

Lessons from Yanacocha: assessing mining impacts on hydrological systems and water distribution in the Cajamarca region, Peru. *

Diana Raquel Vela Almeida, Froukje Kuijk, Nicolas Kosoy, Nilton Deza and **Guido Wyseure****

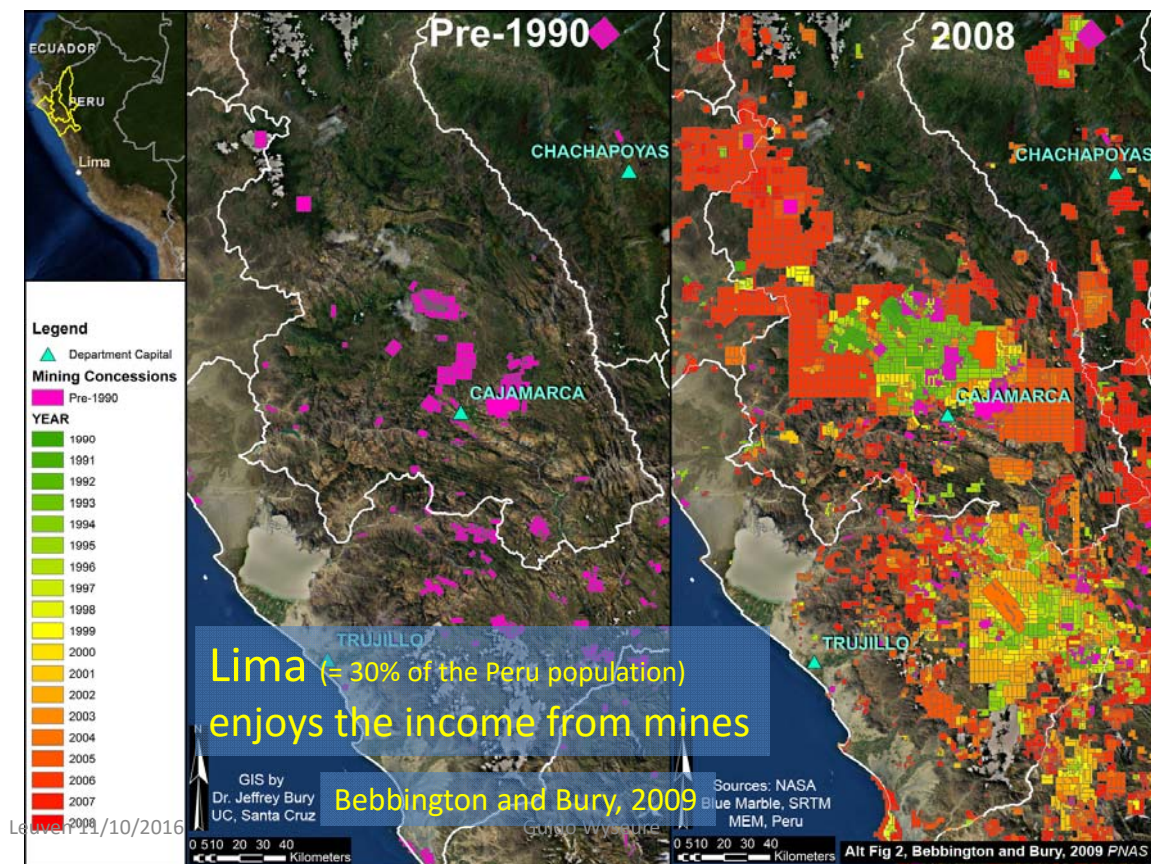
**Contact: Department of Earth and Environmental Sciences, KU Leuven, e-mail Guido.Wyseure@KULeuven.be

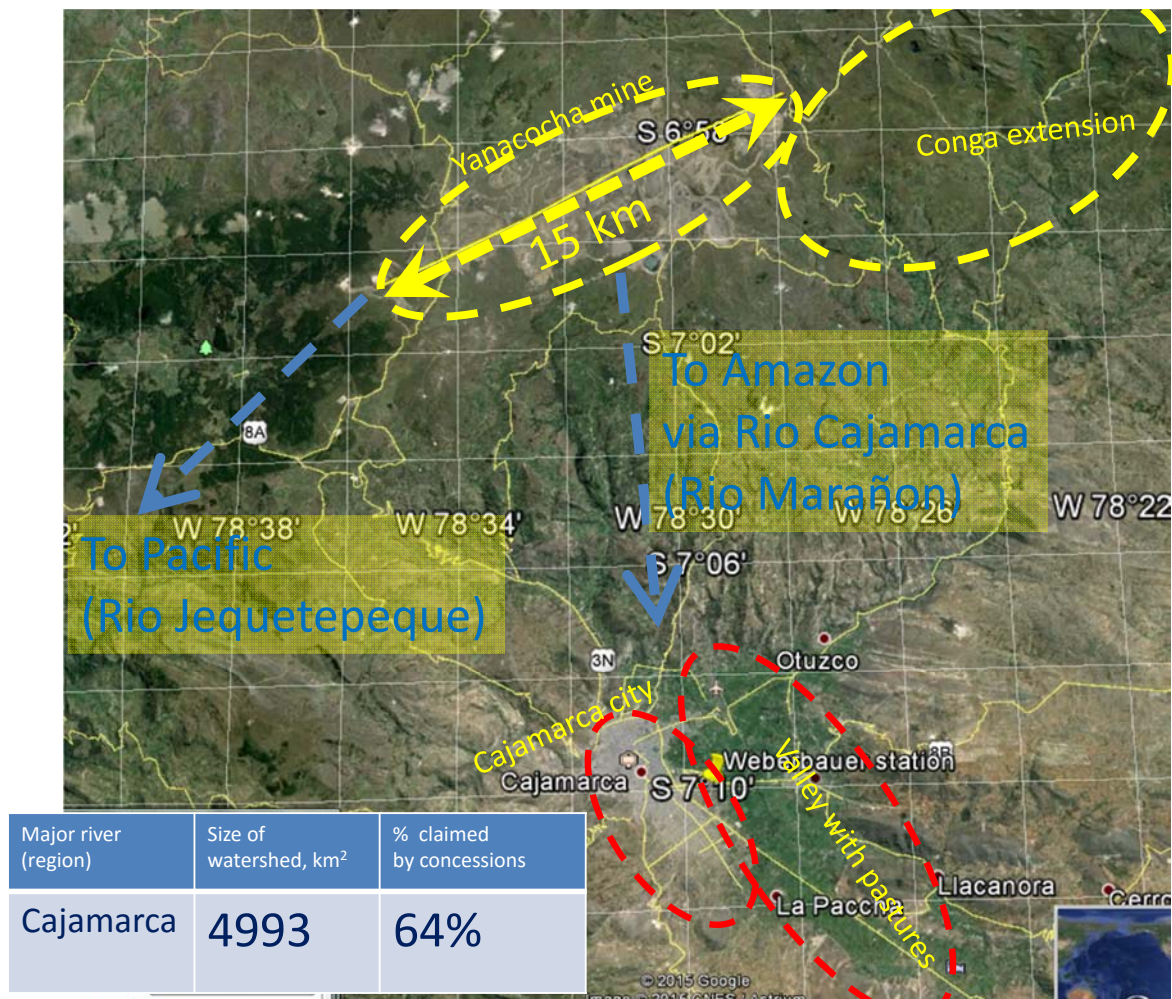
*Article published in 2016 "Water international" 41:3, 426-446

Leuven, 11 October 16



Concessions for mining in Peru





Open cast- gold mining

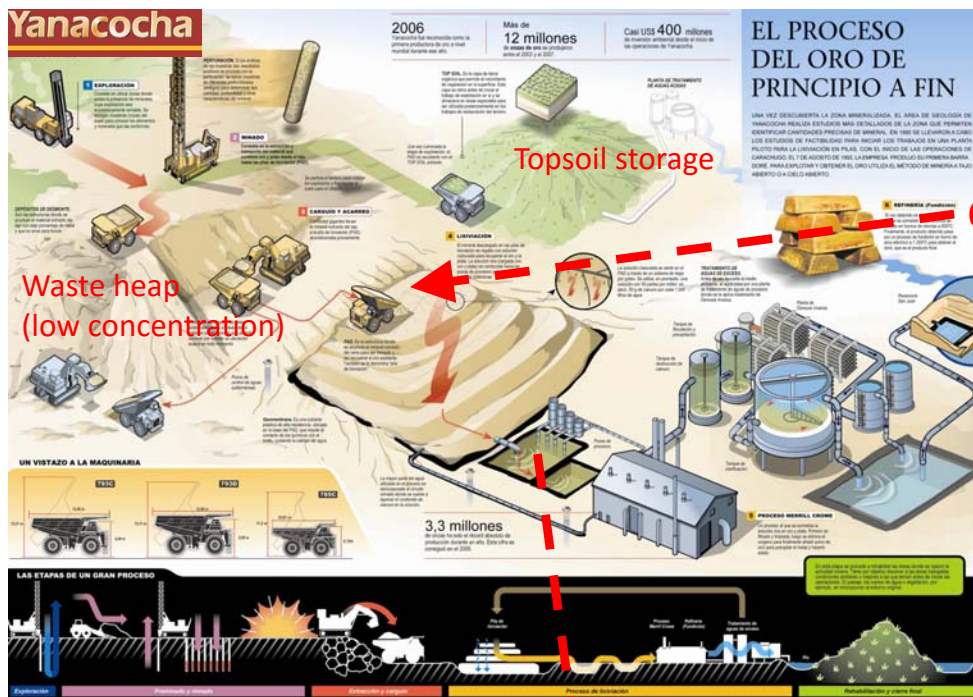
- Average concentration is **1 g gold per 1.8 ton of ore** (=low)
 - First step: explosions, transport and grinding of rock
 - Second step: leach out the gold, silver, mercury and other precious metals out by HCN (cyanide acid, dangerous but controlled...)
 - Third step: process leachate to "**Doré bar**" (75% gold + 20% silver), to be exported from Peru
- Literally destroying mountains at > 3500 m, making a very deep pit and creating heaps of tailings close to the processing plant
- Problems **during** operation: heavy metals, acid water (from sulfide oxidation; often **pyrite** or **FeS₂** present), open pit requires pumping, destruction of ecosystems...
- Problems **after** operation: Restoration possible? Take the money (gold) and run?



Open cast pit:

- different pits in action
- requires pumping for excavation
- => lowering water table
- => springs dry up

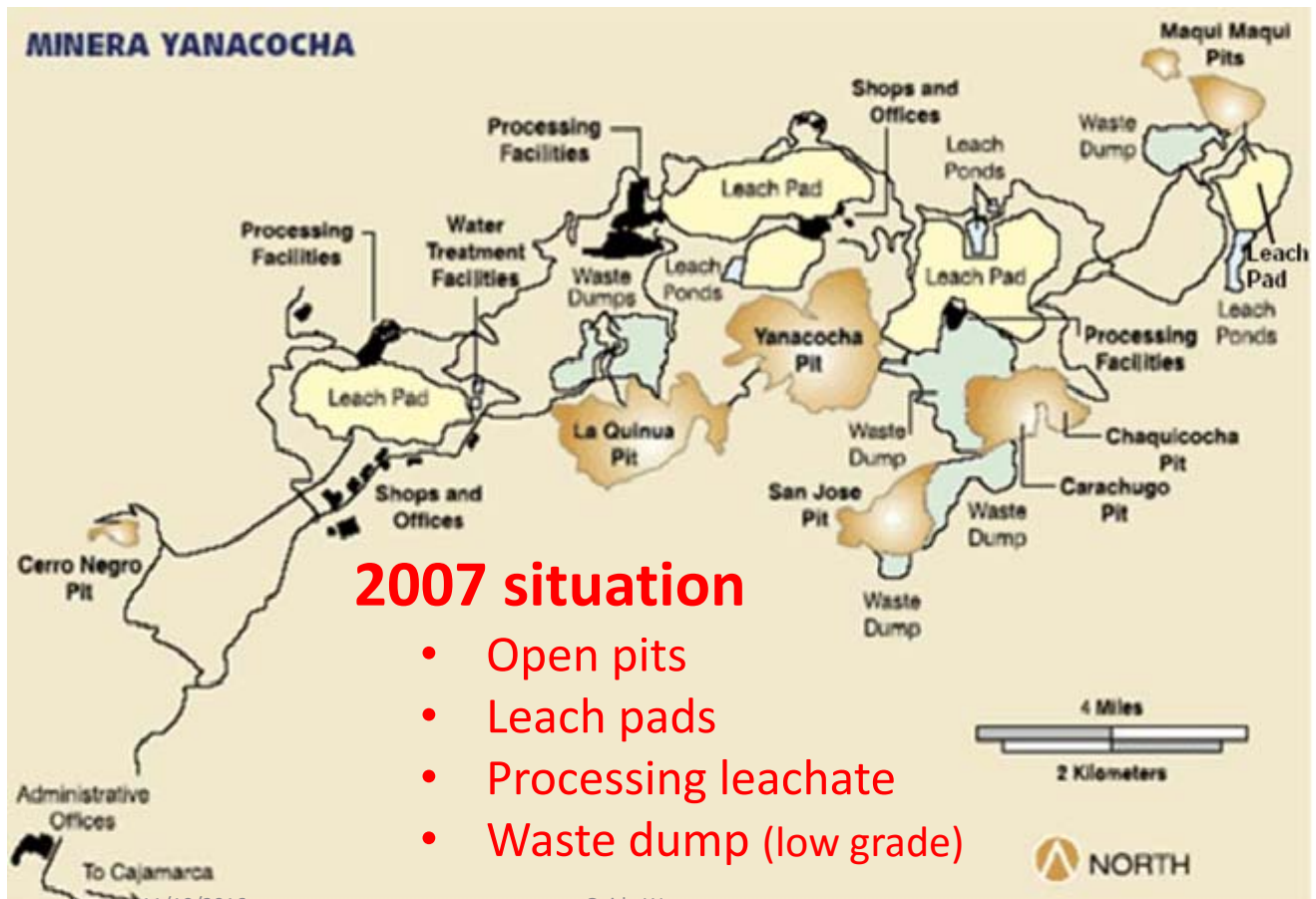




Leuven 11/10/2016

Guido Wyseure

HJB



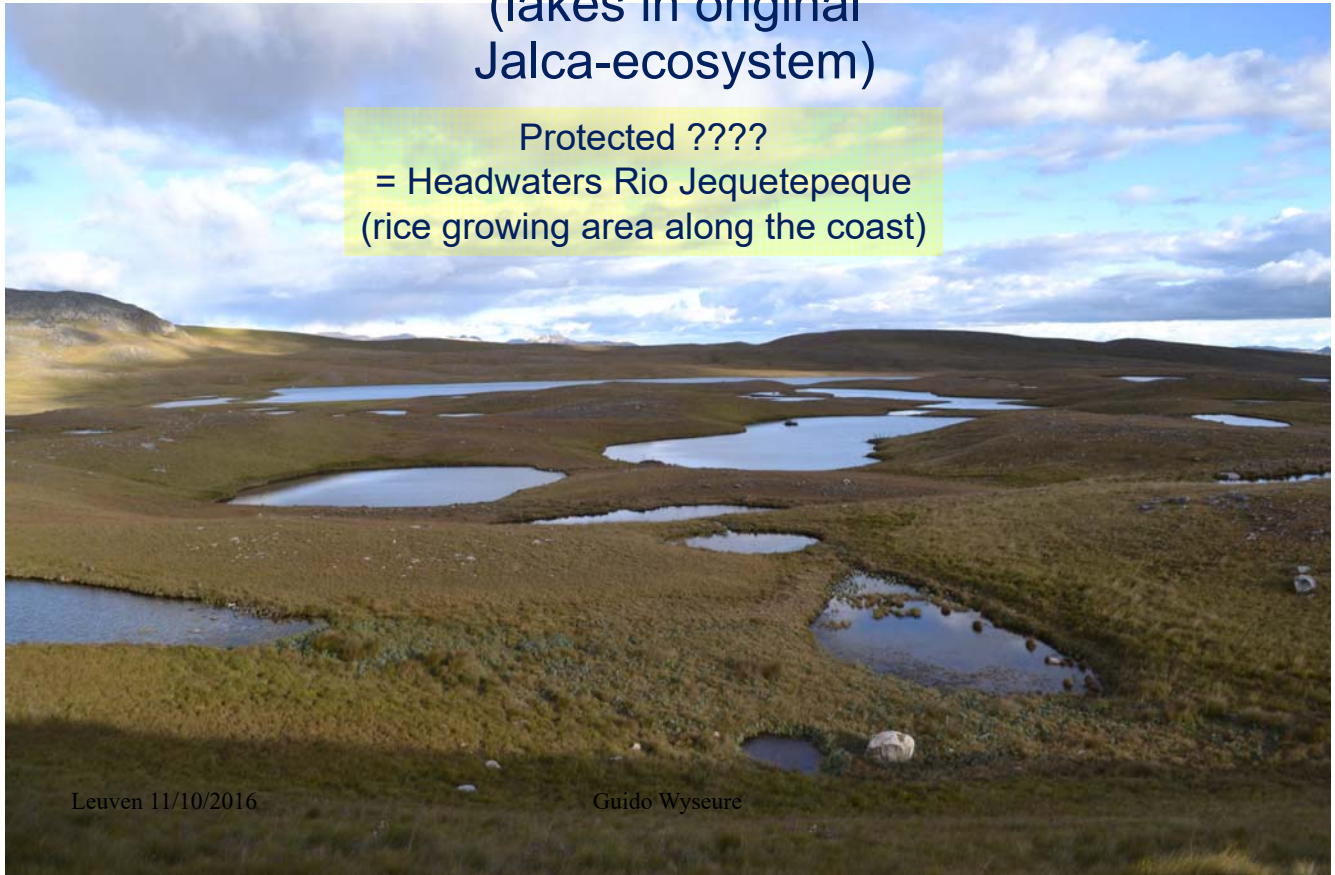
Leuven 11/10/2016

Guido Wyseure

Lagunas de Alto Peru

(lakes in original
Jalca-ecosystem)

Protected ????
= Headwaters Rio Jequetepeque
(rice growing area along the coast)



Leuven 11/10/2016

Guido Wyseure

Water: symbol of the conflict

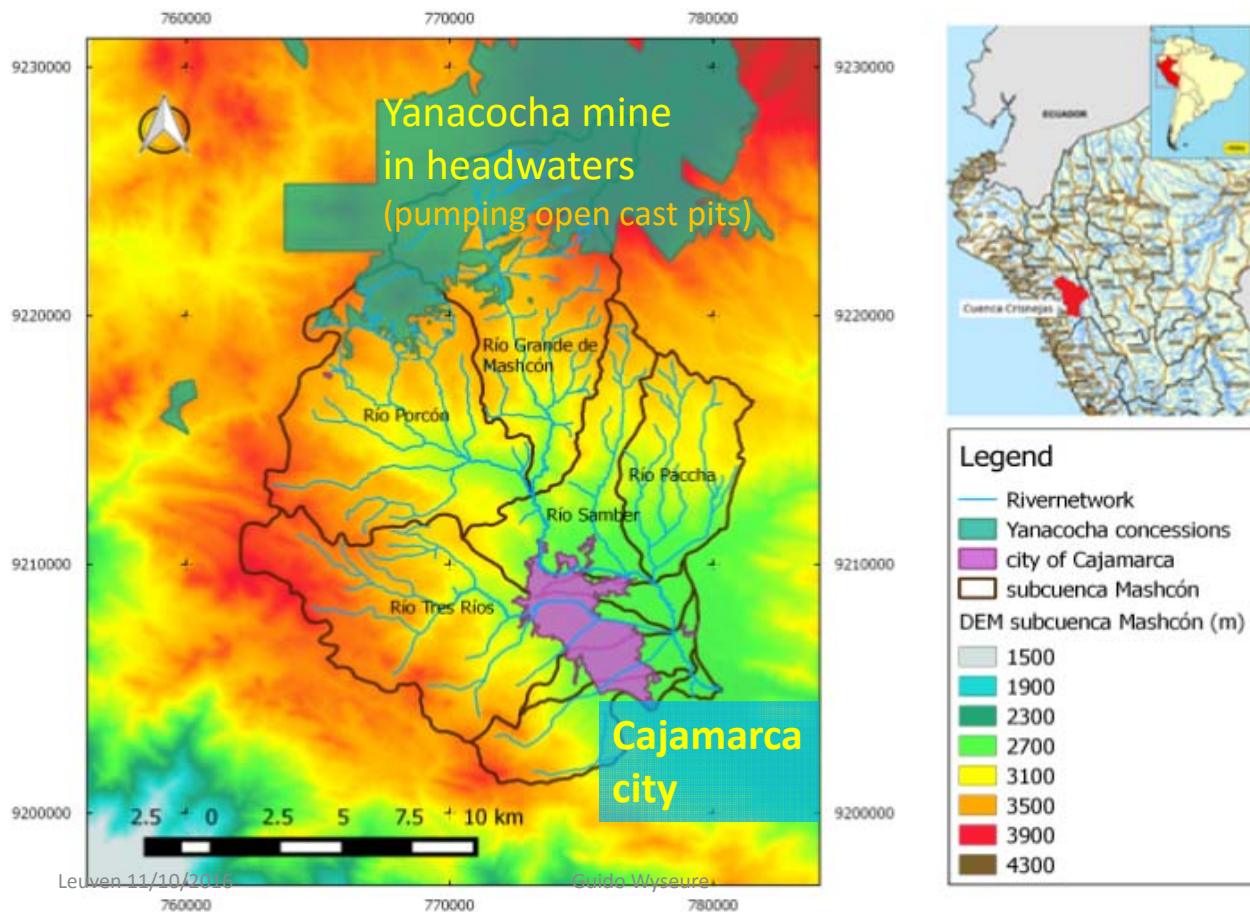
- Cajamarca known for its pastures with dairy products: especially cheese.



Leuven 11/10/2016

Guido Wyseure

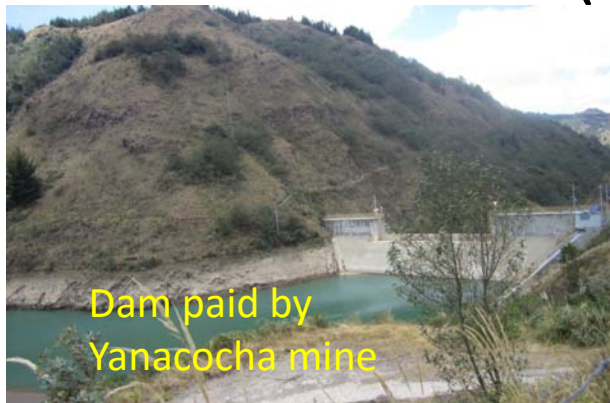




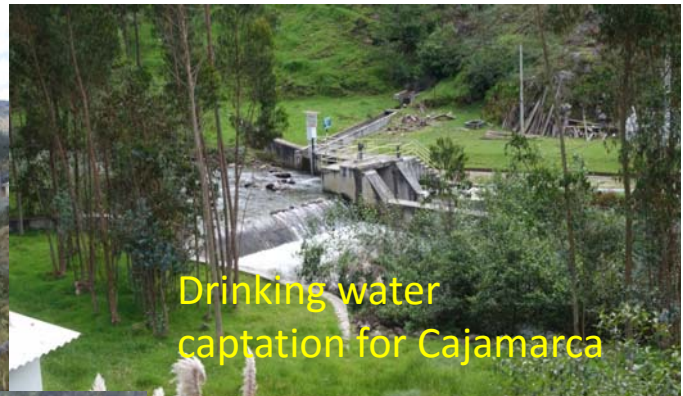
New artificial "source" of the Rio Grande by water pumped from the mine pit Natural springs dried up



Rio Grande (de Mashcón)



Dam paid by Yanacocha mine



Drinking water captation for Cajamarca



Tres Molinos irrigation water captation



Irrigation canal

Multisectoral water rights

Use	# users	Area (ha)	Granted flow (m ³ /s)	Volume Mm ³ /year	% of demand
Agriculture	7869	1669	0.766	24.3*	41.2
Domestic use	89296	-	0.456	14.4*	24.6
Mining use	1	16000	0.634	20.0	34.2

Water reported by the mine

Year	Total water (m ³)*	Surface drainage (m ³)	Ground-water drainage (m ³)	Rainfall (m ³)	Water used (m ³)	Net Water (m ³)	Water discharged (m ³) ***
2008	29.69M	7.90M	11M	10.79M	-	0.36M	29.34M
2009	33.79M	7.95M	13.47M	12.36M	125.10M	5.60M	31.44M
2010	32.29M	4.90M	18.29M	9.10M	126.97M	2.14M	34.48M
2011	40.77M	4.14M	27.05M	9.58M	128.64M	-	46.37M
2012	49.07M	4.22M	32.40M	12.45M	89.92M	4.12M	44.96M
2013	53.07M	15.50M**	37.58M	**In surface drainage	62.27M	3.30M	49.78M

38.6 Mm³ /year should correspond to **

Sustainable mining ?

- "Concession" = underground <> "Topsoil" = privately owned
 - Conflict mining companies with local population over land properties (e.g. Familia Chaupe-Acuña, de facto expropriated against their will)
 - Peruvian and other governments enjoy the income from the mines (and give out concessions to mining industry)
- **Propaganda machines** at full swing (resistance are criminals, drug smugglers, "*Shining path*" members, against development...)
- Possible to execute open-cast mining without environmental impact ?
- **What after the closure ?????**

Leuven 11/10/2016

Guido Wyseure

7 CIERRE DE MINAS

Revegetación

After closure

No problem according to

"Propaganda" by Yanacocha SRL

1. Aplicación de cal y abono para preparar el terreno.
2. Fertilización.
3. Siembra de pastos nativos y exóticos.
4. Transplante de especies nativas: "ichu".
5. Forestación.

Stupid "Propaganda":
Jalca is above the three line !!!!

Leuven 11/10/2016

Guido Wyseure

Laguna Yanacocha=

lake with black water

1992



LAGUNA YANACocha 1992 (ANTES)

2006



LAGUNA YANACocha 2006 (DESPUES)

How to restore ????

Leuven 11/10/2016

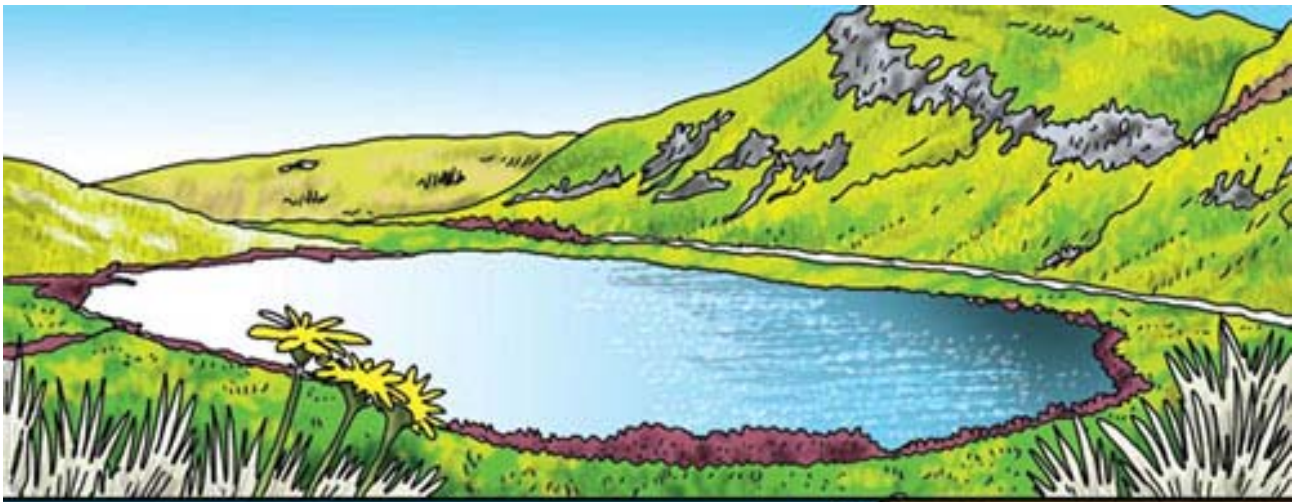
Guido Wyseure

Concluding remarks

- Lack of information on water resources
- Lack of proactive policy about mining
- Lack of regulations + their enforcement
- Large concerns for the **after closure** situation impact on water sustainability in Cajamarca.

Leuven 11/10/2016

Guido Wyseure



Heaven 11/10/2016

Guido Wyseur