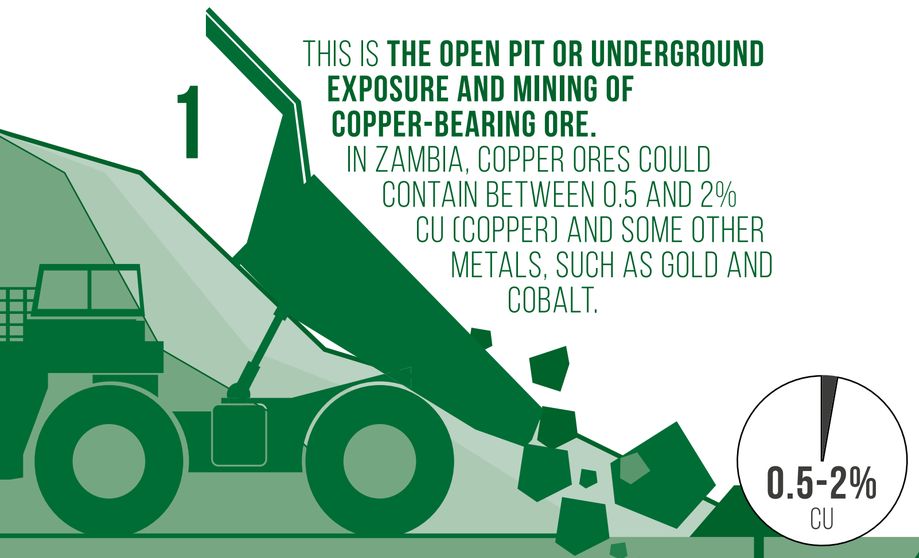
ZAMBIAN COPPER, **FROM PIT TO PORT**

MINE SITE

1

THIS IS **THE OPEN PIT OR UNDERGROUND EXPOSURE AND MINING OF COPPER-BEARING ORE.** IN ZAMBIA, COPPER ORES COULD CONTAIN BETWEEN 0.5 AND 2% CU (COPPER) AND SOME OTHER METALS, SUCH AS GOLD AND COBALT.



2

CRUSHING

THIS IS THE **BREAKING OF ORE INTO SMALLER PIECES,** CRUSHING IS A DRY PROCESS.

WHAT IS MILLING? MILLING IS A FURTHER PROCESS OF REDUCING ROCK FRAGMENTS DOWN BY GRINDING THEM. IN THIS CASE A BALL MILL IS USED.

3

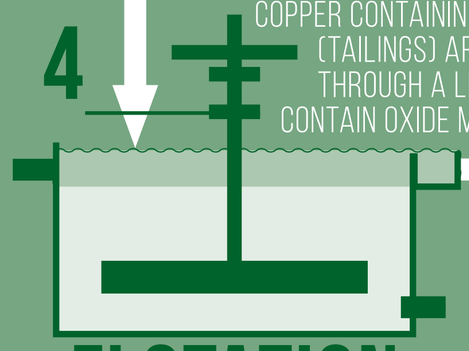
WHAT IS HEAP LEACHING? THIS IS THE EXTRACTION OF COPPER FROM LOW-GRADE ORES BY PERCOLATING SULPHURIC ACID THROUGH LARGE STACKED HEAPS OF PEBBLE SIZED ORE, DISSOLVING THE COPPER INTO THE ACID.

4

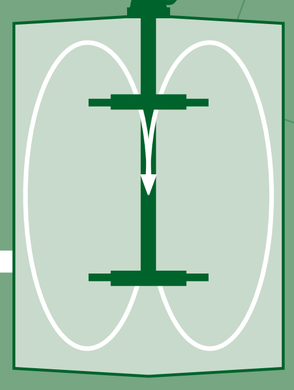
HEAP LEACHING

WHAT IS FLOTATION? THIS PROCESS IS BASED ON THE CAPACITY OF CERTAIN MINERALS TO STICK ONTO BUBBLES. IT IS USED TO CONCENTRATE ORE WHERE THE COPPER OCCURS IN SULPHIDE MINERALS, AS WELL AS OXIDE MINERALS. THE PROCESS COLLECTS AND CONCENTRATES THE COPPER CONTAINING MINERALS, THE REST (TAILINGS) ARE DISCARDED OR RECYCLED THROUGH A LEACHING PLANT IF THEY CONTAIN OXIDE MINERALS.

4



FLOTATION



5

AGITATION LEACHING

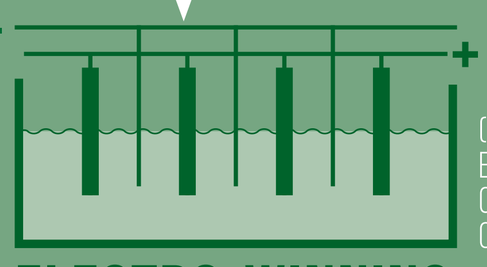
WHAT IS AGITATION LEACHING? THIS IS THE EXTRACTION OF COPPER INTO ACID FROM HIGHER-GRADE, FINELY MILLED OXIDE ORES, A PROCESS THAT HAPPENS IN TANKS WHERE THE SOLUTION IS STIRRED/AGITATED.

6

WHAT IS SOLVENT EXTRACTION? THIS IS THE SEPARATION OF COMPOUNDS BASED ON THEIR RELATIVE SOLUBILITY IN TWO DIFFERENT IMMISCIBLE LIQUIDS SUCH AS WATER AND AN ORGANIC SOLVENT.

SOLVENT EXTRACTION

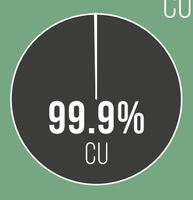
7



WHAT IS ELECTRO-WINNING? THIS IS THE RECOVERY OF CU (COPPER) FROM SOLVENT EXTRACTED SOLUTION ONTO CATHODES BY A PROCESS OF ELECTROLYSIS.

ELECTRO-WINNING

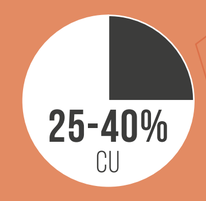
CU CATHODES TYPICALLY CONTAIN 99,95% CU.



8

(ROAD) TRANSPORT

SMELTER / REFINERY SITE



WHAT IS SMELTING? THIS IS THE MELTING OF THE SULPHIDE CONCENTRATE, RESULTING IN A MELT THAT CONTAINS THE COPPER (AND OTHER) METALS, AND A SLAG WHICH IS DISCARDED OR RECYCLED.

COPPER CONCENTRATES TO SMELTER

5

SMELTING FURNACE

IMPURITIES ARE SKIMMED OFF THE TOP.

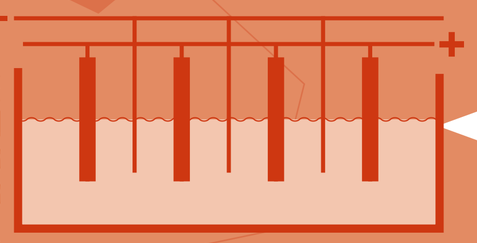
HEAVIER,PURER COPPER COLLECTS ON THE BOTTOM

6

CASTING

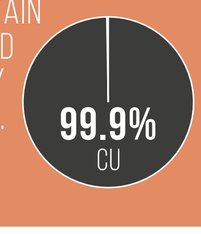
THE MELT (COPPER AND OTHER METALS) IS POURED INTO MOULDS, RESULTING IN ANODES THAT CONTAIN BETWEEN 95% AND 99,5% CU (COPPER) AND SOME OTHER METALS.

7



WHAT IS ELECTRO-REFINING? THE COPPER ANODES ARE THEN SUSPENDED IN A TANK CONTAINING ACID, ALTERNATING WITH THIN METAL PLATES (CATHODES). BY APPLYING A CURRENT, THE ANODES DISSOLVE AND ALMOST PURE COPPER FORMS ON THE CATHODES. ONCE SEPARATED FROM THE STEEL PLATES, THE CATHODES CONTAIN BETWEEN 99,95% AND 99,99% CU. ANY OTHER METALS THAT WERE PRESENT IN THE ANODES ARE LEFT IN THE SLIME AT THE BOTTOM OF THE TANKS. THESE ANODIC SLIMES GENERALLY CONTAIN VALUABLE METALS SUCH AS GOLD, SILVER AND PLATINUM. THEY ARE EXPORTED TO GOLD REFINERY PLANTS TO EXTRACT THE PRECIOUS METALS.

ELECTRO-REFINING



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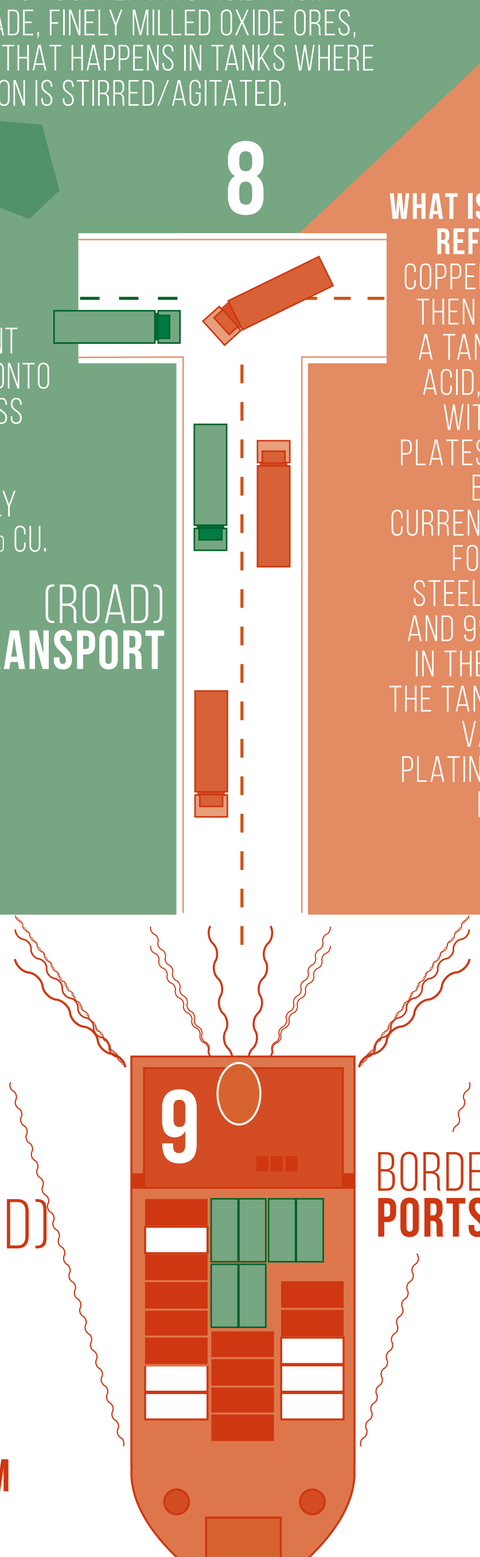

BORDERS: **PORTS**

THE MINERAL PRODUCTION MONITORING SUPPORT PROJECT

(MPMSP) TO THE MINISTRY OF MINES AND MINERALS DEVELOPMENT (MMMD) IN ZAMBIA

WANT TO KNOW MORE?

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ONE ZAMBIA ONE NATION

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THE MPMSP IS FUNDED BY THE EUROPEAN UNION