## Environmental Impacts of Gold Recovery at a leading gold mining enterprise in Bolivia,

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- Thomas Reichard
- Environmental Engineering
- University of Leoben





- Studied the Viola at the Conservatory of Vienna 1994-1997
- Born in Vienna 1978
- Slogans: He who enjoys helping, shall receive help also
- A smile is the shortest connection between two people













### Empresa Inti Raymi S.A.



• The Kori Kollo mine:

• Situated in Oruro, Bolivia, South America

Since 1982-present days

• oxidised and sulphide ores

### **5** Episodes of mining

- 1 oxidised ores Kori Kollo hill: 1982-1992
- 2 sulphide ores Kori Kollo hill: 1992-2003
- 3 oxidised ores Llallagua deposit: 1997-present days
- 4 releaching of ox-tailings Kori Kollo hill: 1999-present days
- 5 sulphide ores Llallagua deposit currently under investigation

### Two key issues of concern

- The handling of water (liquids)
- The handling of the mineral (solids)

# Oxidised ores of the Kori Kollo hill 1982-1992

#### The path of water (Ox)



# Oxidised ores of the Kori Kollo hill 1982-1992

The path of the mineral (Ox), part 1



# Oxidised ores of the Kori Kollo hill 1982-1992

### The path of the mineral (Ox), part 2



Environmental aspects of the project of oxidised ores

- H<sub>2</sub>O<sub>ox, prec</sub> leaching CN or other harmful substances from the heaps
- Impacts from the waste dumps
- Handling of CN-solution in the case of spills and after the closure of operations

### The path of water (Sulphides), part 1



The path of the mineral (Sulphides), part 1



The path of the mineral (Sulphides), part 2



The path of the mineral (Sulphides), part 3



Environmental aspects of the project of sulphide ores, 1

Waste dump of sulphide ores -> generate AMD?

High CN in: fountain PFSA-5 (San Andrés):

01/94: 2.58 mg/l, 07/94: 4.88 mg/l, 01/95: 18.58 mg/l
-> What happened with that fountain?

-> 07/95: dried out, 01/96: closed why?

-> What measured were taken by EMIRSA?
-> Did EMIRSA report to the authorities?
-> How did the authorities react? Environmental Act 1333: 1992

Environmental aspects of the project of sulphide ores, 2 Salinisation: Did heavy rainfalls surpass capacity of evaporation ponds?

Air: Monitoring only includes PM10, TSP
-> what about the form of the particles?
-> what about the chemical composition of dust?

Low collaboration by EMIRSA: Why? Do they have to hide something?

### Summary

- EMIRSA at Kori Kollo: 1982-present days
- Mining of oxidised and sulphide ores

   > various by-products of environmental concern
   > uncertainties and doubts remain
- Environmental Act 1333: 1992:
   -> Uncertainty in execution on both sides after 15 years of enpowerment: Enterprise and authorities

=> These issues shall be further investigated in a masterthesis

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I have been living the Latin adventure for 6 months and am looking forward to every second of it

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- Institute for Sustainable Waste Management and Technology, University of Leoben, Austria
- Metallurgy and Materials Research Institute, University of San Andrés, La Paz, Bolivia

#### ... and to YOU!

Thank you for your attention!

**Glück Auf!** 

