



AWARE

educating for e-waste recycling

Exercises on e-waste

Advanced



Introduction to e-waste and circular economy

We use and need many electrical devices every day, and as long as they are working, we don't pay much attention to them. What happens when they break? We immediately notice if a lamp burns out, our washing machine breaks or our phone smashes on the ground. A broken or unusable device or machine becomes e-waste or WEEE (Waste Electrical and Electronic Equipment).

When a big, new machine, like a washing machine or a freezer is delivered, the delivery company will often take the old device away to be recycled. Smaller devices like mobile phones and electronic toys tend to remain stored in our dresser drawers and closets for a longer time. Do you know how many unused mobile phones or other electronic devices are there in your home?

Recycling even the smaller devices would be good, though. All electronic devices contain valuable materials that could be used again if recycled properly. When a device is recycled, it is taken apart and all the different materials it contains are separated. Responsible recycling also takes care of potentially dangerous materials that could harm the nature, animals or people if not treated properly.

The difficulty with recycling comes from the wide variety of materials that make up e-waste. A smartphone can contain as much as 50-60 different elements. A high percentage of the common metals, like aluminium and copper, are recycled. For some materials, efficient recovery can be either too difficult or too expensive.

While most of us would not throw away jewelry containing precious metals such as gold, silver or platinum, we don't pay quite as much attention to broken appliances. It has been estimated that up to 7 % of the world's gold may currently be contained in e-waste. Currently only about one third of WEEE in the EU is collected and managed properly. There is still room for improvement!

We Europeans generated 12.3 Mt of WEEE in 2016. This equals to the mass of 1,200 Eiffel towers. Per person, this amounts to 16.6 kg every year - as much as over 100 average mobile phones or about one fifth of a washing machine, for example.

It is important to recycle, but even more important to try to avoid generating waste in the first place. Manufacturing a device, even when using recycled material, still consumes energy and resources. If possible, repairing and otherwise prolonging the lifespan of a device is a good thing.



Discuss in groups:

Variety of electronic products

What kind of electronic products do you use every day? Which of these products are necessary? Are there some products you could live without?

Consumer habits and extending product lifetime

Think about your mobile phone. When was the last time you bought a new phone? Why did you buy a new one? How many phones have you had in your life? Do you use your phone until it is broken, or do you get a newer model even when the old one is still working?

Dealing with electronic waste

Do you know where to take electronic devices that are broken or not used anymore? Which materials do you think could be recycled from electronic products? Which are the benefits of sorting and recycling electronic waste?

Sustainability of electronics

Which materials are used in the manufacture of electronic products? Where do these materials come from? What kind of problems are there related to the mining of raw materials for electronic products? What does sustainable electronics mean?



E-waste vocabulary

Option 1. Find out what these terms related to e-waste mean and write down short descriptions.

Option 2. Teacher selects one term from the list below. Students make up a definition for the term without using any information sources. Who makes up the most convincing definition?

1. **WEEE or e-waste**
2. **Planned obsolescence**
3. **Rare earth elements (REEs)**
4. **Circular economy**
5. **Conflict minerals**
6. **Critical raw materials (CRM)**
7. **Pyrometallurgy**
8. **Ore**
9. **Waste hierarchy**
10. **Urban mining**



Exercise on Critical Raw Materials

Critical Raw materials (CRMs) are raw materials that are economically important for the European economy but have high-risk in their supply. The full list of 27 materials classified as CRMs by European commission can be found in https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en.

Examples of CRMs used in electronics include for example:

| | | |
|-----------|----------------------------|----------|
| antimony | indium | scandium |
| beryllium | palladium | tantalum |
| cobalt | platinum | tungsten |
| gallium | REEs (rare earth elements) | vanadium |
| germanium | | |

Exercise: Choose one of the CRMs in the table and fill in the info card below:

| | |
|---|--|
| Material name: | |
| Symbol: | |
| Major producer countries: | |
| End uses: | |
| Most important properties (why is this CRM used in electronics?) | |

Introduce the info card to you friend or to the class.

Information on many critical raw materials can be found for example in:
<http://criticalrawmaterials.org/critical-raw-materials/>



Topics for an essay or a group work

Conflict minerals

Sustainable design of electronic products

Planned obsolescence

Urban mining

Some references on sustainability of electronics to start with:

- Jurate Miliute-Plepiene, Lena Youhanan, E-WASTE AND RAW MATERIALS: FROM ENVIRONMENTAL ISSUES TO BUSINESS MODELS, 2019.
https://www.ivl.se/download/18.2299af4c16c6c7485d0c39/1567678533720/E-waste_190905.pdf
- A New Circular Vision for Electronics: Time for a Global Reboot, 2019.
http://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf
- EEB (2019) Coolproducts don't cost the earth, <https://eeb.org/library/coolproducts-briefing/>

Design a poster/advertisement

Plan and organize a motivational campaign for your school on why and how to recycle e-waste: what benefits are there in recycling e-waste? Include also information on how to recycle e-waste in your region.



About AWARE

This content has been created as a part of AWARE project. The purpose of the AWARE project is to spread information on e-waste and circular economy among schoolchildren of different ages and teachers. For more information, please visit

<https://aware-eit.eu/>

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RawMaterials
Connecting matters



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