RADIO MARIA

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Title: pollution and mining s.1

Introduction: Mining operations are based on the extraction of valuable minerals from the Earth for human use, for example; Gold, silver, copper, lead, zinc, cadmium, mercury, molybdenum, manganese, chrome, iron, nickel, Palladium, Platinum, gallium, indium, thallium, niobium, tantalum, zirconium, thorium, uranium, aluminium, lithium and other metals, as also the mining of non-metallic compounds whose applications are countless. With the exception of coal and asbestos non-metallic do not cause pollution problems, for this reason we are going to concentrate on the mining of metals.

The problem is that the valuable minerals are mixed with rocks or soils no mining value, so the first stage after extraction is the reduction in size and milling of ores, the second stage is the concentration of values, and the third stage is the separation of different metals by physical or chemical.

Another problem is that rare metals appear pure in nature, as example see loe ores that contain silver. It is true that sometimes we find Silver compounds or native binary as his chlorides and sulfides but most come as well:

Many are minerals that contain silver among the ones: Acanthite (Ag2S), Aguilarite (Ag4SeS), Alargento(Ag1-xSbx) (x ≈ 0.09-0.16), Andorrita (AgPbSb3S6)) Argyrodite (Ag8GeS6), Balkanita (Ag5Cu9HgS8), Boleite (KAg9Pb26Cu24Cl62 (OH) 48), Bromargirita) AgBr), Chlorargyrite (AgCl), CuadratitaAg(Cd,Pb) AsS3, Diskrazite (Ag3 + xSb1-x)(x≈0,2), Stephanite (Ag5SbS4), Eugenita (Ag11Hg2), Fettelite (Ag24HgAs5S20), Freibergite (Ag6Cu4Fe2Sb4S13), Lodargirita (AgI), Jalpaite (Ag3CuS2),

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Krennerite (Au, Ag) Te2, Hannah (AgPbAsS3), Lengenbachita (Ag4Cu2Pb18As12S39) Matildita (AgBiS2), Mckinstryíta(Ag,Cu) 2S, Miargyrite (AgSbS2), Pavonita (AgBi3S5), Moschellandsbergite (Ag2Hg3), Petzite (Ag3AuTe2), Pearceite Cu(Ag,Cu) 6Ag9As2S11, Pirostilpnita (Ag3SbS3), Polybasite Cu(Ag,Cu) 6Ag9Sb2S11, Pirquitasita (Ag2ZnSnS4), Quetzalcoatlita(Cu2+) 3Zn6(Te6+) (OH) 6· 2O12 (Ag, Pb,-) CL Samsonite (Ag4MnSb2S6), Routhierite Tl(Cu,Ag) (Hg, Zn) 2(As,Sb) 2S6, Schachnerita (Ag1.1Hg0.9), Sylvanite (Sternbergita (AgFe2S3), Uchucchacuaite (AgMnPb3Sb5S12), Stromeyerite CuAgS AgAuTe4 Stützite (Ag5-xTe3)(x=0.24-0.36),) Uytenbogaardtita (Ag3AuS2), Weishanita (Au, Ag) 1.2Hg. 8, Xantoconita Ag3AsS3 Iodargyrite AgI.

So as we see in this list the silver normally appears as a byproduct of the mining of copper or lead.

Gold, diamonds, silver, copper, bauxite, manganese, coal etc, are minerals and metals most valued by the mining industry. Main exploitation takes place in the Americas, Asia and Africa mostly.

Mining is a highly destructive extractive activity but also depending on which method is used can be really very polluting for people and the environment.

To be able to extract from the mines of interest elements are used different highly toxic chemicals such as cyanide, lead, arsenic, sulfuric acid, mercury, among others, which are used to open.

As a result of this form of exploitation, some of the countries that most environmental problems have had pollution are Peru (La Oroya), Ghana, Kenya, Zambia, Argentina, Bolivia and elsewhere. The majority of these

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places so affected are countries poor that believe that the arrival of companies multinational mining will bring

progress and money for the country. But what happens in reality is that millions of dollars are, exhausted deposits, destroy and pollute the environment, ill and kill hundreds of thousands workers and the local population. The benefits are minimal against the negative consequences that cause.

Them problems environmental that generate them mining are pollution with toxic, the water underground and water surface as rivers, lakes, aquifers and glaciers, the air and the soil, alteration and destruction of the flora and fauna of the place, as well as to the people that are exposed to emissions of toxins and heavy metals that alter health and develop serious sicknesses such as poisoning metals, respiratory problems and cancer, among others.

 It is possible to develop an economic activity safely and significantly reduce pollution but to do so we must invest much money firms, why not do it and abuse of poverty and need for the countries of capital inflows foreigners. But after end of exploit them mines and is removed, the consequences are very serious and is the State which should do is charge. So you must prevent this from happening, with rigorous controls and not allow polluters methods used.

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Countries should avoid this type of environmental problems already that some at times, it is not possible to restore the environment by the level of damage or the resources there are.

To understand how a mining with a minimum of pollution can be, you have to understand the basic processes.

          PROCESSES IN WHICH THE TOXIC MATERIALS ENTER THE MINING

Processes in which is generated or substances are used highly toxic are:

(1) - FLOTATION

Concentration of sulphides polymetalicos: this process is called flotation. Need products chemicals that have affinity with the sulfides, these collectors act as detergents, the most common are the xanthates that have a tail, a head of sulfur which is ionic and Covalent. We also have an oil to create foam and float sulphides with air to concentrate minerals. Also there are depressants which are extremely toxic (sodium cyanide) and sometimes arsenic products this is used to separate types of metals. For example to separate zinc or to depress the copper when we try to focus the molybdenum etc. Here we have the following problems: oils, xanthates, cyanide and arsenic. Also the tailings have to try so not to leave out the waters toxic metals. The water must of treat is before discard it and is should reuse.

(2) - MINERAL TOASTING OR ROASTING OF ORES

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**Toasting** or roasting is a step in the transformation of  certain metal minerals. More specifically, the toast is a metalworking process involving reactions with solid and gas to high temperature

in order to purify the metal component. Often before toasting, the ore has already been partially purified, for example, by [floatation foam](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FFlotaci%25C3%25B3n_(proceso)). He concentrated is mixed with other materials to facilitate the process. This technology is useful, but also a serious source of [air pollution](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FContaminaci%25C3%25B3n_atmosf%25C3%25A9rica). [1](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FTostado_(metalurgia)%23cite_note-1)

Roasting consists of reactions thermal solid-gas, which may include [oxidation](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FOxidaci%25C3%25B3n), [reduction](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FReducci%25C3%25B3n" \o "Reducción" \t "_top), chlorination, sulfation, and fumed. In the roasting, ore concentrate is treated with very hot air. This process is usually applied to metallic ores with [sulphur](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAzufre), as the [sulphide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FSulfuro" \o "Sulfuro" \t "_top)metal. During the roasting, the metallic sulfide becomes an oxide, and sulfur is released as [of sulphur dioxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDi%25C3%25B3xido_de_azufre), a gas. For2 S Cu ore ([chalcocite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCalcosina)) and ZnS ([sphalerite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FEsfalerita" \o "Esfalerita" \t "_top)), the equations of equilibrium for the toast is:

2 Cu2S + 3 [Or2](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDiox%25C3%25ADgeno)→ 2 Cu2or + 2 SO2

2 ZnS + 3 /2 → 2 ZnO + 2 SO2

The product gas from the roasting of sulphides, dioxide of sulphur (SO2) is often used to produce [sulfuric acid](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2F%25C3%2581cido_sulf%25C3%25BArico). Many sulfur ores contain other components such as the [arsenic](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FArs%25C3%25A9nico)that are released into the environment.

Until the beginning of the 20th century, roasting was started by burning wood on top of the ore. This increased the temperature of the ore to the point that the sulphur content was going to be the source of fuel, and the roasting process could continue without external energy sources. The primitive tostaciones were performed in "homes" open, roasters, where they waved hand (a practice known as "rabbling" in English), using tools in the form of

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rake to expose the ore without toasting to the [dioxygen](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDiox%25C3%25ADgeno)air to continue the reaction. This process if done in a handmade

 it pollutes the atmosphere with sulphur dioxide and often with arsenic.

LEACHING OF MINERALS

In [extractive metallurgy](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fw%2Findex.php%3Ftitle%3DMetalurgia_extractiva%26action%3Dedit%26redlink%3D1)is known as **leaching** to the process of extracting from a [ore](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMineral)a kind of interest by reagents that the [dissolve](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDisoluci%25C3%25B3n)or transformed into soluble salts. In other words, in the leaching recover useful species from a phase liquid, substance or a salt of this in [aqueous solution](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDisoluci%25C3%25B3n_acuosa). Which are usually leached minerals are those less rusty ([oxides](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2F%25C3%2593xido), , [carbonates) (sulfates](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FSulfato), [silicate](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FSilicato" \o "Silicato" \t "_top), etc.).

Leaching is a technique widely used in extractive metallurgy which converts metals into soluble salts in aqueous media. Compared to pyrometallurgical operations, leaching is easier to perform and much less harmful, since no gaseous pollution occurs. Its main drawbacks are its high acidity work and in some cases their toxic waste effluent, and also their lower efficiency caused by the low temperatures of the operation, which dramatically affect chemical reaction rates.

Ore used for the leaching process can be oxidized either or sulphur. For example, for an oxidized ore, a simple acid leaching reaction can be illustrated by the reaction of leaching of oxide of [zinc](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FZinc):

ZnO + H2SO4 → ZnSO4 + H2O

In this reaction solid ZnO dissolves, forming sulfate of zinc dissolved in water.

In many cases can be used other reagents to Leach oxides. For example, in the metallurgy of aluminium, aluminium oxide reacts alkaline solutions are: Al2O3 + 3 H2O + 2NaOH → 2NaAl (OH)4

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Leaching of sulfides is a more complex process due to the refractory nature of sulfide minerals. This often involves the use of pressure vessels, called autoclaves. A

good example of the autoclave Leach process can be found in the metallurgy of zinc. It is best described by the following chemical reaction:

2ZnS + or2 + 2 H2SO4 →4 2ZnSO + 2 H2O + 2S

This reaction occurs at temperatures above the boiling point of water, thus creating a pressure of steam into the container. Oxygen is injected under pressure, making the total pressure in the autoclave more than 0.6 MPa.

Leaching of precious metals such as gold can be performed with cyanide or ozone under mild conditions. The cyanidation of the gold or silver will be described to then.

Leaching of sulphide oxidation of the sulfide is used in hydrogen to prevent the formation of the highly toxic gas H2S.

LEACHING BACTERIOLOGICAL

Is a process of solutions implemented by a group of [bacteria](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FBacteria)that have the ability to oxidize sulfide minerals, allowing free metal values contained in them. It aims to exploit ores that have low no concentration of metal can be treated with traditional methods. This process is used for the extraction of [uranium](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FUranio), [copper](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCobre" \o "Cobre" \t "_top), [zinc](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FZinc), [nickel](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FN%25C3%25ADquel" \o "Níquel" \t "_top), [cobalt](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCobalto" \o "Cobalto" \t "_top), among others. The bacteria produce an acid solution containing the metal in its soluble form.

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Bacteria most commonly used species are *Thiobacillus oxidans*, *T. thiooxidans*, *T. ferrooxidans* and *T. dentrificans*. They are beings forced quimiolitoautotrofos, i.e., they get their energy by the oxidation of elements present in the rocks, as a [iron](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FHierro)and [sulphur](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAzufre" \o "Azufre" \t "_top). In

general these bacteria require to live and reproduce, in an acid environment (are acidofilicas) with a pH between 1 and 5, temperatures ranging from 25 ° C to 30 ° C (up to 45 ° C for some species) and high concentrations of metals. Some are [aerobic](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FOrganismo_aerobio)and [anaerobic](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FOrganismo_anaerobio" \o "Organismo anaerobio" \t "_top).

The most studied bacteria on the biological oxidation of sulphide minerals is the *Thiobacillus ferrooxidans*. It is a bacterium [gram-negative](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FGramnegativa)anaerobic. It gets its energy by the oxidation of sulphides ([pyrite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FPirita)- [Marcasite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMarcasita) [galena](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FGalena), , ) , [chalcopyrite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCalcopirita" \o "Calcopirita" \t "_top), [bornite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FBornita" \o "Bornita" \t "_top), [blende](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FBlenda" \o "Blenda" \t "_top), [covellina](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCovellina" \o "Covellina" \t "_top)( ), and require CO2 as a source of carbon, nitrogen and phosphorus to synthesize their food, in addition to a temperature between 28 ° C and 35 ° C.

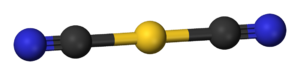
These processes occur in the tailings causing the release of uranium, NICKEL, cobalt, lead and other minerals toxic to the environment.

CYANIDATION

The **Gold cyanidation** (also known as the **cyanide process** or the **MacArthur-Forrest process)** is a technique [metallurgical](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMetal%25C3%25BArgica)for the extraction of [Gold](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FOro)of [ore](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMineral)low quality, which seeks to convert (water insoluble) gold in metal anion complexes of **aurocianida**, soluble in water, through a process called [leaching](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FLixiviaci%25C3%25B3n). It is the process most commonly used for the gold [extraction](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FExtracci%25C3%25B3n). Because of the poisonous nature

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of the [cyanide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCianuro), the process is highly controversial, and its use is prohibited in several countries and territories.

[](https://commons.wikimedia.org/wiki/File:Dicyanoaurate(I)-3D-balls.png)

The [chemical reaction](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FReacci%25C3%25B3n_qu%25C3%25ADmica)the **Elsner equation** is called in the following way:

4 Au + 8 NaCN + O2 + 2 H2O → 4 Na [Au (CN)2] + 4 NaOH

Is is of a process electrochemical in which the oxygen collects electrons of the gold in an area cathodic, them ions of gold, while are rapidly complexed by the cyanide around the area Anodic to form the complex *soluble*dicianoaurato of sodium .

In 1896 Bodlander confirmed that oxygen was necessary, something that MacArthur doubted, and discovered that the [hydrogen peroxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FPer%25C3%25B3xido_de_hidr%25C3%25B3geno)was formed as an intermediate.

Leaving the formula:

2 Au + 4 NaCN + O2 + 2 H2Or → 2 Na [Au (CN)2] + 2 NaOH + H2O2

### [**1**](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCianuraci%25C3%25B3n_del_oro%23cite_note-1)Effect of the pH and lead nitrate

The [lead nitrate](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FNitrato_de_plomo_(II))can improve the speed of [leaching](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FLixiviaci%25C3%25B3n)of gold and the amount recovered, particularly in processing partially oxidized ores.

At low pH:

2Au + 2HCN + O2 → 2AuCN + H2O2

And to prevent its broadcast since the HCN is highly toxic.

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The cyanidation of gold is very controversial due to the toxic nature of cyanide. While free cyanide breaks down quickly when exposed to the light of the Sun, the less toxic products, such as cyanates and thiocyanates, can persist for several years. Cyanide spills can have a devastating effect on rivers, killing all forms of aquatic life for several kilometers. Fish are the most obvious victims, but actually all the food chain collapses from phytoplankton to Ospreys. Without

However, if contamination is removed from the river systems, organisms can migrate from unpolluted areas (upstream) and the affected areas may soon be repopulated, an example is the [River Someș](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FR%25C3%25ADo_Some%25C8%2599)low [Baia Mare](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FBaia_Mare), where plankton recovered to 60% of the

normal to the spill days. [2](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCianuraci%25C3%25B3n_del_oro%23cite_note-Baia_Mare_report-2)Bleach can be used to counter the effects of the cyanide, but the release of chlorine from the reaction creates its own environmental threat. A way to avoid spills is to place double funds in the leaching vats, so given the fracturing of the first has another under as support.

More than 90 mines worldwide now use an Inco SÓ detoxification circuit2cast to convert cyanide to the much less toxic cyanate before waste dumping to a raft. Normally, this process sends blows of compressed air through the queues, while lime is added [Sodium Metabisulphite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fw%2Findex.php%3Ftitle%3DMetabisulfito_de_sodio%26action%3Dedit%26redlink%3D1)(which releases OS2)) to maintain the pH around 8.5, and the [copper sulfate](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FSulfato_de_cobre)as catalyst, if there is enough copper in the ore. This can reduce the concentration of weak acid dissociable (Weak Acid Dissociable, WWAD) cyanide below 10 ppm how ordered the mining waste directive (Mining Waste Directive) of the EU. This compares with levels of 66-81ppm of free cyanide and 500-1000 ppm

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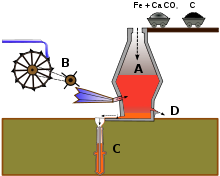
of total cyanide in the pond of [Baia Mare.](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fw%2Findex.php%3Ftitle%3DBaia_Mare.%26action%3Dedit%26redlink%3D1)[2](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCianuraci%25C3%25B3n_del_oro%23cite_note-Baia_Mare_report-2)The remains of WAD cyanide, decompose naturally in the pond, while the cyanate ion are naturally hydrolyzed to ammonium ions, and then to nitrate. Recent studies show that the residual cyanide in gold mines can cause a persistent leak of toxic metals (e.g., mercury) in groundwater and the water surface systems. [3](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCianuraci%25C3%25B3n_del_oro%23cite_note-3)[4](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCianuraci%25C3%25B3n_del_oro%23cite_note-4)

CASTING:

CASTING process:

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 Casting process in [blast furnaces](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAlto_horno)..

[](https://commons.wikimedia.org/wiki/File:Proceso_de_fundicion_en_la_Fabrica_de_Artiller%C3%ADa_de_La_Cavada.svg)

Scheme of a furnace of iron cannons. Alternately add layers of coal and ore of iron (*to*). At the bottom of the oven, there were some [nozzles](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FTobera)by where is forced by some big air intake [bellows](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FFuelle_(neum%25C3%25A1tico)" \o "Fuelle (neumático)" \t "_top)(*B*). In the [Crucible](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCrisol)oven was

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a hole which flowed the [cast iron](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FArrabio" \o "Arrabio" \t "_top)and was going to mold Cannon (*C*). Above this opening but below the nozzles, had another mouth where you took out the [slag](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FEscoria_(metalurgia))(*D*).

The casting is a process that involves more than the simple [fusion](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FFusi%25C3%25B3n_(cambio_de_estado))the metal out of the mena. The majority of mineral ores are [compounds](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCompuesto_qu%25C3%25ADmico)in which metal is combined with the [oxygen](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FOx%25C3%25ADgeno" \o "Oxígeno" \t "_top)(in the [oxides](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2F%25C3%2593xido)), the [sulphur](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAzufre)(in the [sulphide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FSulfuro" \o "Sulfuro" \t "_top)) or the [carbon](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCarbono" \o "Carbono" \t "_top)and oxygen (in the [carbonates ) (](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCarbonato)), among others. To get the metal in its elementary form

it should produce a [chemical reaction](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FReacci%25C3%25B3n_qu%25C3%25ADmica)of [reduction](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FReducci%25C3%25B3n-oxidaci%25C3%25B3n)that break down these compounds. Therefore the cast requires the use of [reducing substances](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAgente_reductor)that react with the metal parts [rusted](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FReducci%25C3%25B3n-oxidaci%25C3%25B3n" \o "Reducción-oxidación" \t "_top)transform them in their metallic forms.

**Calcination**

The roasting is the process of heating the ore up to high temperatures to dissipate the volatile matter. In the case of carbonates and sulfates this process serves to eliminate unwanted, sulphur and carbon, transforming them into oxides which can be directly reduced. Therefore the calcination in these cases is done in oxidizing environments. Practical examples are:

         the [Malachite](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMalaquita), a current mena of the [copper](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCobre), is mainly carbonate (CuCO3) copper. This ore is decomposed thermally to CuO and CO2 in several stages between them 250 ° C and 350 ° C. The [carbon dioxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDi%25C3%25B3xido_de_carbono)is released into the atmosphere leaving the copper oxide that can be reduced as described in the next section.

         the [Galena](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FGalena), the most common ore of the [lead](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FPlomo), is mainly composed of lead sulphide (PbS). Sulfur is oxidized to sulfite (PbSO3) in its first stage of thermal decomposition originating lead oxide and [sulphur dioxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDi%25C3%25B3xido_de_azufre)gas (PbO and SO2). The [of sulphur dioxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDi%25C3%25B3xido_de_azufre)(as the carbon

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dioxide in the previous example) dissipates into the atmosphere and lead oxide is reduced even in open air combustion.

**Reduction**

The [reduction](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FReducci%25C3%25B3n-oxidaci%25C3%25B3n)is the stage end to high temperatures of the cast. This is when the oxide is converted into elemental metal. The reducing environment (usually provided by the carbon monoxide produced by the incomplete combustion of carbon on the inside of the little ventilated oven) brings to the pure ore oxygen atoms. The necessary temperatures vary within a wide range, both in the

comparison between different metals as in relation to the melting point of the metal itself. For example:

         iron oxide becomes in [iron](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FHierro)metal around 1250 ° C, nearly 300 degrees below the melting point of iron which is 1538 ° C;

         mercur.io oxide is converted into steam from [mercury](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMercurio_(elemento))near 550 ° C, almost 600 degrees above its melting point of-38 ° C.

In the case of cast iron Coke burned as [fuel](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCombustible)to heat the oven in addition to blazing releases [carbon monoxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMon%25C3%25B3xido_de_carbono), which combined with the mineral iron oxides and reduces them to metallic iron, according to the equation:

Fe2O3 + 3CO → 2Fe + 3CO2 ↑

In the case of copper smelting the intermediate product produced in the calcination is reduced according to the reaction:

CuO + CO → Cu + CO2 ↑

In both cases gas of [carbon dioxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FDi%25C3%25B3xido_de_carbono)is dissipated into the atmosphere leaving the metal free.

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**Fluxes**

In the smelting process using fluxes with various purposes, the main ones are [catalyze](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCat%25C3%25A1lisis)reactions to desired or who join chemically impurities or unwanted reaction products to facilitate their elimination. The [calcium oxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2F%25C3%2593xido_de_calcio), in the form of limestone, is often used for this purpose since it can react with carbon dioxide and dioxide of sulphur produced during the roasting and reduction by keeping them out of the reaction environment.

The flux and slag can provide an additional secondary service after the reduction stage is completed, coated with a layer of melted purified metal to avoid entering into contact with oxygen, to be still so hot is It oxidaría quickly.

Is used in the smelting of iron the [limestone](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FCaliza)to load the oven as an additional source of [carbon monoxide](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMon%25C3%25B3xido_de_carbono)and as melting substance. This material is combined with the [silica](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2F%25C3%2593xido_de_silicio_(IV))present in the ore (which does not melt at the temperatures of the oven) to form higher melting point, calcium silicate. Without the limestone is formed iron silicate, with which metallic iron would be lost. Calcium silicate and other impurities

they form a [clinker](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FEscoria_(metalurgia))floating on the molten metal at the bottom of the oven.

**AMALGAMATION OF GOLD**

Amalgamation is a process that applies to recover gold and silver from gold or existing materials. Gold, silver and various other metals and their compounds are capable of alloy with mercury. These alloys are

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known as amalgams. Amalgamation in gold mining serves for recovering gold in the form of amalgam and thus separated from accompanying minerals. The amalgam is formed by contact between mercury and gold in a pulp with water. Mercury may be present in the form of scattered "pearls" in the pulp or extended on a surface (amalgamadoras plate). The first use of the amalgamation for the production of gold probably dates from mining in Bosnia, in the time of Nero (54-68 BC). Until today the small gold mining uses this technique in a widespread manner.

Free gold (native) in a grain size between 20-50 mm and 1 - 2mm is suitable for amalgamation. Thick gold can be recovered easily with gravimetric methods. In the process of amalgamation, minimally gold dissolves in mercury. The amalgam contains usually gold particles on the surface alloyed with mercury and linked between if for the same.

In principle, all the gold free and clean (e.g. not covered by iron oxides) amalgamates. Without, however, often gross ore

It may contain certain minerals companions and/or impurities with negative effects on the process of amalgamation. Some of these problems are described below:

* The sulfide of arsenic, antimony and bismuth react with mercury, producing a significant loss of precious ore and mercury. In an oxidizing atmosphere (e.g. with water
* acid mine), also the pyrrhotite and lesser degree pyrite and chalcopyrite can have a negative effect on the amalgamation.
* Barite, talc, soapstone and other hydrated silicate of magnesium and aluminium could also disrupt the process and increase the losses of gold and mercury.

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* Lubricants and greases are extremely problematic, because they are attached to the mercury and tend to catch sulfide, talc, clays and other minerals. As a result, mercury is covered by a solid film of fine particles. In addition, the presence of lubricating oils or fats cause flotation of gold, which is away from contact with the mercury. Such factors, naturally fall the recovery of precious metal in a process of amalgamation. Preventive measures to avoid these negative factors include, add cleaning agents, a strong detergent or the SAP ("juice") of a plant as sisal (sisal or pita), whose leaves are often used for that purpose in Colombia; use aims to saponify the oil and grease. Other agents commonly used to improve the performance of the amalgamation are: panela (concentrated sugar cane), lemon, traces of cyanide, gasoline, etc.
* Aluminum or copper metal detonators or wiring, both metallic lead (in the form of pellets or bullets of Hunter in the alluvial mining) and the metallic zinc from batteries can amalgamate, consume, and fouling mercury. The
* amalgams of these metals are often dispersed in the form of fine particles under oxidizing conditions.
* The acidic mine waters, commonly used as processing water, also have effects for the amalgamation (by oxidation of sulfides, see above). The metered addition of lime neutralizes partially these effects.

Small mining operations

While large corporations produce the largest amount of gold, tens of thousands of people work independently on smaller craft operations, in some cases illegally. Among them are the *galamseys* (name of the self-

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employed in [Ghana](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FGhana)) whose amount varies between 20,000 to 50,000. These workers are called Orpailleurs countries [francophones](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FFranc%25C3%25B3fonos)neighbors. The high risk of these firms was observed in the collapse of an illegal mine in Dompoase, region of [Ashanti](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAshanti), Ghana, on November 12, 2009, when 18 workers, including 13 women died. Many of them work in mines as loaders. This was the worst mining disaster in the history of Ghana. [5](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FMiner%25C3%25ADa_del_oro%23cite_note-bbc-5)

The extraction of gold in popular culture or in small-scale mining

Minerals extracted from veins or veins which have a good concentration of gold, especially free and granulated particles, mixed with water and grind in a stones called *quimbaletes*, which have a concave allowing use them as a mortar. Mercury is then added to form a [amalgam](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=https%3A%2F%2Fes.wikipedia.org%2Fwiki%2FAmalgama_(qu%25C3%25ADmica))with gold, which is separated from the rest straining it through a fine cloth. Then is *refoga* or burning the amalgam to evaporate the mercury, leaving the gold in the form of balls, whose size depends on the amount of metal in the ore. This procedure is not only harmful to the miner extracted material, who sucks part of vapours of mercury removed during heating, but also for the

surrounding areas, because the mercury evaporated condensed polluting land and water.

LEGAL AND FORMAL AND INFORMAL AND ILLEGAL MINING:

Small-scale or artisanal mining there are frequently not public or private services that provide health care and education essential to the miners, many of them women and children, although such services are reasonably developed in other areas of the country. Due to the often erratic nature of small-scale mining, it is not possible to establish local administration structures and financial systems necessary to provide such services with sufficient time, when miners gather in a given area to exploit discovered natural resources. In the space of few years, previously sparsely populated areas can become the place of residence of 50,000 or 100,000 miners and their families, with no water supply or transport, health or education services. Regional authorities, if they exist, are typically unable to intervene or feel obliged to do so in the context of largely uncontrolled and difficult to monitor developments. On the other hand, in regions where there are well established mining communities, higher incomes and greater population density often facilitate the provision and deprived of basic health care and education services funding.

Environmental damage : can cause additional health risks, due to a variety of problems, from pollution of water or lack of adequate volumes of drinking water, to dust, noise and cave-ins. In the case of cessation of operations, the abandoned mine is reason of

great concern, since often you can continue causing pollution and pose a potential danger to the public. Often, environmental and health standards are not agreed before the start of mining operations or are difficult to monitor. It is very easy to demonstrate how the lack of timely preparation for the closure of a mine increases the negative impact on the

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local environment and regional economies, impact which, in turn, affects the administrative budgets and the stability of society. The positive economic development that often follows the establishment of a mining operation, can also have negative effects on the levels of consumption of the poor. The higher incomes of the workers of the mine, especially in relatively remote areas, can produce an increase in local prices and leave behind the poor.

The problem is not only social. Informal mining, it is impossible not to pollute. Some small operations well regulated and with the distribution of the appropriate equipment to craft extraction of gold sand and alluvial silt can be less damaging. But this requires equipment and instruction given to miners to avoid problems

serious. The barrier large is the ignorance of the dangers of mercury and any other reagent used in mining.

Checking each process we can see that the only a corporation organized under the supervision of a mining engineer or equivalent can work efficiently without causing pollution or damage to their workers. The engineer of mines must work together with specialists in the preservation of the environment, so that the facilities

they are safe and the water and air are not contaminated by gas emissions or discharge of polluted water and finally the tailings. The problem is exacerbated because there is no

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responsible person in the informal mining. There is no way to apply punitive actions for violations.

In recent years agitators used the peasant masses with mendacious stories to miners formal and well equipped force to leave the mines. Once the mines were abandoned, illegal miners began to work in these mines contaminating the environment at high levels. These miners only was interested in the silver and gold while leaving that untreated cyanide enters the river killing all fish and contaminating the waters that were before drinking.

Something to ponder!

LIMA, Peru - For almost 90 years, the smelter at La Oroya, high in the Peruvian Andes, spewed out a toxic cocktail of heavy metals that slowly poisoned the town's people.

The contamination became so bad that the Oroya has-been compared to Chernobyl and [ranked](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Fwww.worstpolluted.org%2Fprojects_reports%2Fdisplay%2F41)among the world's 10 most polluted places.

The plant has been offline for over two years due to financial troubles, the owners have said.

Now - despite concerns that Renco Group, the US company that runs the plant, have largely failed to install the new technology needed to prevent it from emitting clouds of deadly smoke again - the smelter may be set to reopen.

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"We are totally exposed, especially the poorest, the children and the elderly," said local retired teacher Rosa Amaro, who heads the Movement for the Health of La Oroya, or MOSAO, a local activist group.

The smelter is one of just a handful in the world that can process multiple metals, including copper and lead, as well as refine zinc. But its antiquated technology emits contaminants such as arsenic, cadmium, lead and sulfur dioxide, which cause serious health problems.

**More from Peru:**[**Latin America's hidden growth story**](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Fwww.globalpost.com%2Fdispatch%2Fnews%2Fregions%2Famericas%2F120217%2Fperu-latin-america-economy-growth)

In one [study](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Fwww.slu.edu%2FDocuments%2Funiversity%2FKnowledgeWinter07.pdf), by St. Louis University in 2005, more than 90 percent of children from La Oroya had excessive levels of lead in their bodies. And ambient levels of sulfur dioxide, which causes acid rain, have been [recorded](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Felcomercio.pe%2Fediciononline%2Fhtml%2F2008-08-19%2Fazufre-aire-oroya-supero-niveles-historicos.html)at mind-boggling 27,000 parts per cubic meter - almost 100 times the limit established by Peruvian law.

The smelter stopped production after banks cut off credit to Doe Run Peru, Renco's local subsidiary, in 2009. The firm pleaded financial hardship and failed to implement the environmental management plan that was a condition of its purchase of the smelter from state ownership in 1997.

Asked about allegations that Doe Run had misled Peruvian authorities during the purchase of the smelter, Luis Hernandez, spokesman for the company, insisted: "The company has complied with all relevant laws."

Now, three years later, local congressman Casio Huaire is attempting to get the Peruvian Congress to pass a new law giving Doe Run Peru

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two more years to complete the environmental clean up - and allow the smelter to operate in the meantime.

If passed, the law would mark the third time the company has been allowed to delay completion of the environmental management plan.

Despite the contamination, many locals actually Doe Run back, which has kept La Oroya 4,000 employees on full pay since the plant closed down, a powerful incentive in an impoverished region some 12, 000-feet high in the Andes.

José de Echave, a former deputy minister for the environment who now heads the nonprofit CooperAcción, Peru said should be more careful about how it allows foreign companies to operate here.

"It would send a terrible message about the kinds of investments that Peru as a country is looking for," he told GlobalPost. "The renewed emissions would have an immediate negative effect on the population of La Oroya."

**More from GlobalPost:**[**The Amazon's carbon cowboys**](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Fwww.globalpost.com%2Fdispatch%2Fnews%2Fregions%2Famericas%2F120127%2Fredd-the-amazons-carbon-cowboys)

Behind Doe Run Peru's failure to modernize the smelter and stop the pollution lies a complicated and controversial tale of financial woes.

Privately-owned by New York-born tycoon Ira Rennert and his family, Renco's global [Sales](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Fwww.forbes.com%2Flists%2F2011%2F21%2Fprivate-companies-11_Renco-Group_QQ4T.html)in 2011 were an estimated $7.75 billion, according to Forbes.

But that has not stopped Doe Run Peru from pleading poverty and failing to pay a series of multi-million dollar debts, including to the

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Peruvian taxpayer. Recently, the company even asked the Peruvian government to subsidise the costs of its clean-up.

Under the terms of Renco completo purchase of the smelter, it agreed to set aside more than $100 million for the environmental management plan. But, according to local reports, that plan never materialized.

Doe Run insists it has [gone](https://www.microsofttranslator.com/bv.aspx?from=es&to=en&a=http%3A%2F%2Fdoerunperumedia.com.pe%2Fenglish%2Fkey-facts%2F)to great lengths to upgrade the smelter and help local people. But few in Peru believe the company, which because it is privately-held only releases limited financial information.

"The problem is the company is not transparent," Echave said.

Hugo Villa, a doctor who worked at a public clinic in La Oroya for three decades, is unconvinced that the company has complied with the Peruvian law.

"There is a silent epidemic here," he said. "The effects on the children are not easily visible, but they have all kinds of serious health problems, and those will only get worse if the smelter reopens."

One person who is already suffering is Moses, the 18-year-old are of Amaro, the local campaigner. Moses has a series of ailments such as fatigue, aches, mood swings and respiratory problems.

When I was 5-years old, Amaro said lead levels in her son's blood were measured at 58.3 micrograms per deciliter, almost six times the safe limit established by the US Center for Disease Control.

"Jobs are important," Amaro said. "But they should not come at the cost of our health." "What kind of development is that?"