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An effective option to replace mercury and increase gold recovery by using concentration and cyanidation

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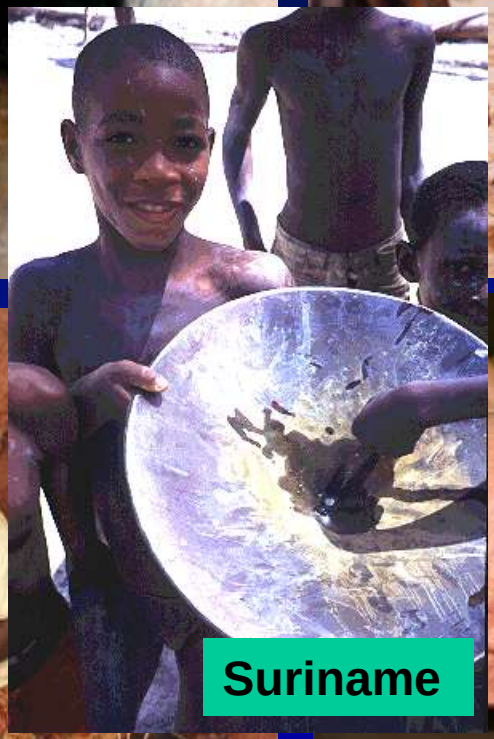
Magnitude of ASM in the world

- ✓ 10-15 million artisanal gold miners producing ~350t Au/a in >70 countries
- ✓ About 50-100 million people directly and indirectly involved in ASM
- ✓ ASM emits around 1,000t of Hg/a to the environment (20% of world's emission)

Magnitude of ASM in the world


China


Laos


Suriname

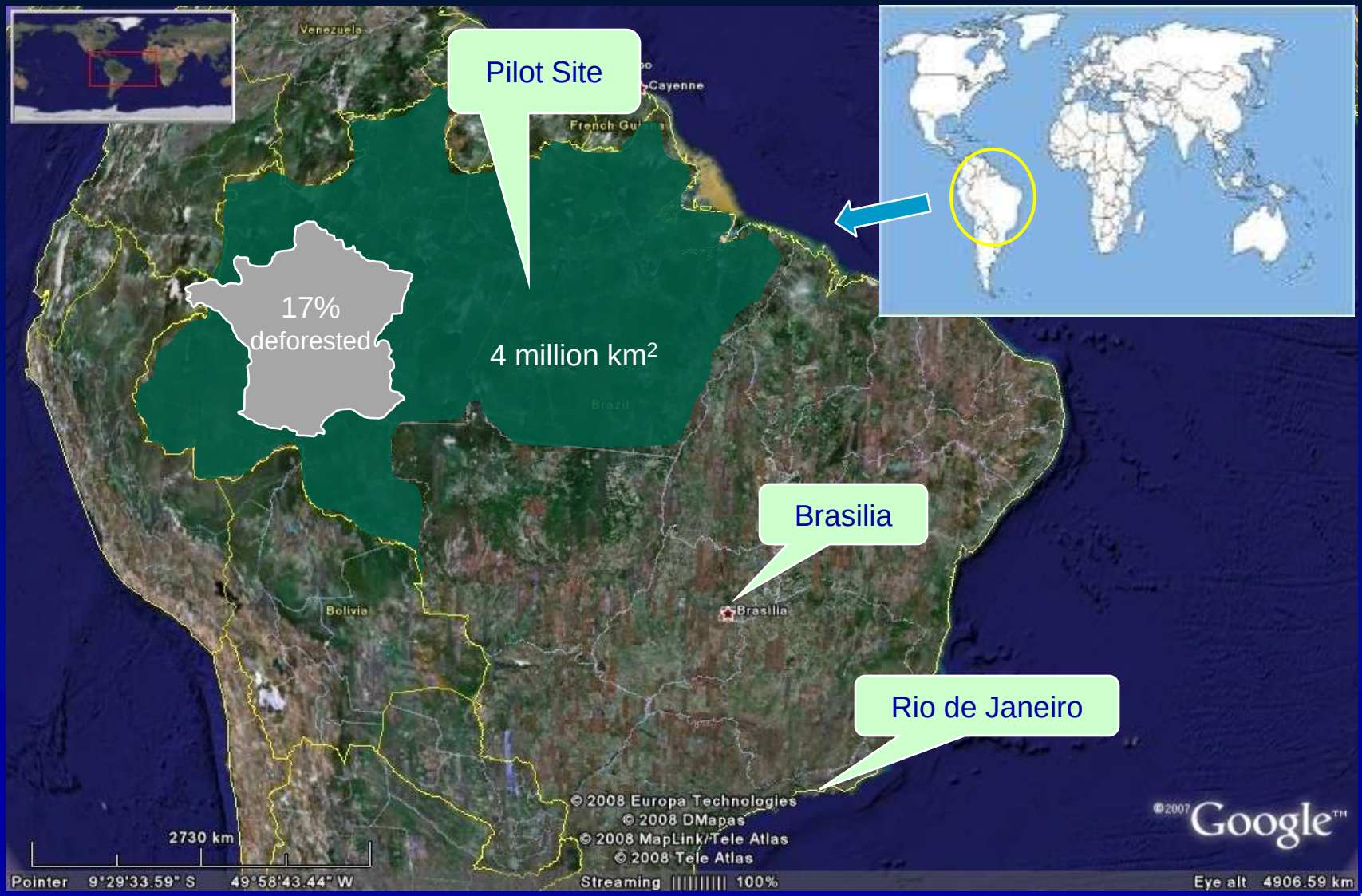

Tanzania


Ecuador

ASM in the Amazon

- In 2008, Brazil produced 54 tonnes of gold, of which 5.2 tonnes were produced by ASM
- Between 10 to 15 tonnes of Hg were lost by ASM
- 600 pits, each with a volume greater than 10,000m^3 are opened annually
- 6,000,000 tonnes/a of Hg contaminated tailings into the rivers

Pilot Site location in the Amazon



Overview of mining operation. Hg-contaminated tailings released into the rivers

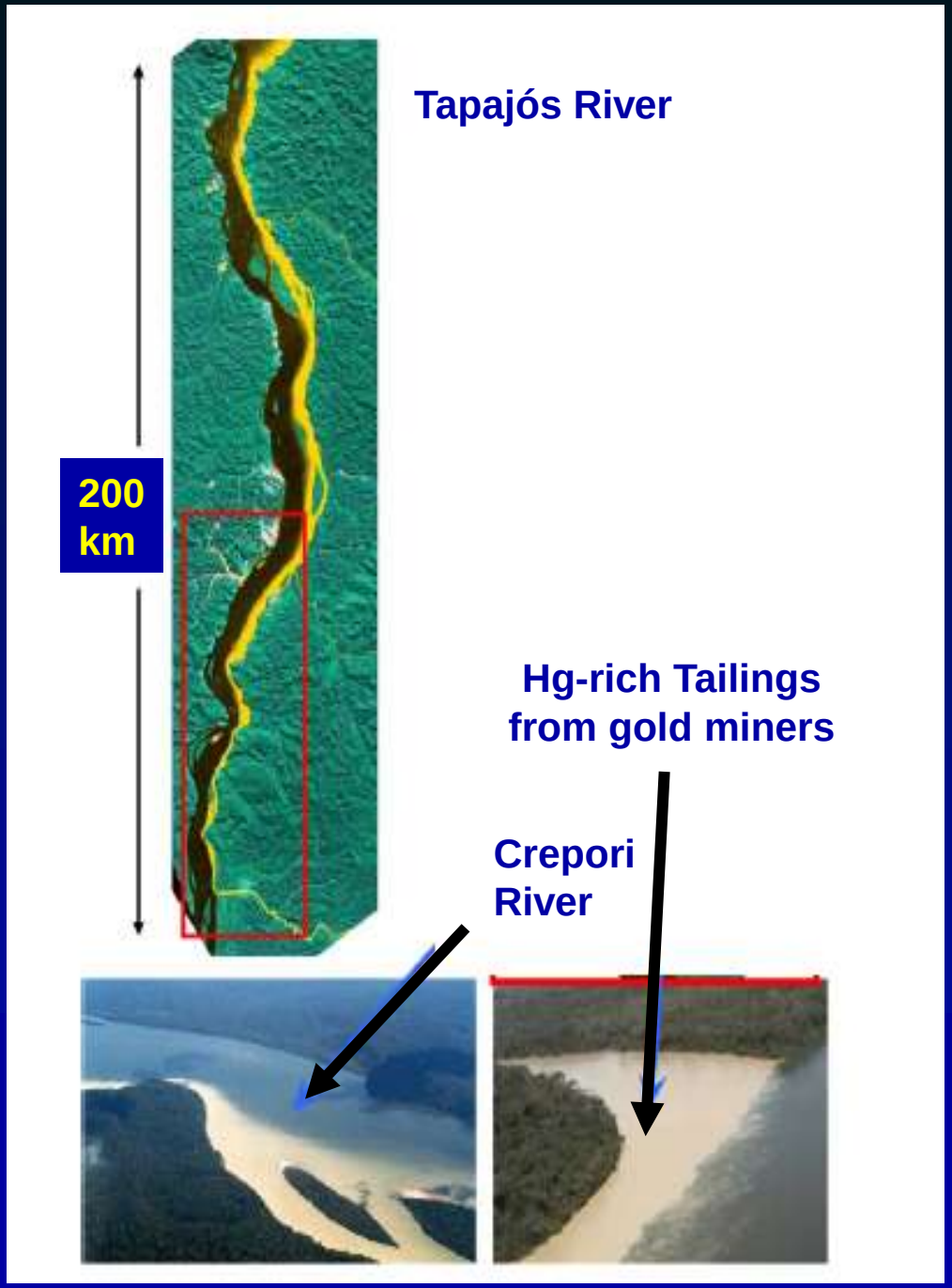
Mobility of Hg-contaminated Tailings

Hg-tailings go >200km downstream in the Tapajós River

Tailings take >4 t/a of Hg to other areas

Hg is methylated and bioaccumalted downstream

Telmer et al., 2006



Loss of Hg depending on the procedure

Amalgamation of the whole ore

and/or

Cyanidation of Hg-contaminated tailings

→ Huge Hg losses

↓

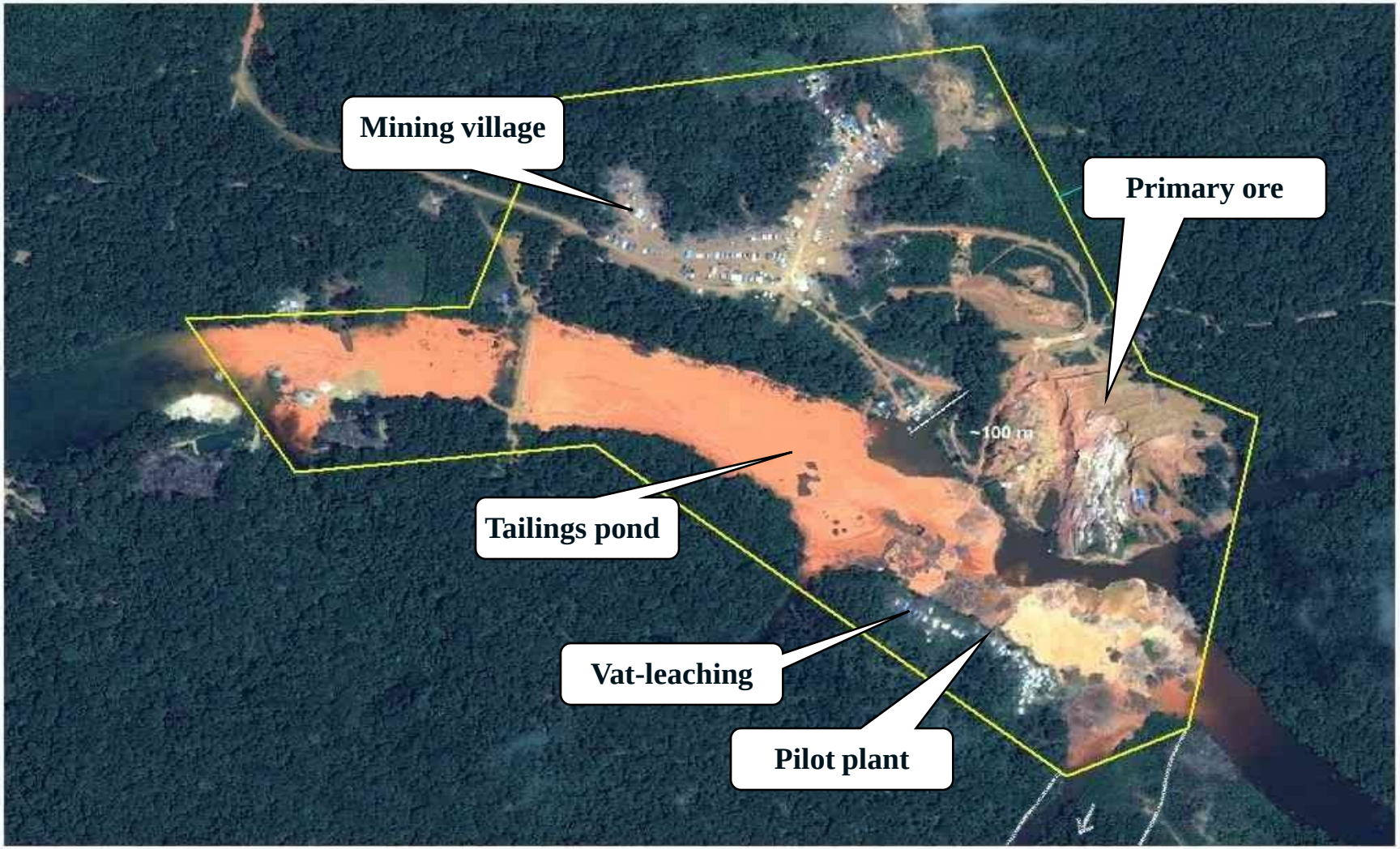
Hg^o → CH_3Hg in fish

Hg^o vapor → lungs

Burning Amalgams in Pans → Health problem for miners, and community

Amalgam roasting and whole ore amalgamation

Site study in the Amazon



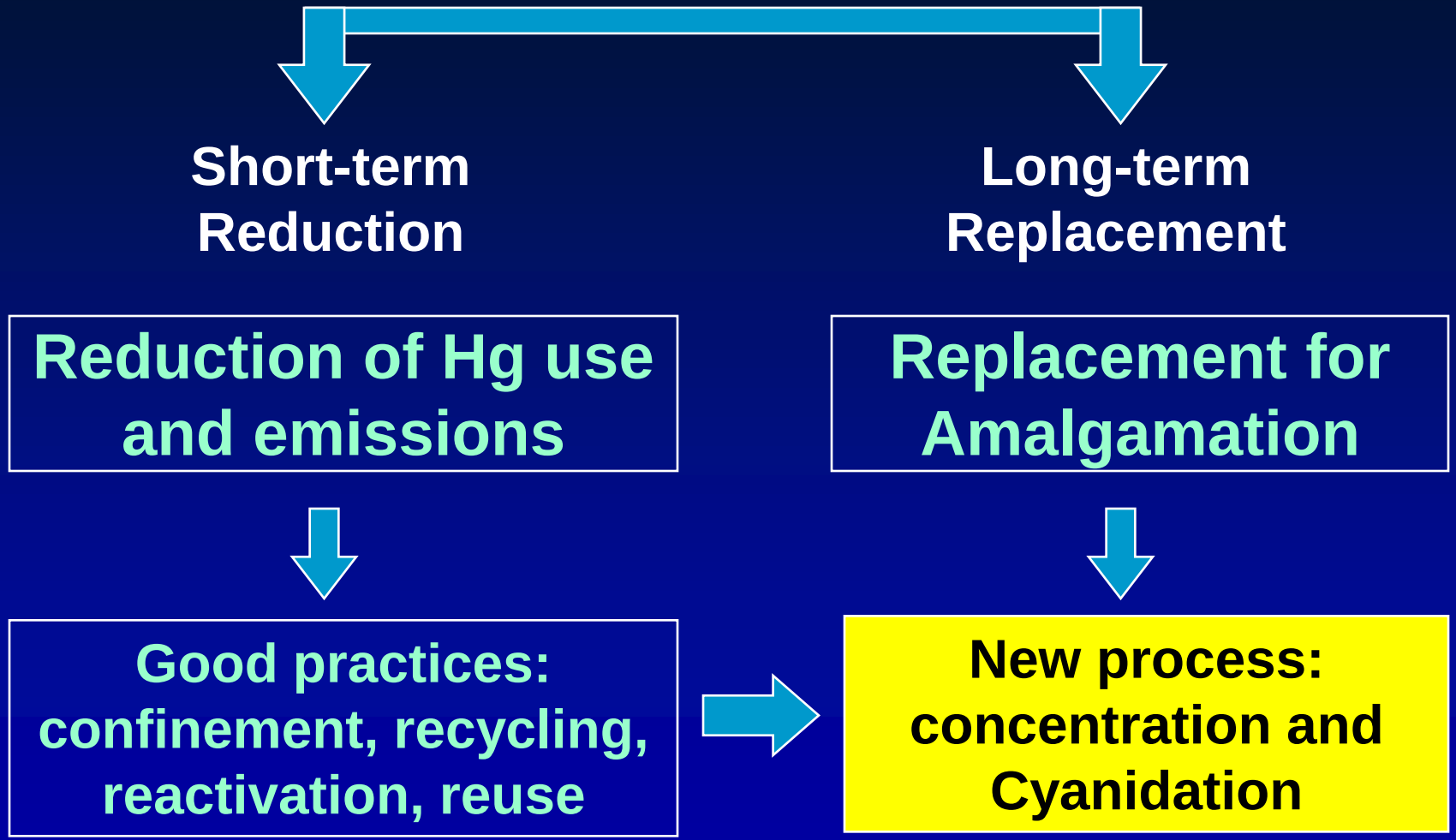
Site study in the Amazon

- Produces 5kg of Au/month;
- Consumes 3,000kg of NaCN and 8kg Hg monthly;

Site study in the Amazon

- The current vat-leaching process

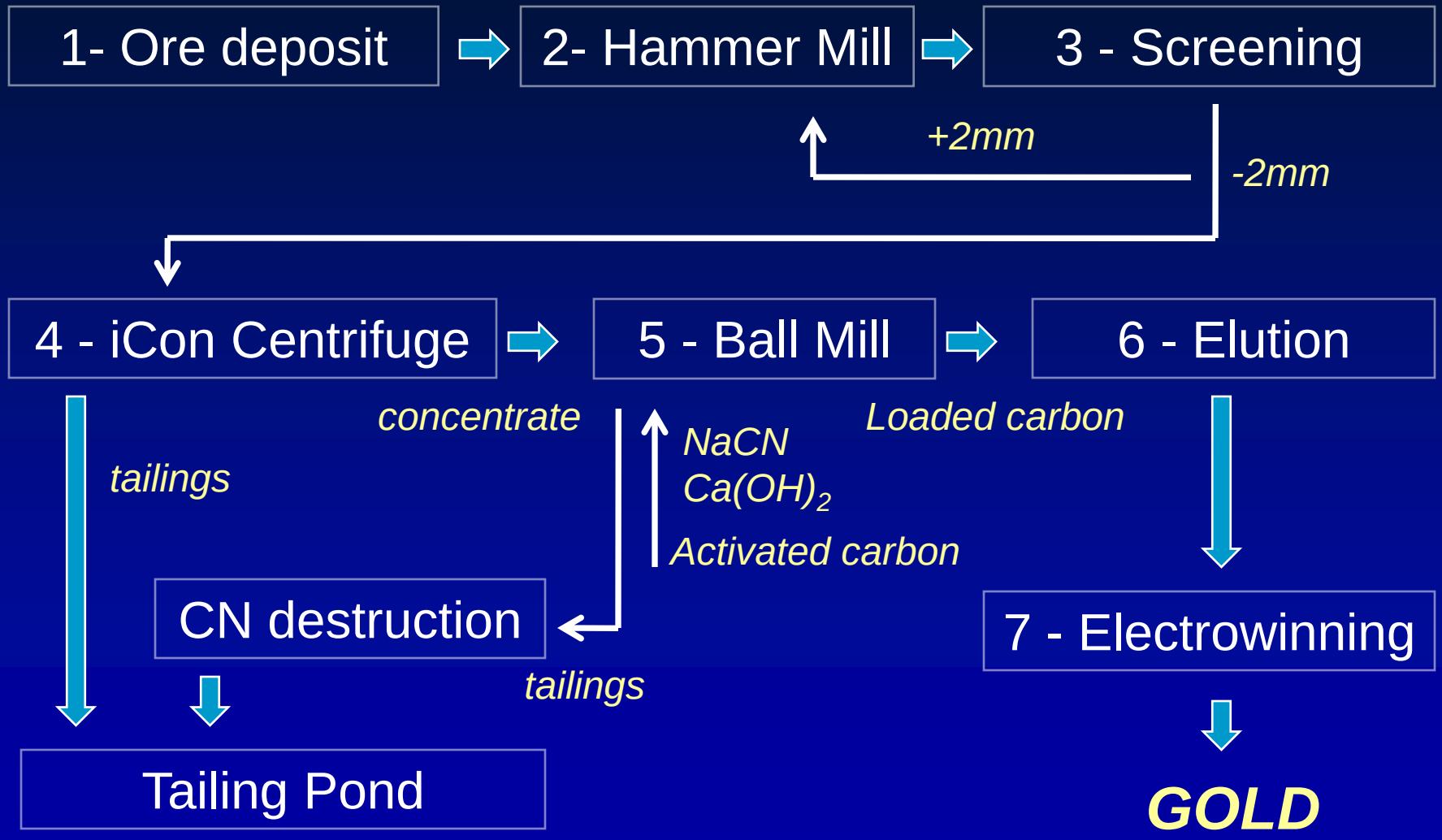
Solutions Being Introduced



Whole ore amalgamation vs Concentration

- Whole ore amalgamation replaced by concentration;
- 500 times mass reduction; Au recovery of 65% => CN

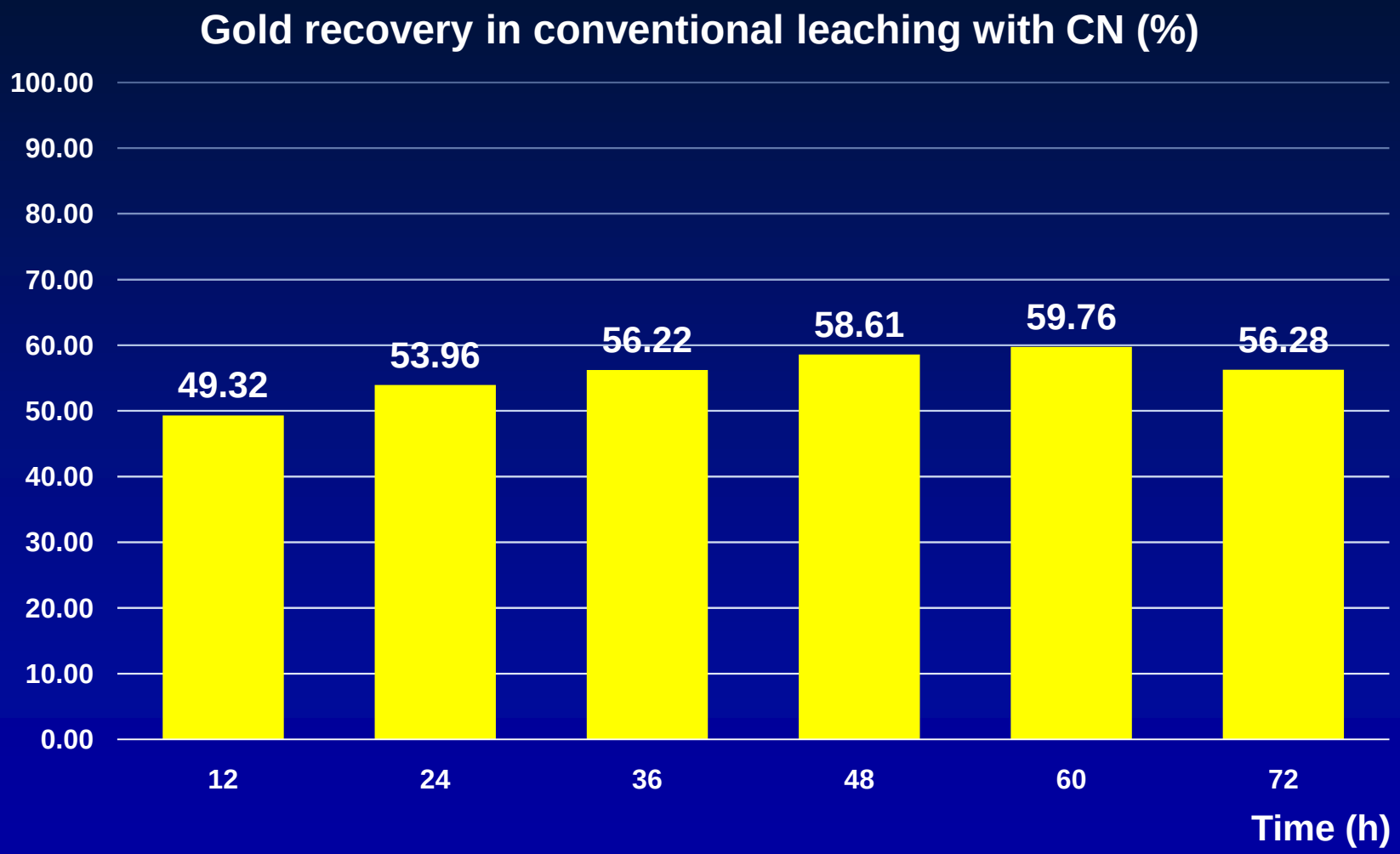
Mill leaching of gold concentrate



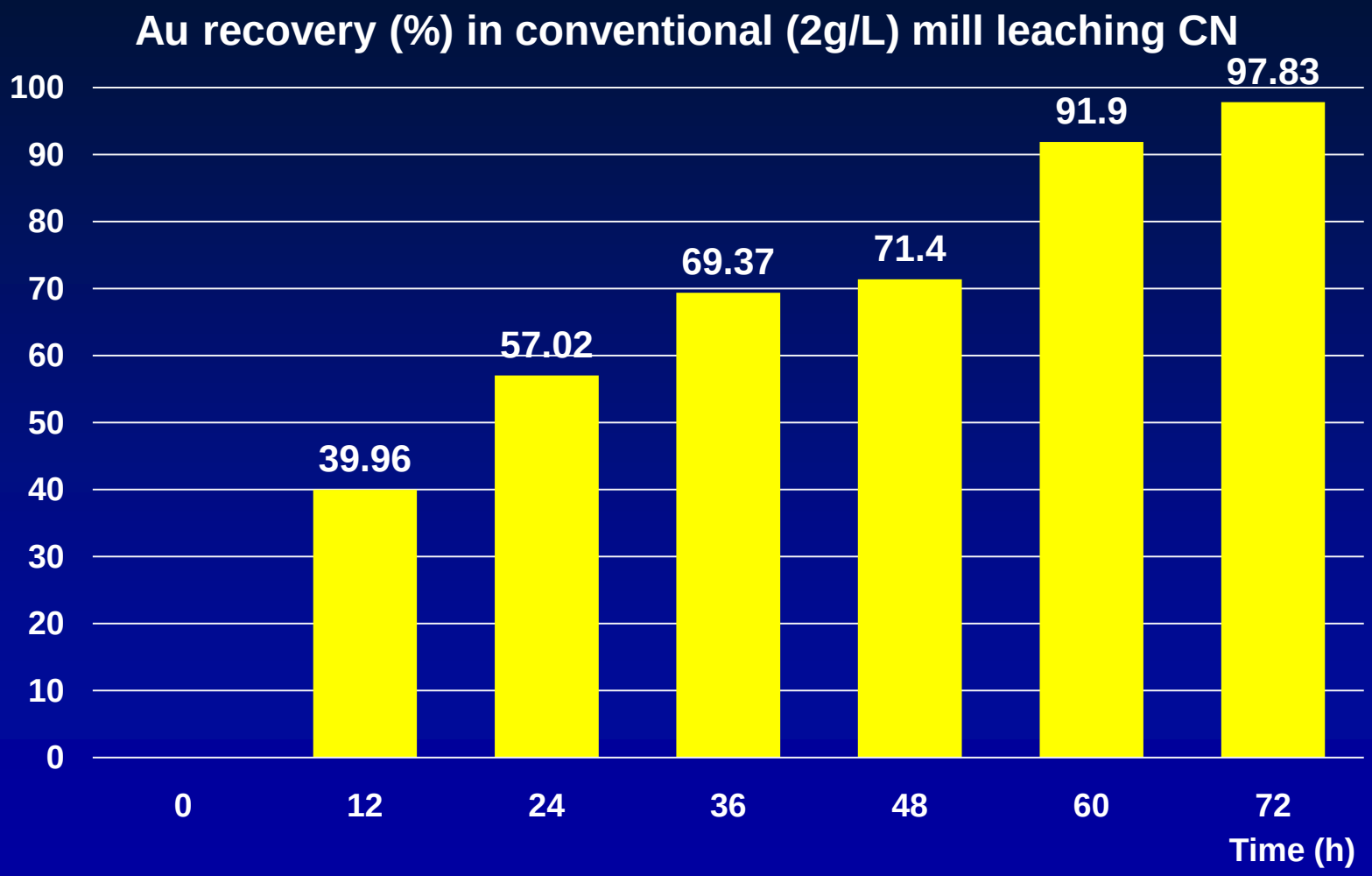
Mill leaching of gold concentrate

- ✓ The main steps of the CN process

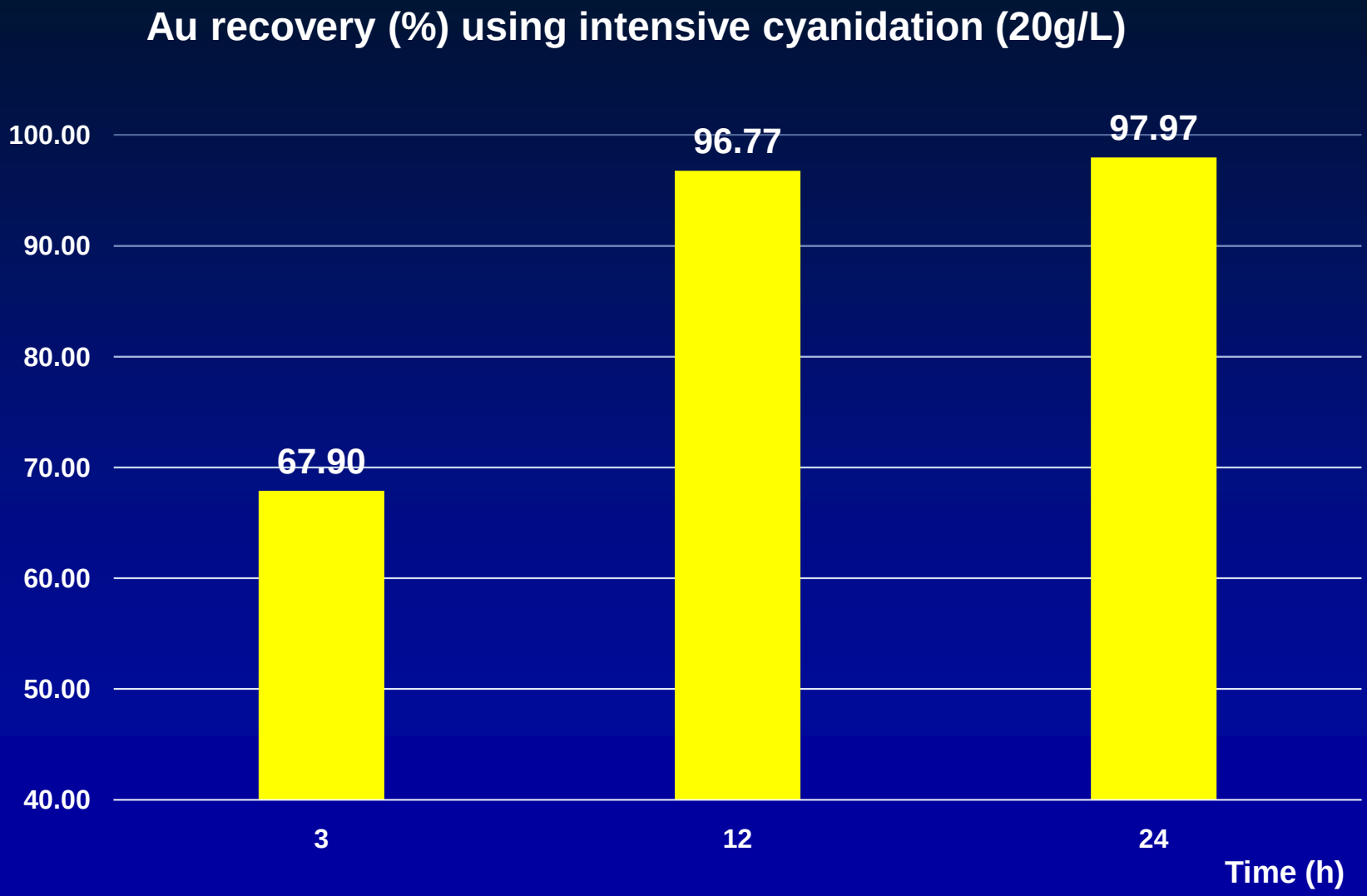
Au recovery in CN agitated tank



Result of CN in ball mill



Result of CN in ball mill



Summary / Conclusion

- Any alternative process in ASM must increase Au recovery or reduce costs
- Current Au recovery: Hg amalgamation = 40%
  Vat-leaching: 60% in 20 days
  Mill-leaching: 65% * 98% = 64% in 24h
- Concentration + cyanidation eliminates Hg, and CN is destroyed at the end of the process
- CN consumption (NaCN/year):
  Vat-leaching: 30,000kg x Mill-leaching: 300kg
- Pilot projects need to gain scale and continuity
- More realistic investment on the ground

Thank you! - Questions??

Training of miners in the Amazon. Mar/2009