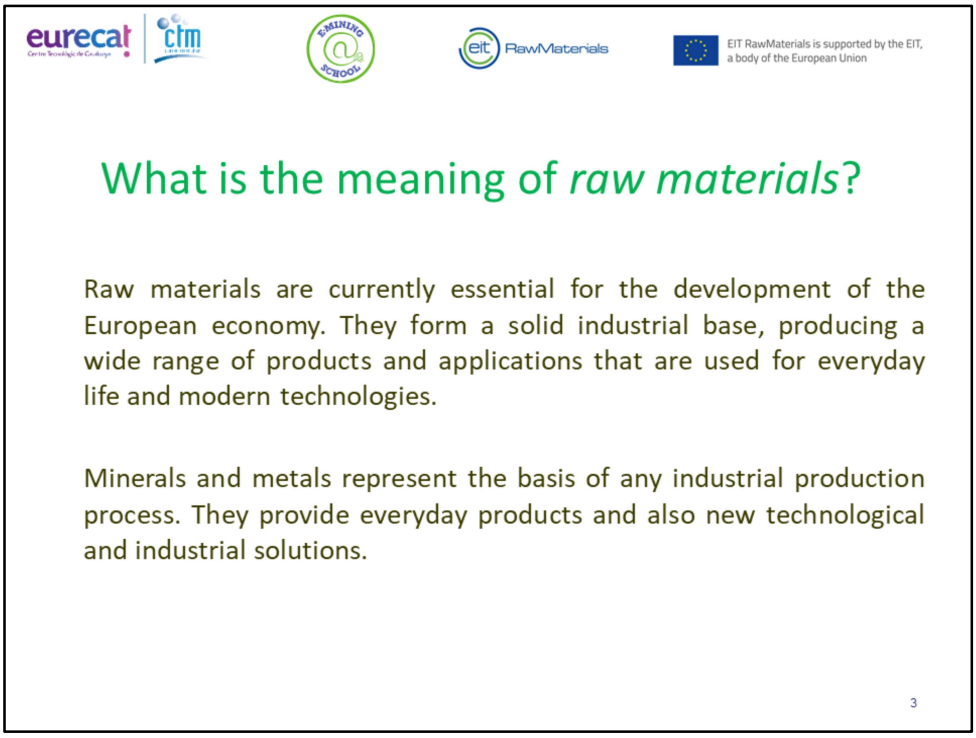
This presentation will describe the scene for CRM, I will also explain the fundamentals of CE, to go on later with the Waste of Electrical and Electronic Equipment (WEEE) and the changes that we are making toward recycling of WEEE.

To start, what is the meaning of raw materials.?



Raw materials are materials or substances used in the primary production or manufacturing of goods.

Among them Critical Raw Materials (CRMs) are those raw materials which are economically and strategically important for the European economy, but have a high-risk associated with their supply.

The EU's industry and economy are reliant on international markets to provide access to many important raw materials since they are produced and supplied by third countries.

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. Being China the major supplier of critical raw materials, accounting for 70% of their global supply and 62% of their supply to the EU (e.g. rare earth elements, magnesium, antimony, natural graphite, etc.).

A relevant fact is that there are over 450 export restrictions on more than 400 different raw materials.

The economy of the European Union is significantly dependent on access to raw materials. The EU member states need not only raw materials produced in Europe but also materials imported from elsewhere. The EU has to import metals such as cobalt, platinum, titanium and rare earth.

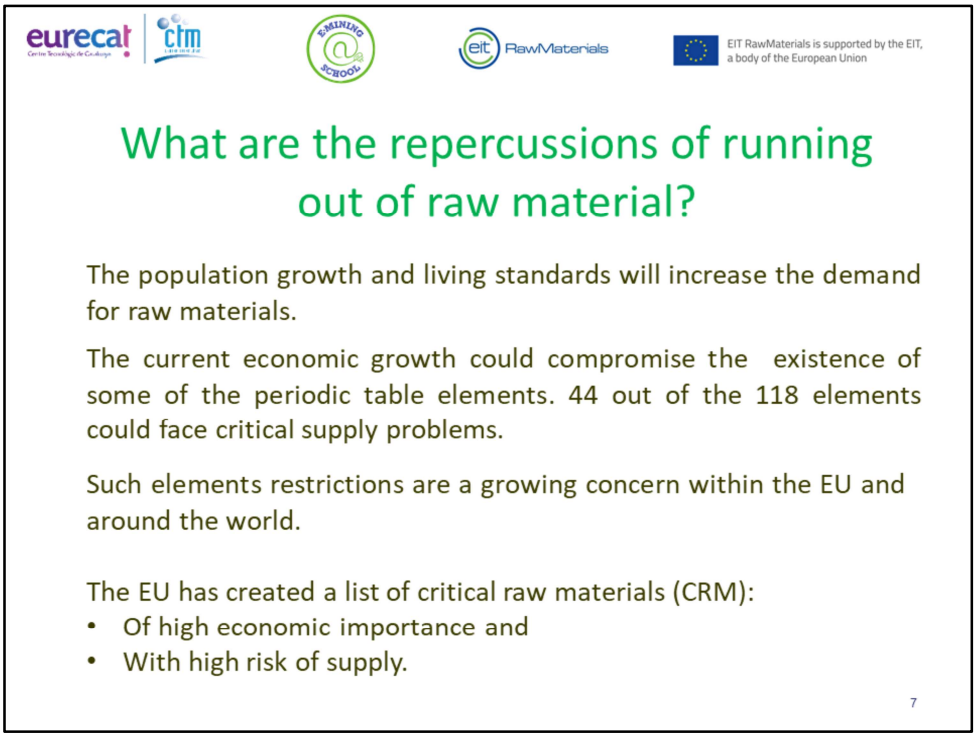
Some examples are:

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.

As I commented before, the critical raw materials are at risk of supply because they come from too few countries or politically unstable countries. 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.

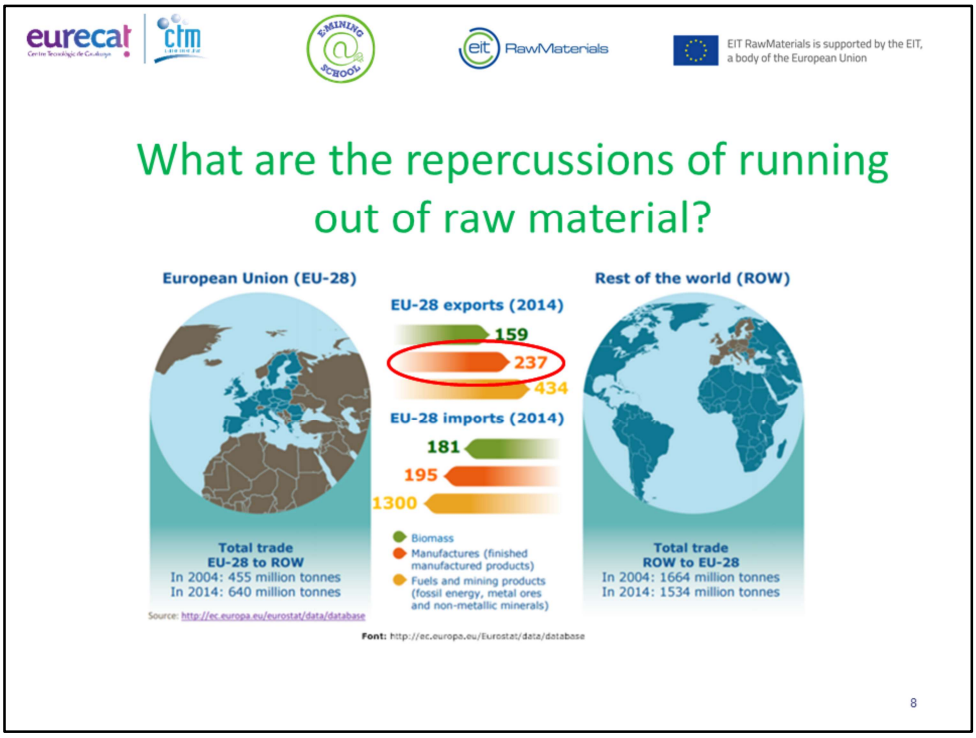
This map shows in detail which are the main European suppliers.

For the critical raw materials, their high supply risk is mainly due to the fact that a high share of the worldwide production comes from China (antimony, fluorspar, gallium, germanium, graphite, indium, magnesium, rare earths, tungsten), Russia (PGM), the Democratic Republic of Congo (cobalt, tantalum) and Brazil (niobium and tantalum). This production concentration, in many cases, is compounded by low substitutability and low recycling rates.



Factors such as world population growth and living standards affect the demand for raw material, compromising the existence of some of the periodic table elements. 44 out of the 118 elements could face critical supply problems.

To address the growing concern of securing valuable raw materials for the EU economy, the European Commission (EC) launched the European Raw Materials Initiative. It is an integrated strategy that establishes targeted measures to secure and improve access to raw materials for the EU. One of the priority actions of the Initiative was to establish a list of critical non-energy raw materials at EU level. The first list was established in 2011 and it is updated every three years.



To understand the potential repercussions of raw materials depletion we should focus on the fact that the EU is heavily dependent on imported raw materials

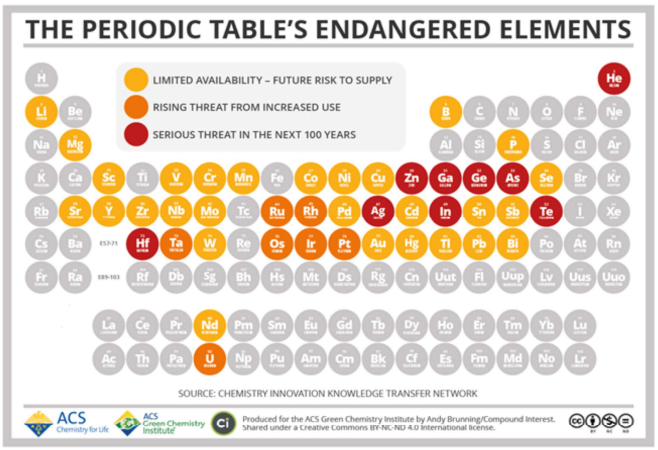
EU imports 3 times more materials and natural resources than it exports

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



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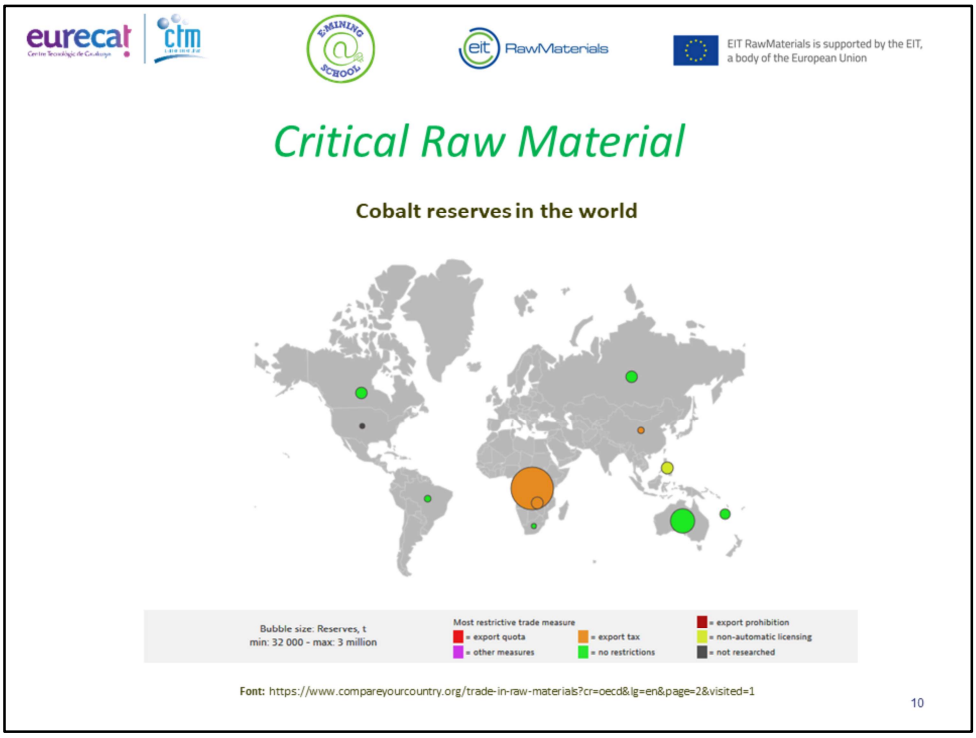
In 2015, Green Chemistry published a special issue on Elemental Recovery and Sustainability.

Hunt as guest editor, estimated the depletion of chemical elements on the basis of the trends in current reserves consumption. The colours indicate the risk of depletion degree from light orange- related to a limited availability, to dark orange for in rising use materials and red that implies a serious threat for the current reserves.



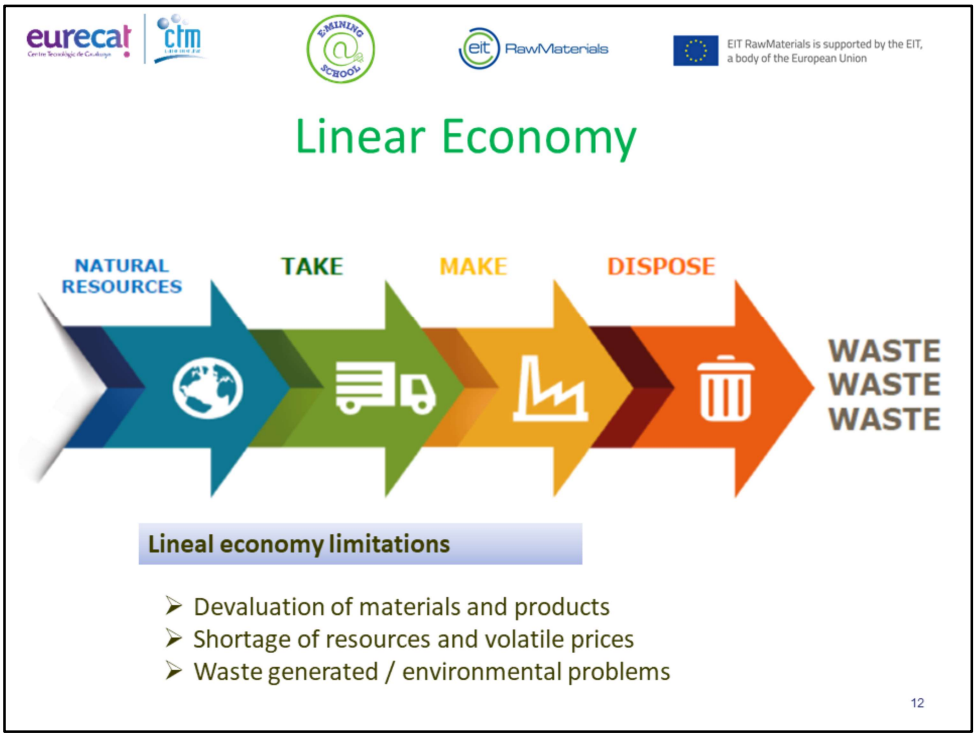
A good example of this is Cobalt.

This metal, combined with other key raw materials, is an essential component of lithium-ion batteries, which are used to power electric vehicles.

The Democratic Republic of the Congo has the largest cobalt reserves in the world, at some 3.4 million metric tons as of 2018. As the total global cobalt reserves amount to 6.9 million metric tons, this means that the DR Congo's cobalt reserves account for nearly half of the world's reserves of the metal. Australia, in second place, holds an impressive 1.2 million metric tons of the global cobalt reserves, equating to a 17.4 percent share.

Despite the expected upward trend in electric vehicles, a shortage of cobalt caused by depletion seems unlikely. However, supply can still be disrupted by factors associated with its high degree of concentration in one country where there is historical and continuing conflict linked to resource extraction. Without stronger governance mechanisms, a minerals boom could drive corruption, conflict and human rights abuses.

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



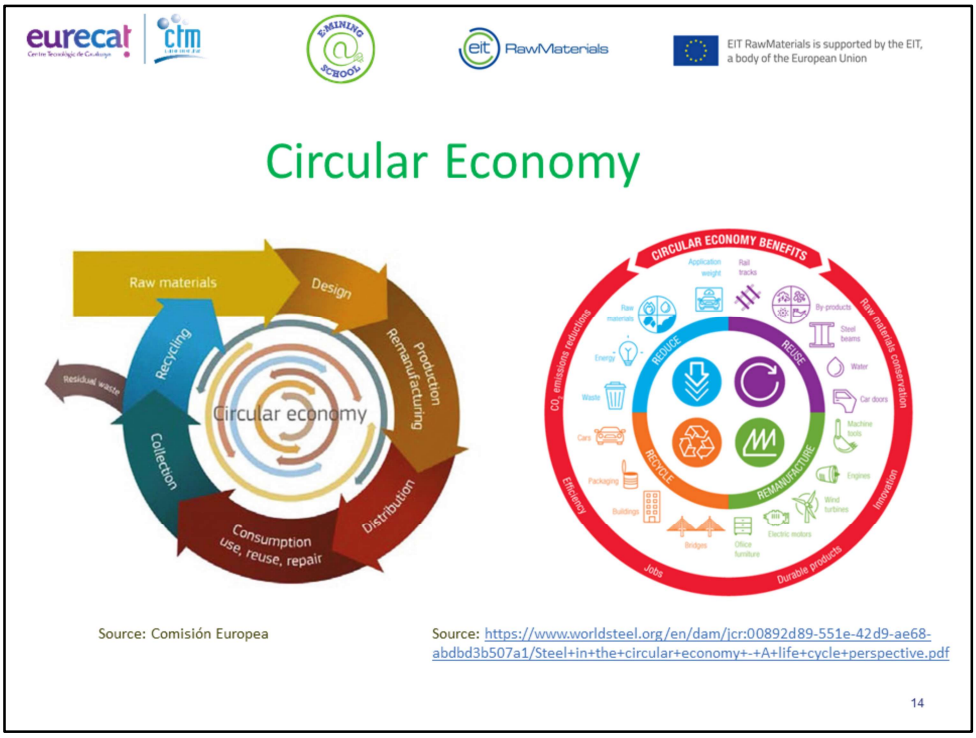
I will explain the concept of linear economy and why it doesn´t work

For many years, most manufacturers and production facilities have operated using a linear economy. A linear economy traditionally follows the “take-make-dispose” step-by-step plan. This means that raw materials are collected, then transformed into products that are used until they are finally discarded as waste. Value is created in this economic system by producing and selling as many products as possible.

Among the many issues related to the linear economy limitation we can name:

Loss of the materials and products value
Lack of resources and unpredictable/inconsistent prices
Waste generation which involves environmental issues

¿What if we turn wastes into new resources?
In that way we could make a shift from a linear economy to a circular economy

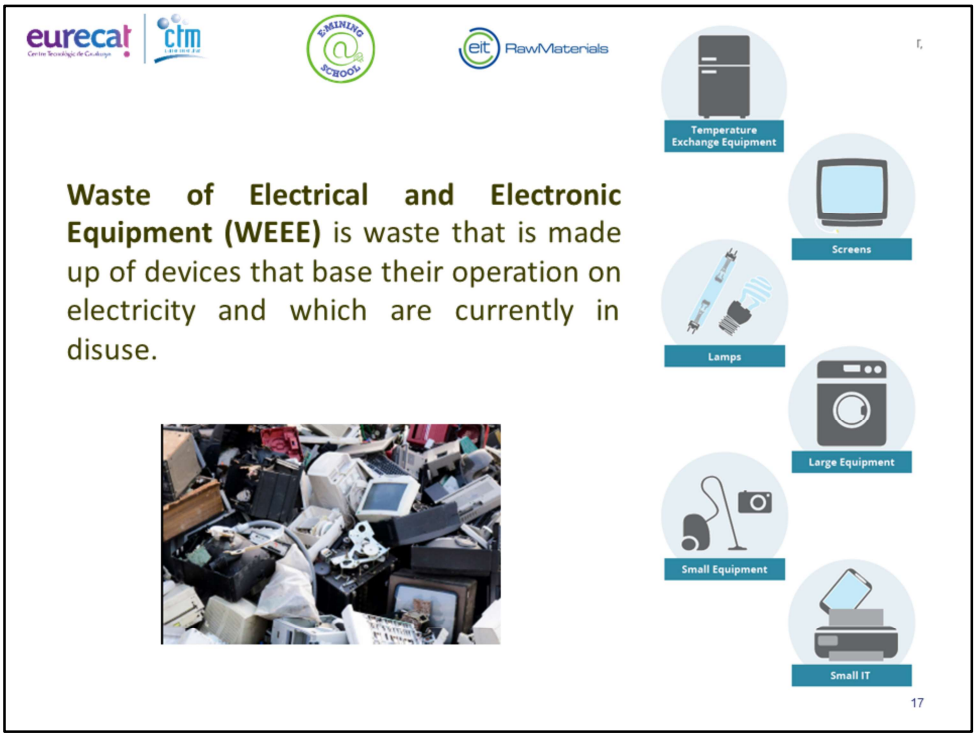


In order to create a truly sustainable future for generations to come, we need to ensure all manufacturing processes are carried out with a circular economy in mind.

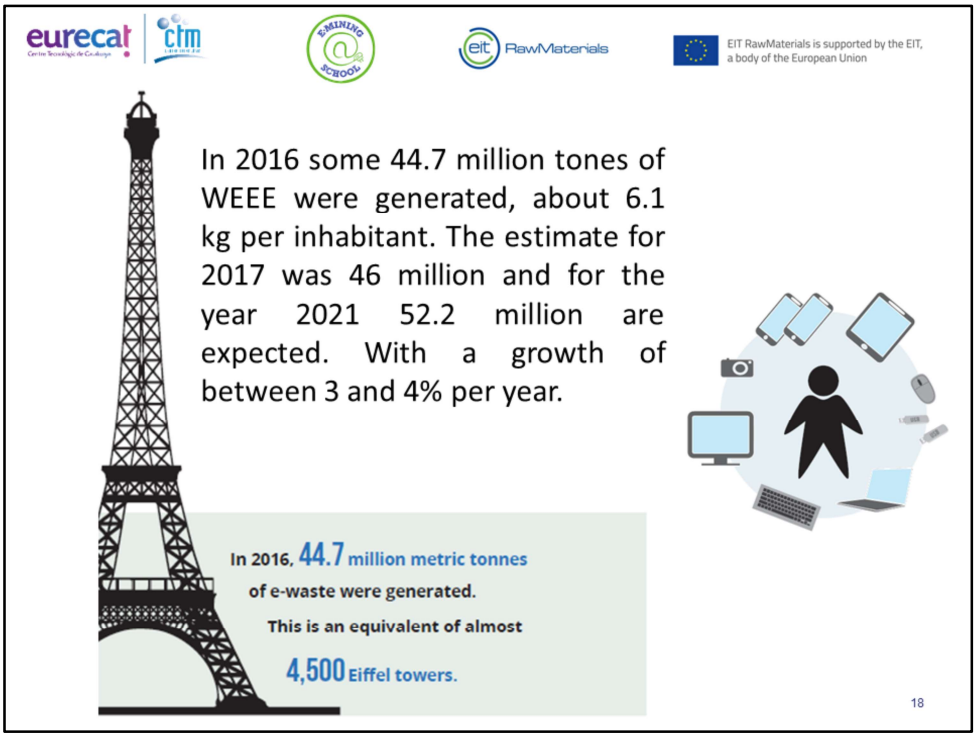
A circular economy is a closed-loop economy that aims to extend the life of assets and resources through recycling, keeping quality materials at their highest value and utility. Unlike linear economy that is based on creating products from raw material and disposing of them in landfill after use, in CE products are created from recycled materials and recycled at the end of their life. In this way, resources are conserved while the quality of products created remains the same.

The opportunities of a circular economy span across economies, the environment, businesses, and citizens. These benefits come together to offer a promising vision for a regenerative and restorative economy in the future.

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. I.e. washing machines, computers, TVs,
fridges and phones.



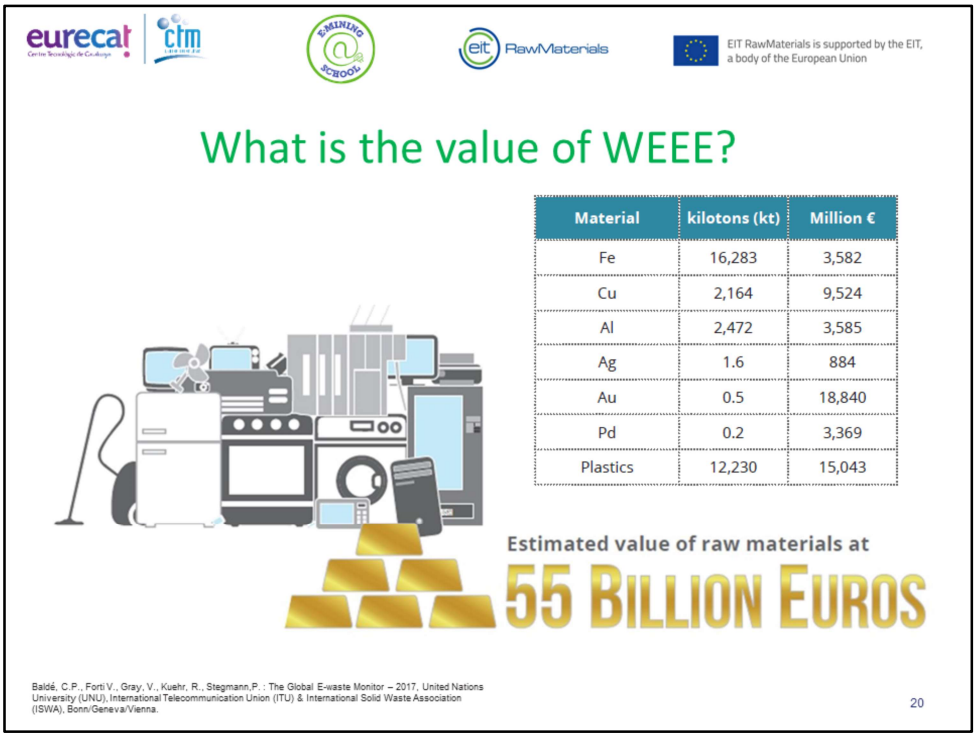
In this slide we can see some figures regarding WEEE.

In 2016 some 44.7 million tones 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.

The composition of WEEE is specific for each appliance. In order to handle this complexity the recoverable materials found in WEEE have been divided into several categories:

- iron and steel, used for casings and frames;
- non-ferrous metals, especially copper used in cables, and aluminum;
- plastic used as casing, in cables and for circuit boards;
- glass used for screens, windows;
- electronic devices mounted on circuit boards;
- others (rubber, wood, ceramic etc.)

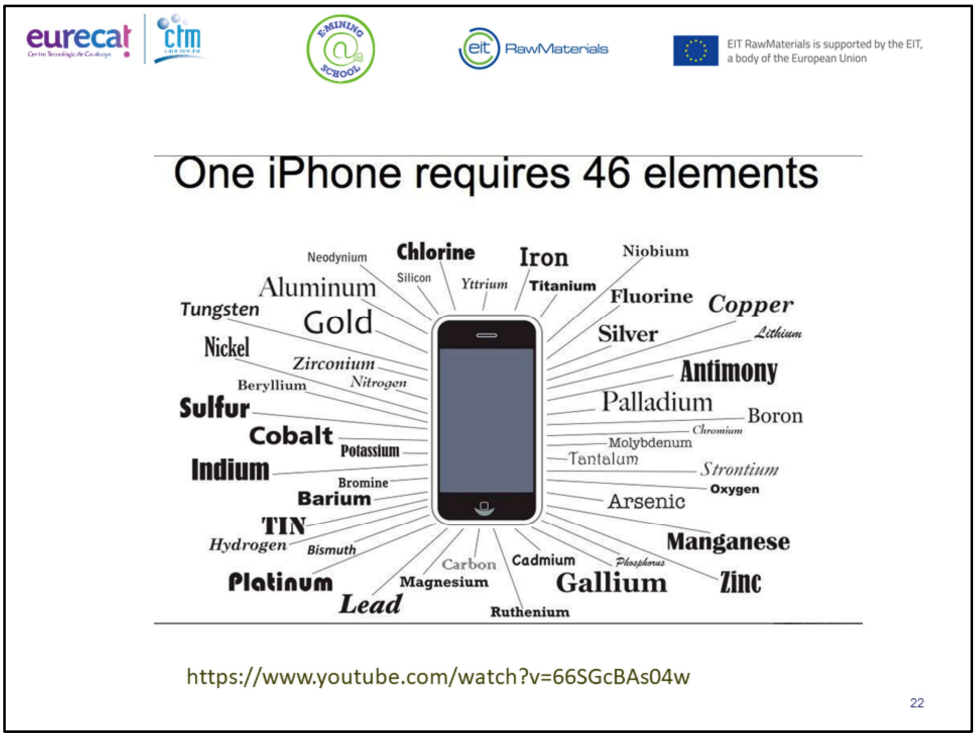
WEEE also contains non-recoverable materials later landfilled or incinerated



This slide shows the accounting global economical impact of not recycling the WEEE Waste of Electrical and Electronic Equipment.

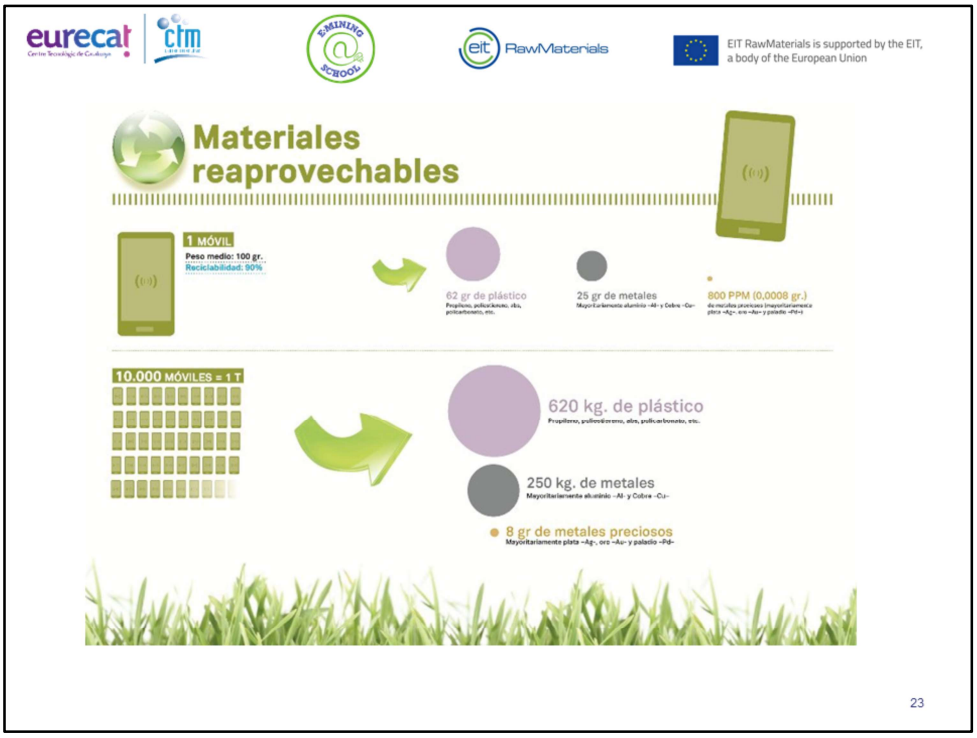
As you can see, it's estimated that the value for the volume of global generated WEEE is equivalent to 55 billion of euros.

Let´s talk about one of the most cherished device – phones



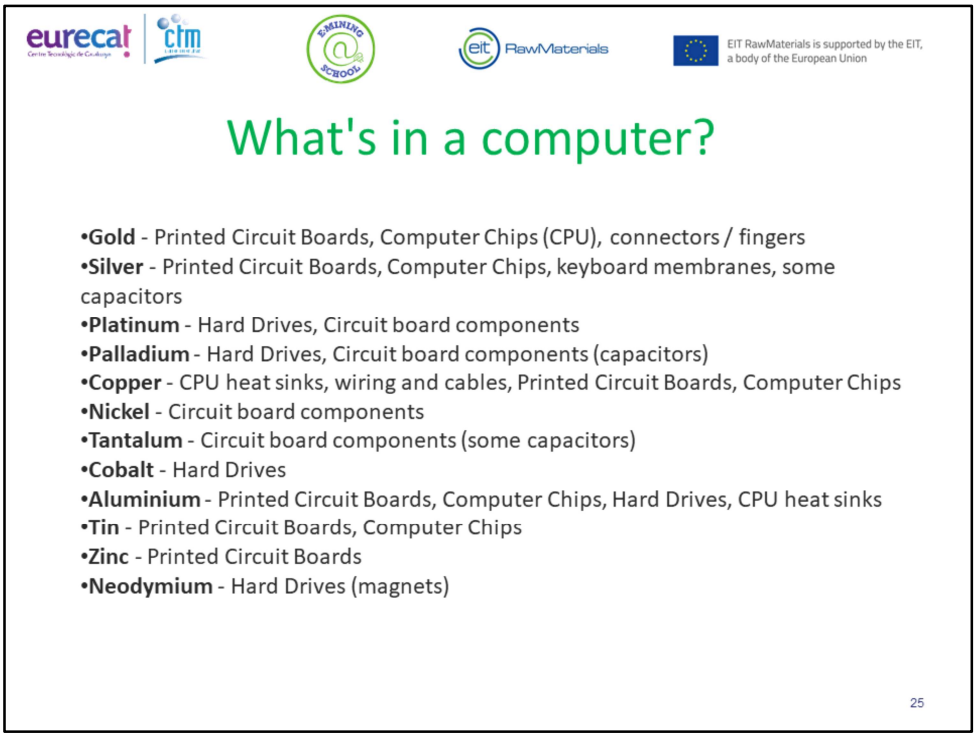
Phones alone contain more than 46 elements along with other CRM. Although many of these metals are present in only a milligram scale or less, they are very important for the function of the device.

This includes elements like copper, aluminum and iron, but also less well-known materials, like the rare earth elements.



From a mobile phone with an average weight of about 100 grams, current treatment techniques allow to recover 62 grams of plastics (a mixture of propylene, polystyrene, abs and polycarbonate, among others) and 25 grams of metals, mostly aluminum and copper. Also, a mobile phone contains 800 ppm of recoverable precious metals -including gold, silver and palladium-, which means about 8 grams per ton of waste from these devices.
About 10,000 mobile phones correspond to 1 ton of these devices.

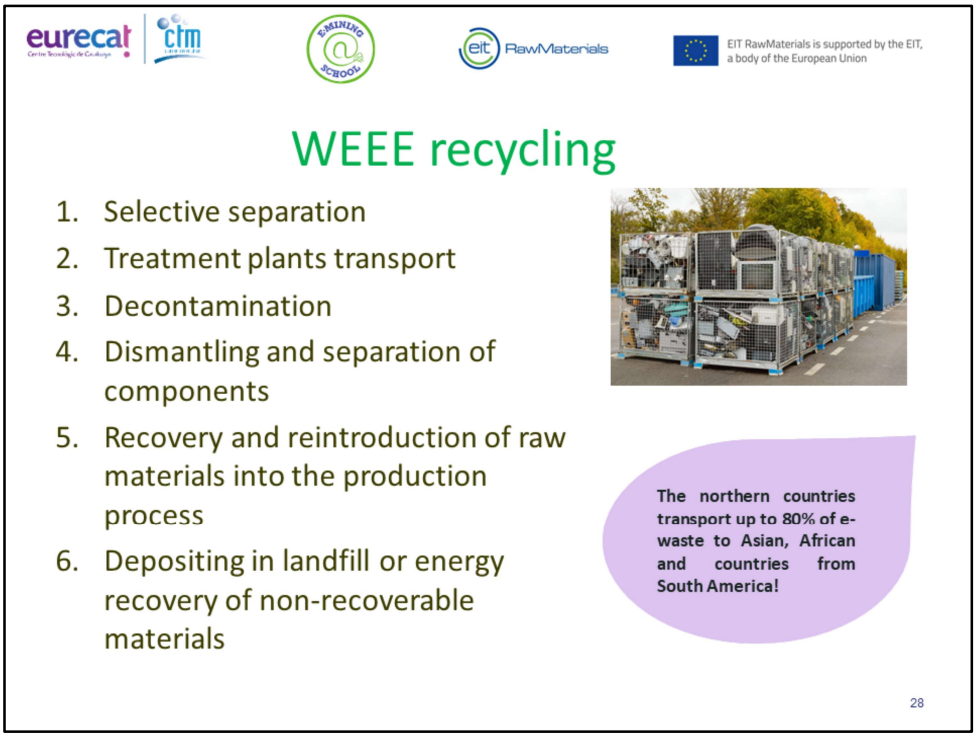
Many materials used in computer hardware can be recovered by recycling for use in future production. Computer recycling implies the disassembly and separation of components and raw materials of waste electronics. This would typically include PCBs such as motherboards, power supplies, graphics cards, memory RAM sticks and hard drives.



Computers consist of the following elements:
Precious metals: gold (Au), silver (Ag), palladium (Pd) and platinum (Pt);
Other metals: copper (Cu), aluminum (Al), nickel (Ni), zinc (Zn), etc.;

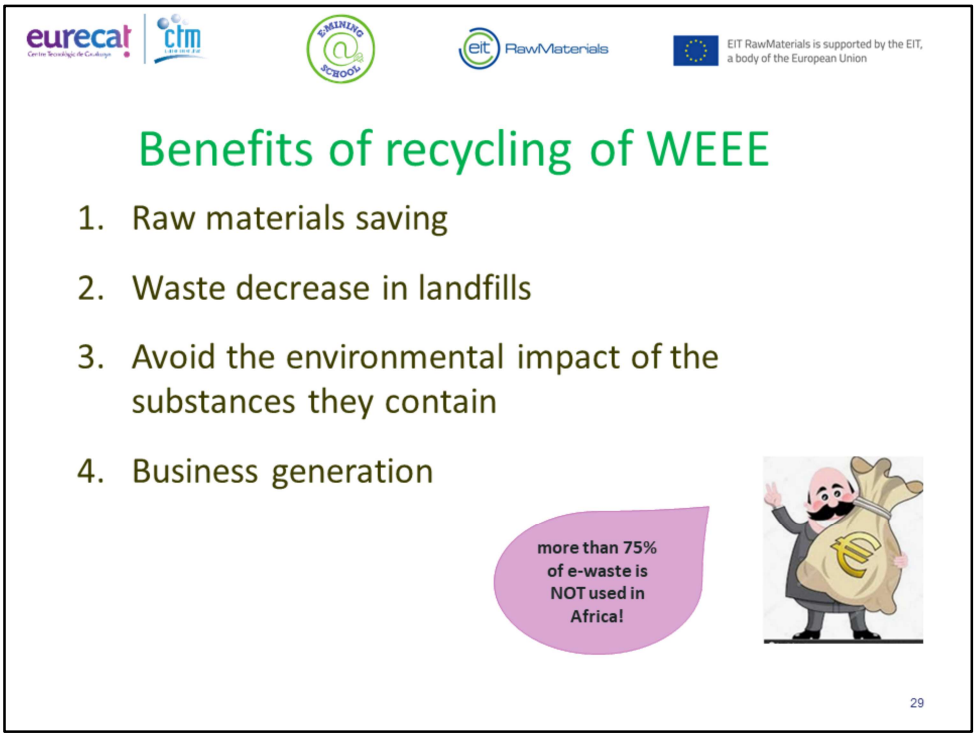
We have spoken before about the evolving of WEEE so I want to introduce a new concept that is URBAN MINING.
Urban Mining is simply defined as the process of reclaiming raw materials from spent products, buildings and waste.

Before talking about, recycling of WEEE, some context setting may be helpful. As you know, recycling is a key industry for the way to a resource-efficient circular economy. Recycling contributes to the security of supply of raw materials and helps to improve the sustainability of materials.



Steps for WEEE recycling include:
- Selective separation
- Treatment plants transport
- Decontamination
- Dismantling and separation of components
- Recovery and reintroduction of raw materials into the production process
- Depositing in landfill or energy recovery of non-recoverable materials

It is worth mentioning that 80% of e-waste from northern countries is transported to Asia, Africa and other countries in South America.



Under the WEEE directive, any company that manufactures, imports, distributes or disposes of electronic goods must deal with end-of-life products using the correct procedures, resulting in some key benefits for the environment:
- Reduce cost materials due to the raw materials saving
- Correctly disposing of WEEE items reduces waste costs
- Using recycled rather than raw materials to make new products helps to lower levels of greenhouse gases being sent into the environment and avoids the environmental impact of the substances they contain in case of landfill disposal
- Business generation as a company could gain a competitive advantage: As awareness of environmental issues grows, more and more consumers are choosing to 'buy green'

To sum up, recycling of WEEE could be a great opportunity to create new companies, generating more job positions.

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.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