum	1.59	0.052	0.018	0.057
Minimum	0.13	0.047	0.002	0.031
Stand.deviation	*0.41*	*0.003*	*0.008*	*0.012*
Number N	*17*	*2*	*3*	*4*
WHO limit for dangerous level	*0.5*	-	-	-

Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau
M. Babut, CEMAGREF

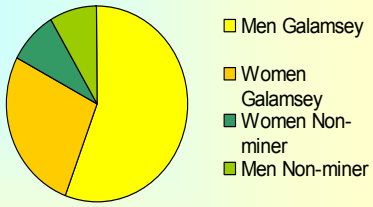
Study in Dumasi (Hard Rock Mining)
- Principal results -

- **Water is not contaminated but sediments are**
- **In all fish sample, the mercury content is higher than the WHO toxicity standards**
- **The WHO toxicity standards for daily intake are reached for 43g of fish or 240g of poultry**
- **The whole mining community is affected by mercury intoxication**
- **50% of miners and 25% of non-miners are considered as heavily intoxicated**

Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau
M. Babut, CEMAGREF

Mercury Contamination Study in Japa (Alluvial Mining)

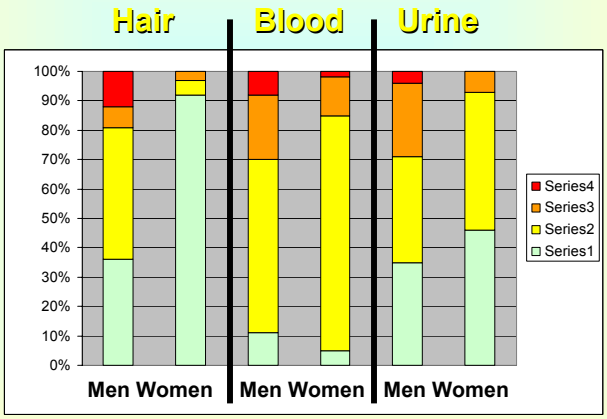
180 people from the community participated in the survey



Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau

Study in Japa (Alluvial Mining)

- Biological samples analyses -



Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau

Study in Japa (Alluvial Mining)

- Biological samples analyses -

- Mining community less affected than the one in Dumasi
- 56 individuals are in class 3 or 4 for at least one of the bio indicator
  - •70% are miners for less than 5 years
- 39 individuals showed neurological disorders
  - •38% are miners for less than 5 years
- 33 miners were considered as heavily intoxicated – special training was proposed for them

Source: A. Rambaud, C. Casellas, University of Montpellier
M. Potin-Gautier, Universiy of Pau

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