



# e-Mining @ School

**Circular Economy and RAEE**



**Laura Rovira**



# What is the meaning of *raw materials*?



## What is the meaning of *raw materials*?

Raw materials are currently essential for the development of the European economy. They form a solid industrial base, producing a wide range of products and applications that are used for everyday life and modern technologies.

Minerals and metals represent the basis of any industrial production process. They provide everyday products and also new technological and industrial solutions.

# Where do we get raw materials from?

- European technology companies and mining companies have a growing global role in accessing raw materials.
- The main sources of raw materials are located in parts of the world that do not have political stability and economic capital is very low.
- There are more than 450 restrictions on the export of more than 400 raw materials, with a deficit of transparency in the export restriction.

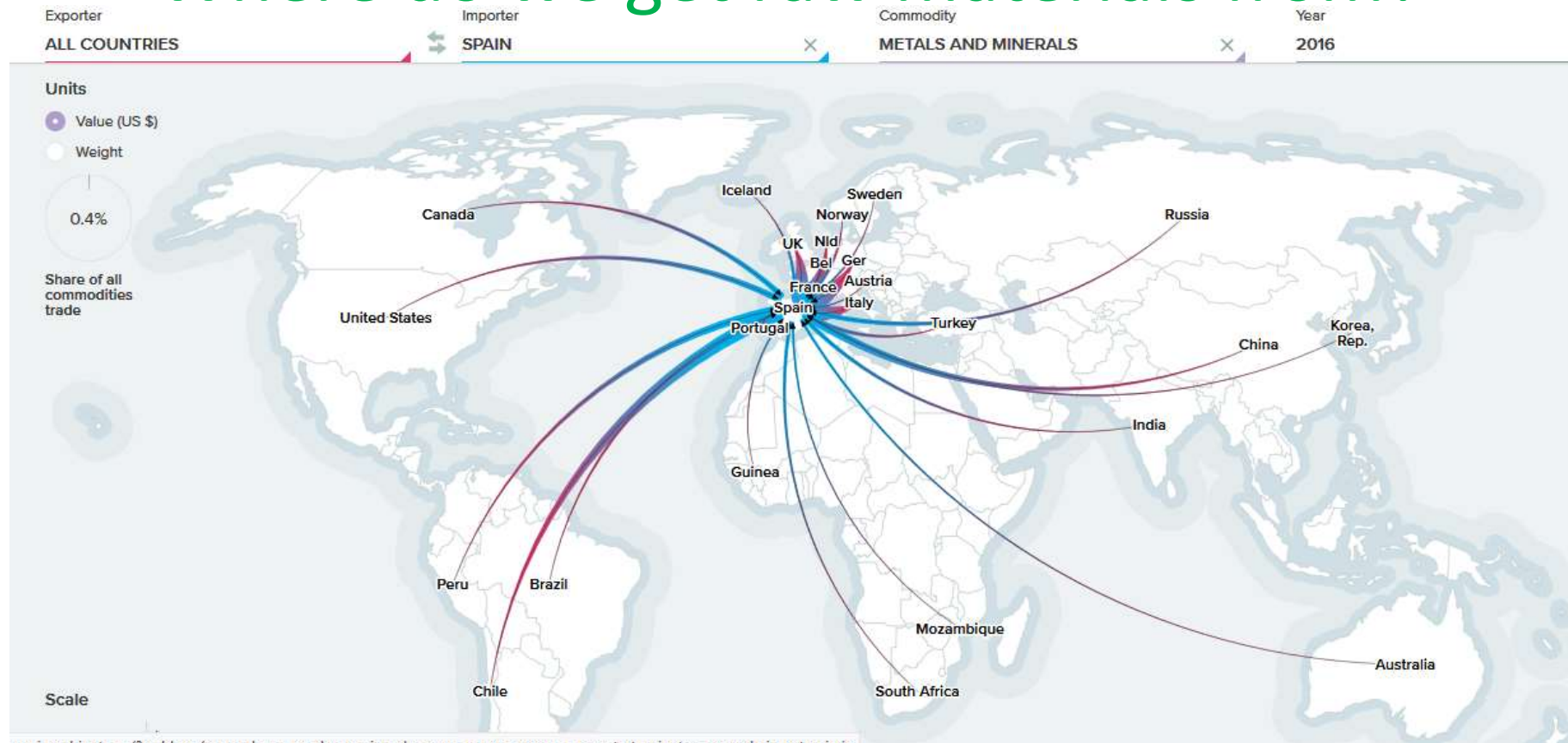
# Where do we get raw materials from?

The EU has a high dependence on imports of high tech metals such as cobalt, platinum, titanium and rare earth.

Examples:

- Hydrogen cars require platinum catalysts.
- Electric cars contain lithium batteries.
- In 2000, the EU suffered a tantalum supply crisis due to the high demand for mobile phones.

# Where do we get raw materials from?



Source: <https://resourcetrade.earth/data?year=2016&importer=724&category=5&units=value>

# What are the repercussions of running out of raw material?

The population growth and living standards will increase the demand for raw materials.

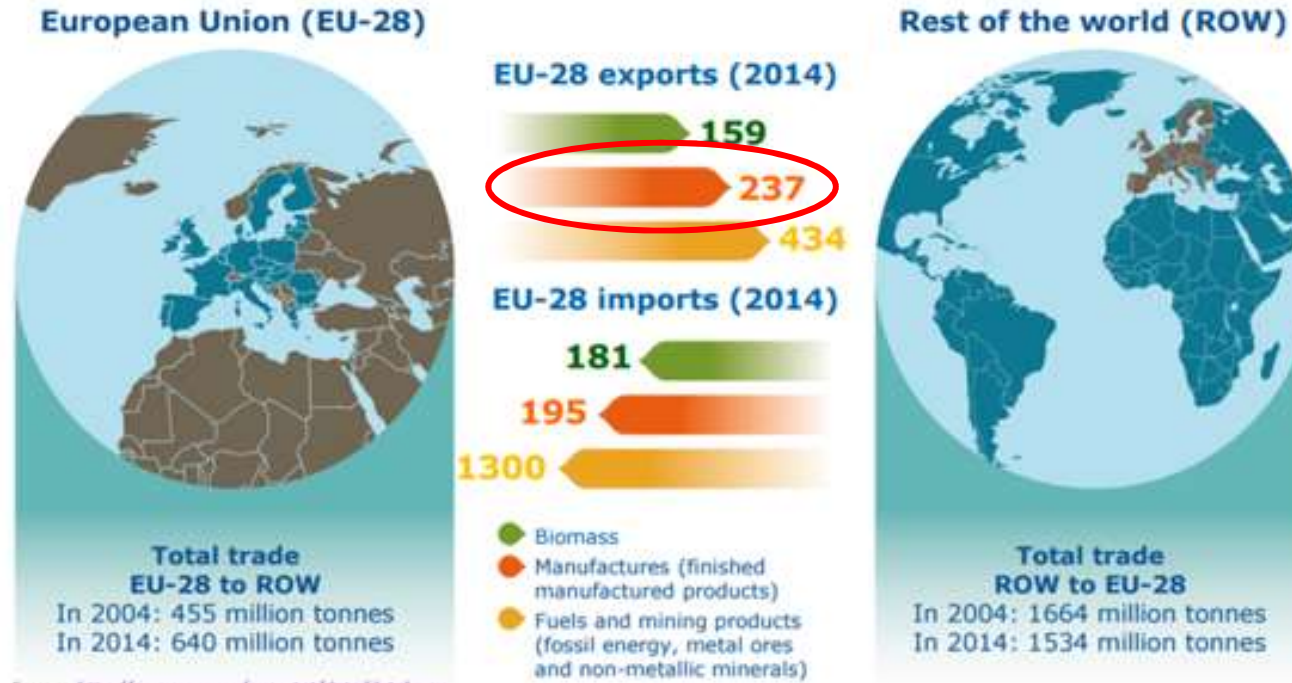
The current economic growth could compromise the existence of some of the periodic table elements. 44 out of the 118 elements could face critical supply problems.

**Such elements restrictions are a growing concern within the EU and around the world.**

**The EU has created a list of critical raw materials (CRM):**

- **Of high economic importance and**
- **With high risk of supply.**

# What are the repercussions of running out of raw material?



Source: <http://ec.europa.eu/eurostat/data/database>

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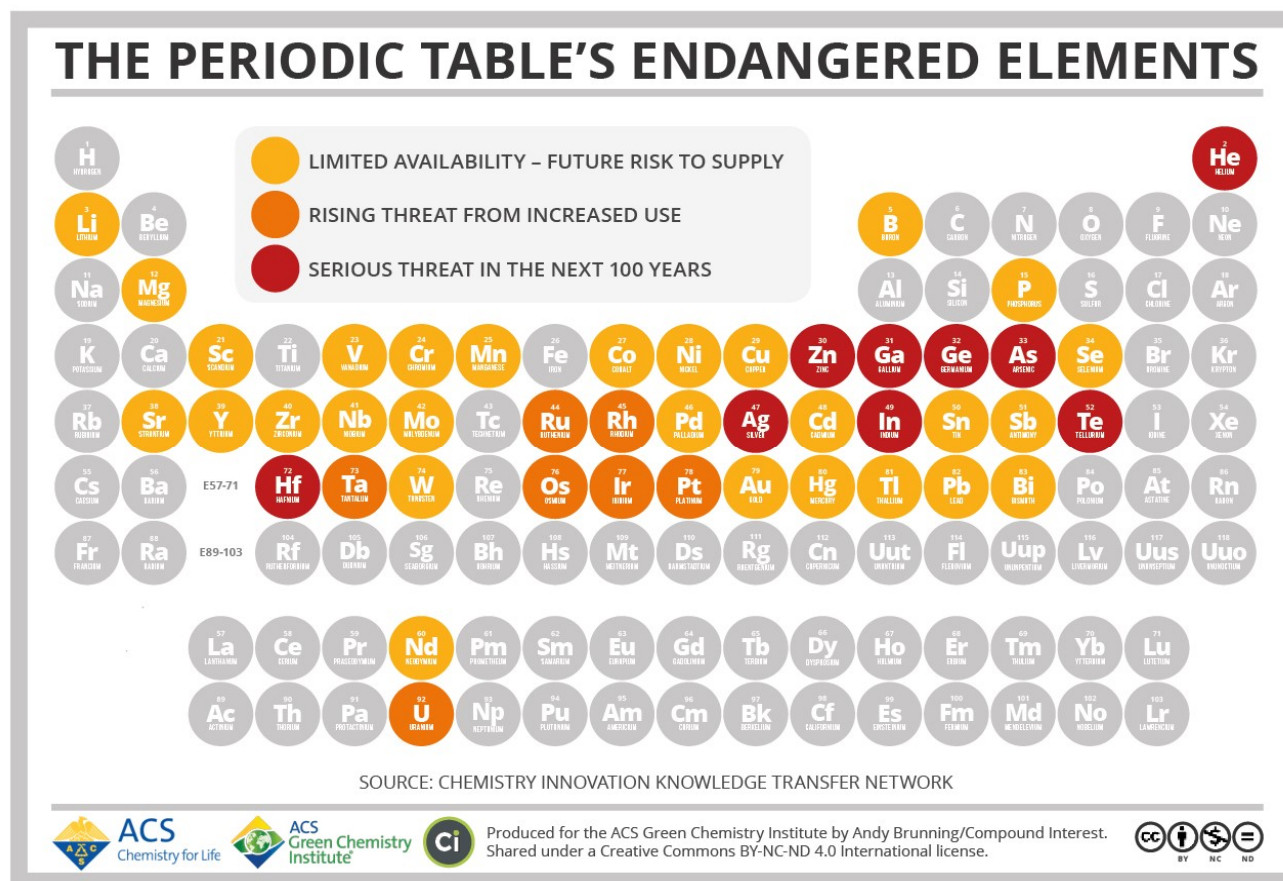


# Critical Raw Material (CRM)

Among these are:

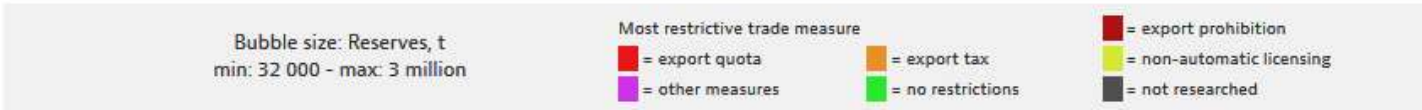
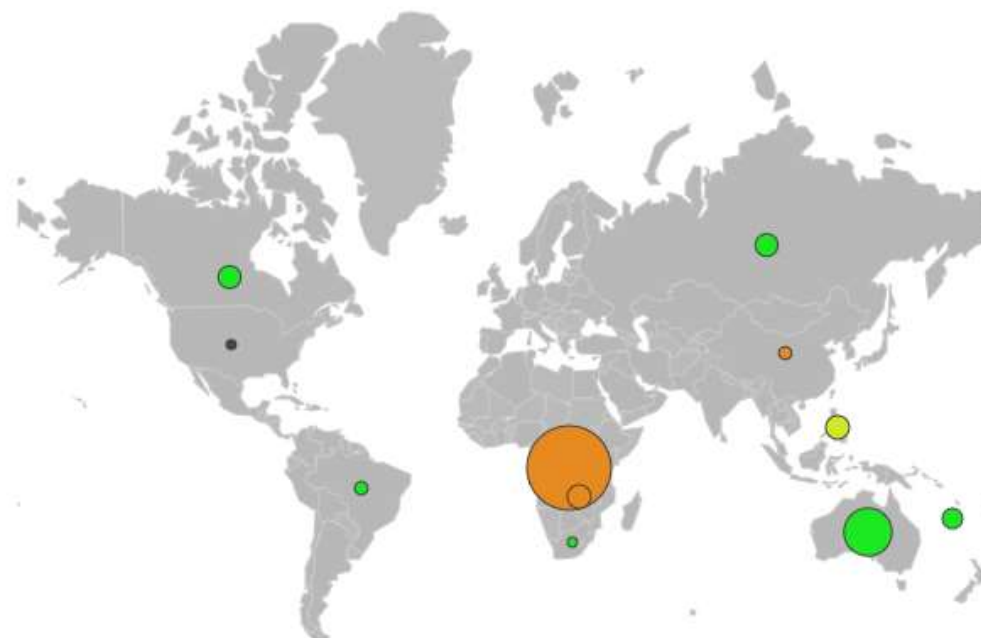
- Rare earths,
- precious metals or,
- essential elements for daily life such as phosphorus.

Not all CRMs are chemical elements



# Critical Raw Material

## Reserves de Cobalt al món



Font: <https://www.compareyourcountry.org/trade-in-raw-materials?cr=oced&lg=en&page=2&visited=1>

# What can we do to increase the availability of raw materials?

# Linear Economy

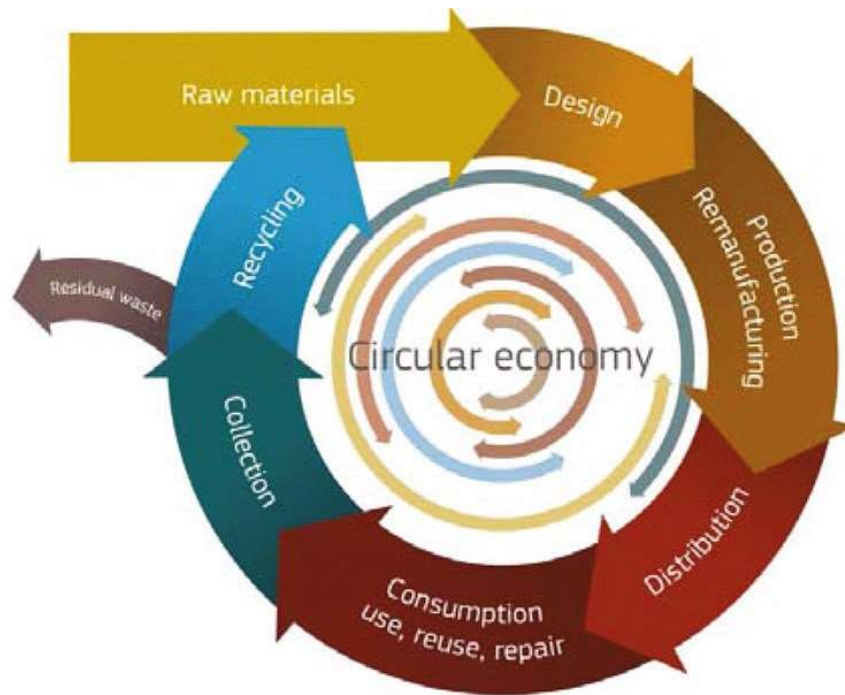


## Lineal economy limitations

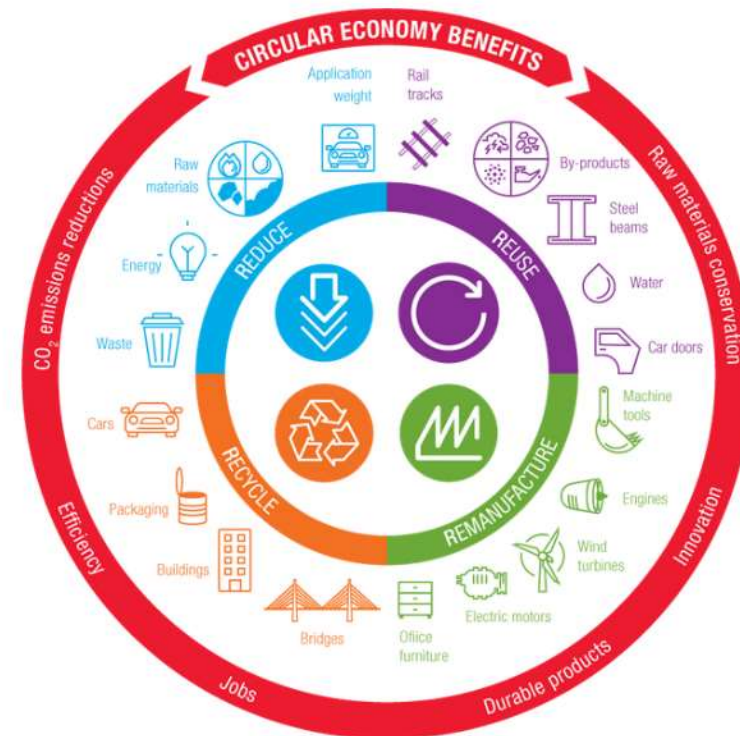
- Devaluation of materials and products
- Shortage of resources and volatile prices
- Waste generated / environmental problems

# What if we turn wastes into resources?

# Circular Economy



Source: Comisión Europea



Source: <https://www.worldsteel.org/en/dam/jcr:00892d89-551e-42d9-ae68-abdbd3b507a1/Steel+in+the+circular+economy+-+A+life+cycle+perspective.pdf>



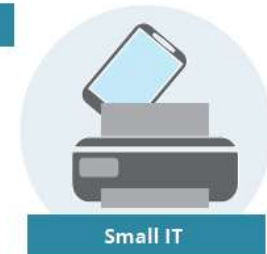
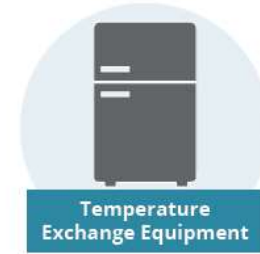
**Source:** <https://economiecircular.org>

[https://www.youtube.com/watch?time\\_continue=190&v=RstFV\\_n6wRg](https://www.youtube.com/watch?time_continue=190&v=RstFV_n6wRg)

# What are WEEE?



**Waste of Electrical and Electronic Equipment (WEEE)** is waste that is made up of devices that base their operation on electricity and which are currently in disuse.





In 2016 some 44.7 million tonnes of WEEE were generated, about 6.1 kg per inhabitant. The estimate for 2017 was 46 million and for the year 2021 52.2 million are expected. With a growth of between 3 and 4% per year.

In 2016, **44.7** million metric tonnes  
of e-waste were generated.

This is an equivalent of almost

**4,500** Eiffel towers.



# What kind of materials are contained by WEEE?

## Recoverable Materials

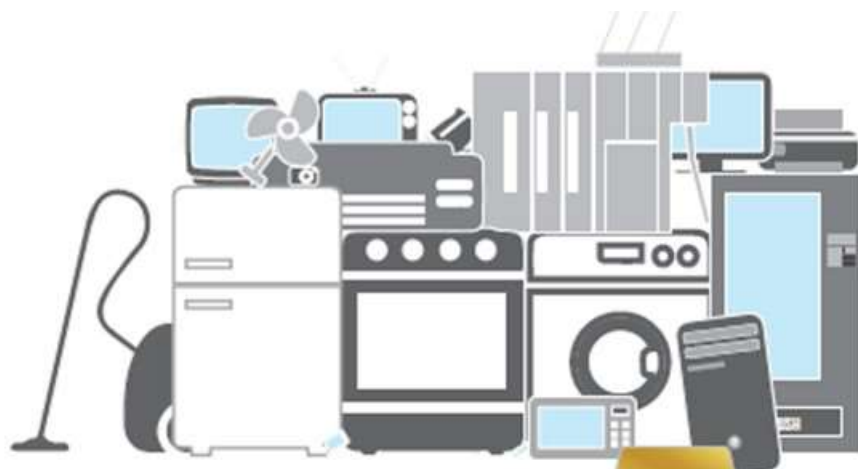
Materials that have a value, either through their own recovery or to be used to obtain energy

- Iron based metals, iron, steel ...
- Non-ferrous metals, Aluminum, Copper, Precious metals
- Plastics of various compositions
- Glass
- Others (wood, rubber, cardboard ...)

## Non-recoverable materials

Materials that do not have a subsequent use and which must be disposed in controlled landfills to avoid its danger

# What is the value of WEEE?



Material	kilotons (kt)	Million €
Fe	16,283	3,582
Cu	2,164	9,524
Al	2,472	3,585
Ag	1.6	884
Au	0.5	18,840
Pd	0.2	3,369
Plastics	12,230	15,043



Estimated value of raw materials at

# 55 BILLION EUROS

# What's in a phone?



# One iPhone requires 46 elements



<https://www.youtube.com/watch?v=66SGcBAs04w>



## Materiales reaprovechables



### 1 MÓVIL

Peso medio: 100 gr.  
Reciclabilidad: 90%



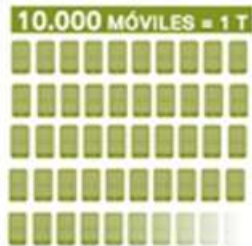
62 gr de plástico  
Poliéstero, poliestireno, etc.  
policarbonato, etc.



25 gr de metales  
Mayoritariamente aluminio -Al- y Cobre -Cu-



800 PPM (0,08 gr.)  
de metales preciosos (Mayoritariamente  
plata -Ag-, oro -Au- y paladio -Pd-)



620 kg. de plástico  
Poliéstero, poliestireno, etc.  
policarbonato, etc.

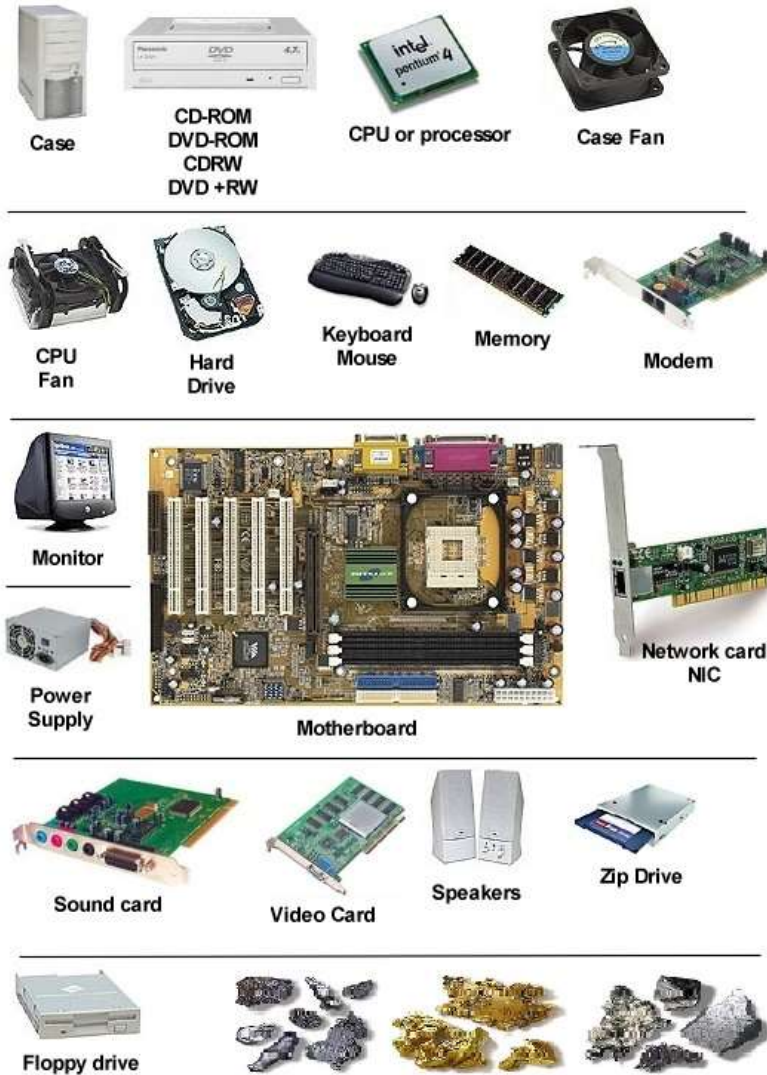


250 kg. de metales  
Mayoritariamente aluminio -Al- y Cobre -Cu-

● 8 gr de metales preciosos  
Mayoritariamente plata -Ag-, oro -Au- y paladio -Pd-



# What's in a computer?





# What's in a computer?

- **Gold** - Printed Circuit Boards, Computer Chips (CPU), connectors / fingers
- **Silver** - Printed Circuit Boards, Computer Chips, keyboard membranes, some capacitors
- **Platinum** - Hard Drives, Circuit board components
- **Palladium** - Hard Drives, Circuit board components (capacitors)
- **Copper** - CPU heat sinks, wiring and cables, Printed Circuit Boards, Computer Chips
- **Nickel** - Circuit board components
- **Tantalum** - Circuit board components (some capacitors)
- **Cobalt** - Hard Drives
- **Aluminium** - Printed Circuit Boards, Computer Chips, Hard Drives, CPU heat sinks
- **Tin** - Printed Circuit Boards, Computer Chips
- **Zinc** - Printed Circuit Boards
- **Neodymium** - Hard Drives (magnets)

# What is urban mining?

Urban mining consists of **recycling electrical and electronic devices** to recover the valuable materials they contain, such as gold, silver, copper, aluminum, platinum, steel or plastics.

Mineral extraction from earth to make new electronic devices is **13 times more expensive** than obtaining them through used devices.

<https://www.bloglenovo.es/mineria-urbana-para-reciclar-residuos-electronicos/>



# How to recycle?



# WEEE recycling

1. Selective separation
2. Treatment plants transport
3. Decontamination
4. Dismantling and separation of components
5. Recovery and reintroduction of raw materials into the production process
6. Depositing in landfill or energy recovery of non-recoverable materials



The northern countries transport up to 80% of e-waste to Asian, African and countries from South America!

# Benefits of recycling of WEEE

1. Raw materials saving
2. Waste decrease in landfills
3. Avoid the environmental impact of the substances they contain
4. Business generation

more than 75%  
of e-waste is  
NOT used in  
Africa!



# Business generation

- ✓ Opportunity to create recycling companies
- ✓ Jobs generation

The waste of electrical and electronic devices (WEEE) could generate more than 7,400 jobs directly in Spain, thanks to its reuse, according to a study elaborated with the data of the sector.

<https://www.youtube.com/watch?v=EzaFerJYZhU>



EIT RawMaterials is supported by the EIT,  
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**THANK YOU**

[www.eurecat.org](http://www.eurecat.org)