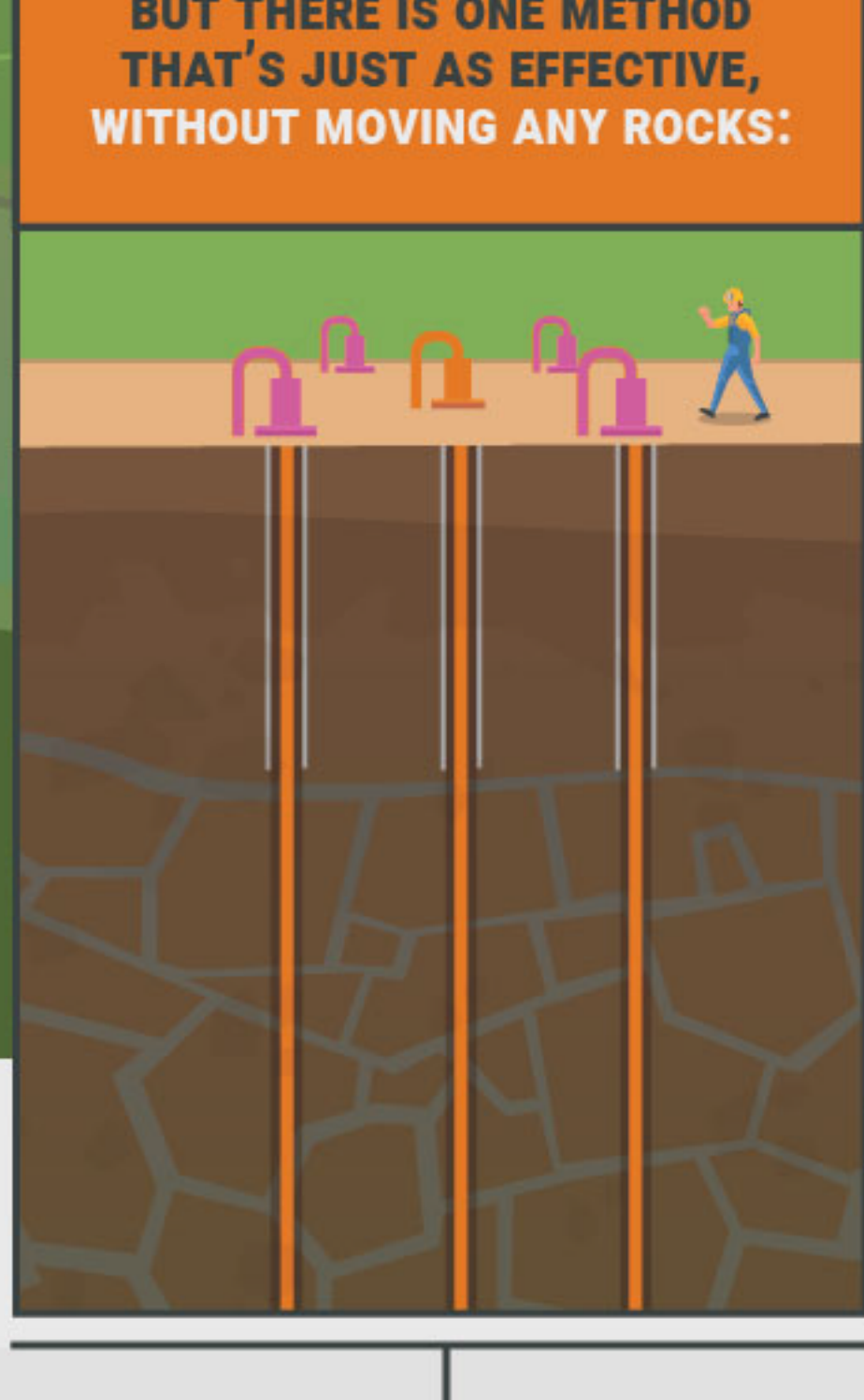
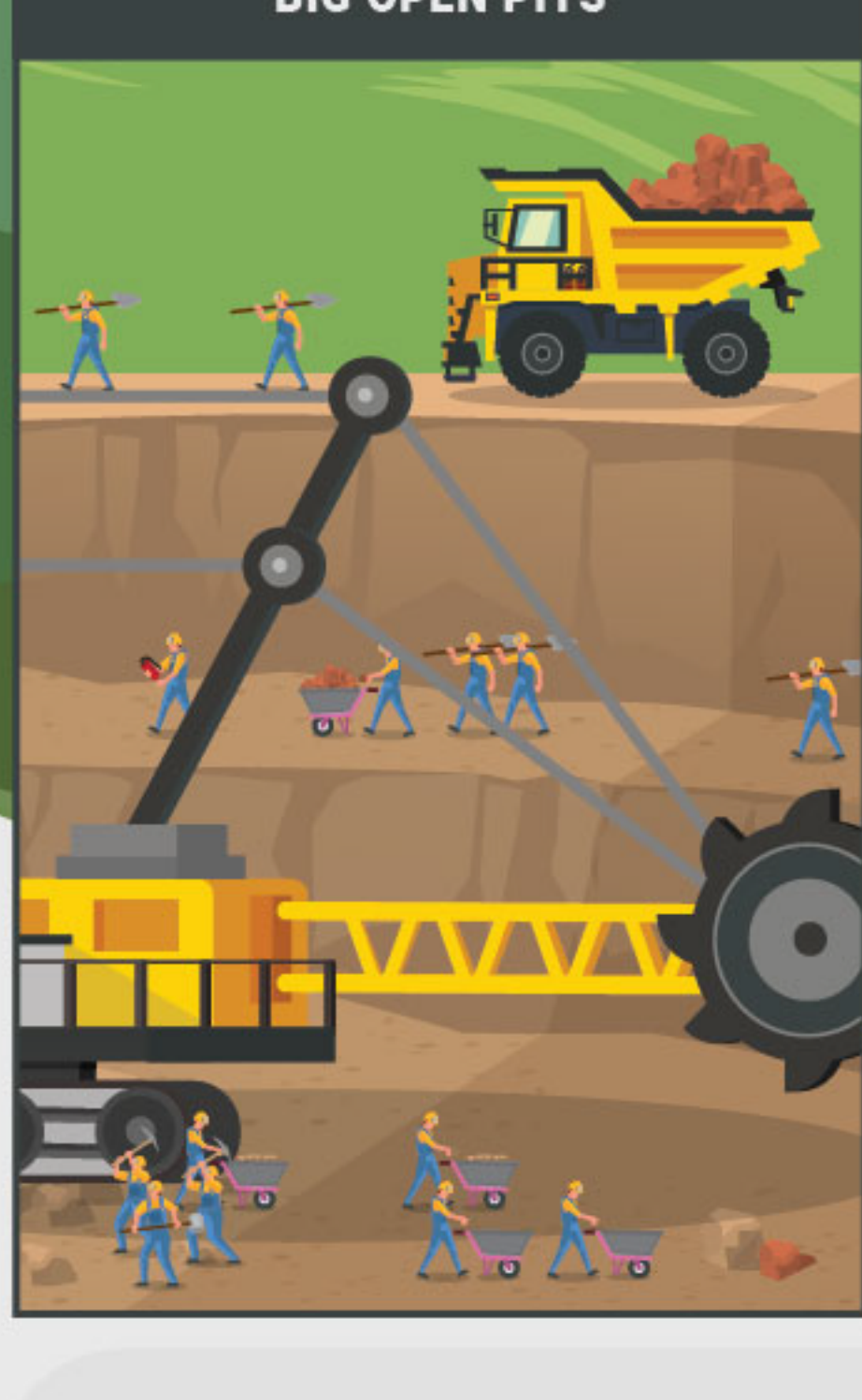


# WHAT IS IN-SITU MINING?

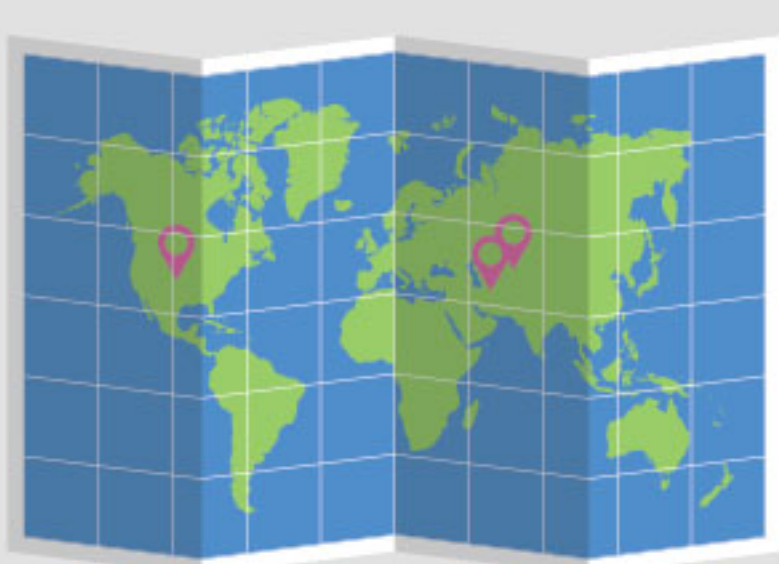
When most people think of mining, they imagine:



## IN-SITU RECOVERY (ISR)



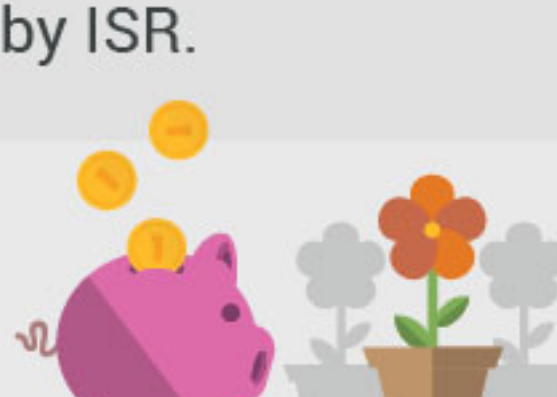
In 2016, 48% of the world's mined uranium was from ISR operations.



Most uranium mining in the USA, Kazakhstan, and Uzbekistan is by ISR.



Gold, copper, and uranium can also be extracted using the ISR method.



ISR is the most cost effective and environmentally friendly method of mining.

### UNDERGROUND MINING

More expensive and often used to reach deeper deposits.

### SURFACE MINING

Typically used for more shallow and less valuable deposits.

### PLACER MINING

Used to sift out valuable metals from sediments in river channels, beach sands, or other environments.

### IN-SITU RECOVERY

Involves dissolving the mineral resource in place then processing it at the surface without moving a rock from the ground.

So why isn't it used more often?  
The geology has to be just right.

## THE RIGHT GEOLOGY

### HIGHLY PERMEABLE ORE BODY

For copper, the ore body must be naturally broken, fractured and permeable.

### MINEABLE

The target mineral must be leachable.

### UNDER THE WATER TABLE

The deposit must be below the water table to allow for the transport of fluids through the ore body. This is very rare for oxidized copper deposits.

These conditions rarely occur in nature. However, once the right conditions are met, it is time to mine.

## THE PROCESS OF IN-SITU RECOVERY

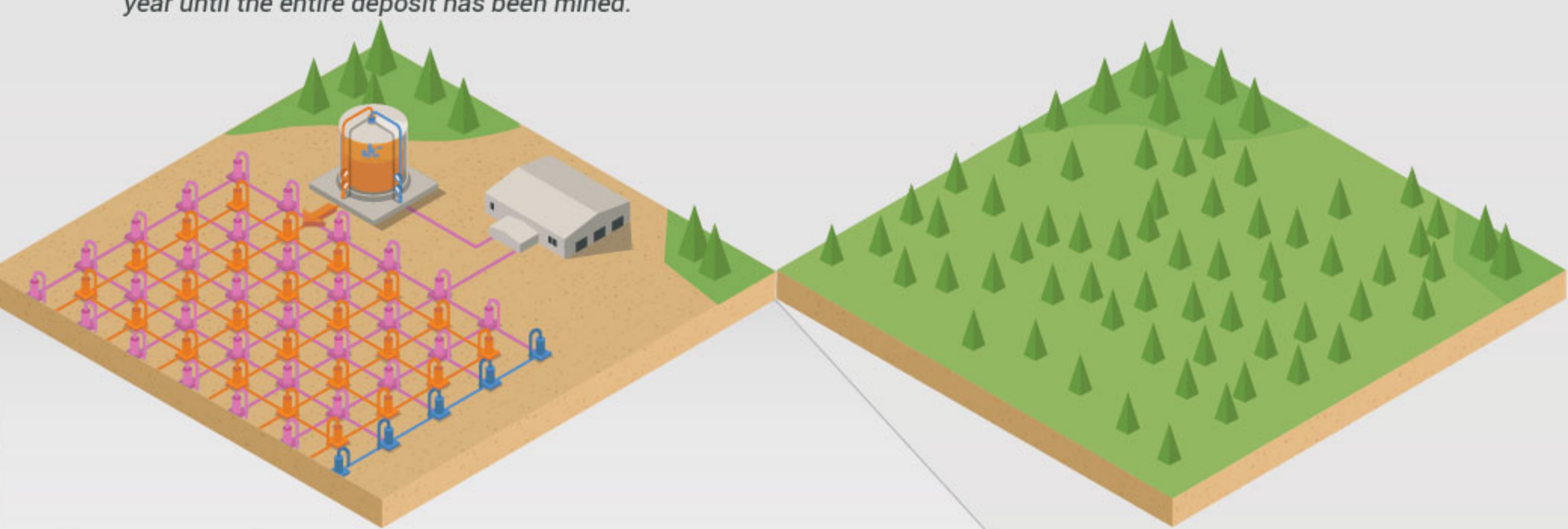
### MINING THE RESOURCE

Once the wells are sunk, minerals such as copper can be mined.

The wellfield mines a specific section of the ore body for 2-4 years; new wells are added each year until the entire deposit has been mined.

### MINE CLOSURE

Previously mined areas are flushed with water; the surface is returned back to pre-mining conditions and can be used for any purpose going forward.



Well arrangement is a series of five-spot patterns comprising one injection well surrounded by four recovery wells.

### STEP 1

Leaching solution is pumped through the injection wells.

### STEP 6

Mining solution is recycled back to the wellfield. In-situ recovery largely recycles water.

### STEP 5

Copper is extracted to create pure copper cathode sheets.

### STEP 2

The solution moves through the naturally fractured rock and dissolves the copper.

### STEP 3

Recovery wells extract the copper-rich solution.

### STEP 4

Solution is pumped to the surface for standard processing.

Differential pumping stops mining fluids from migrating beyond the immediate mining area.

## THE ADVANTAGES OF IN-SITU RECOVERY

Lower capital and operating costs



Minimal noise, dust, and greenhouse gas impact

The most environmentally friendly way to mine



This type of mining gives huge advantages for companies and communities.



Minimal visual disturbance

Safer for mine workers and surrounding communities



No creation of open holes, waste dumps, leach pads or tailings

In-Situ Recovery is a proven mining method, with significant benefits for companies and the environment, all without a moving a single rock.

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