Life cycle of a smartphone



Brainstorm Activity



Do you remember how many stages the life cycle of a cell phone consists of?

That's right. It consists of 5 stages. Write down what comes to your mind for each stage. You can work in pairs or small groups.

RESEARCH AND DEVELOPMENT

RAW MATERIALS

MANUFACTURING

USAGE

DISPOSAL/RESALE/RECYCLING



Co-funded by the European Union

Mascot “SAM” by Judith Neuthard

Author: Martin Sankofi

UNBLACK THE BOX!

WHAT ARE THE COMPONENTS IN YOUR PHONE?



Dare to crack the mobile phone open. Be creative.	Do not start disassembling when the battery is charged.
Use the mobile phones provided in the workshop only.	Don't screw around with a private mobile phone.
Check if the battery is empty by trying to switch on the phone.	Don't give up until you've tried different options.

hair dryer

The hair dryer helps you with sticky areas.

suction cup

The suction cup helps you to lift the screen.

magnetic screw mat

You can use the magnetic mat to collect the small screws.



lever tool

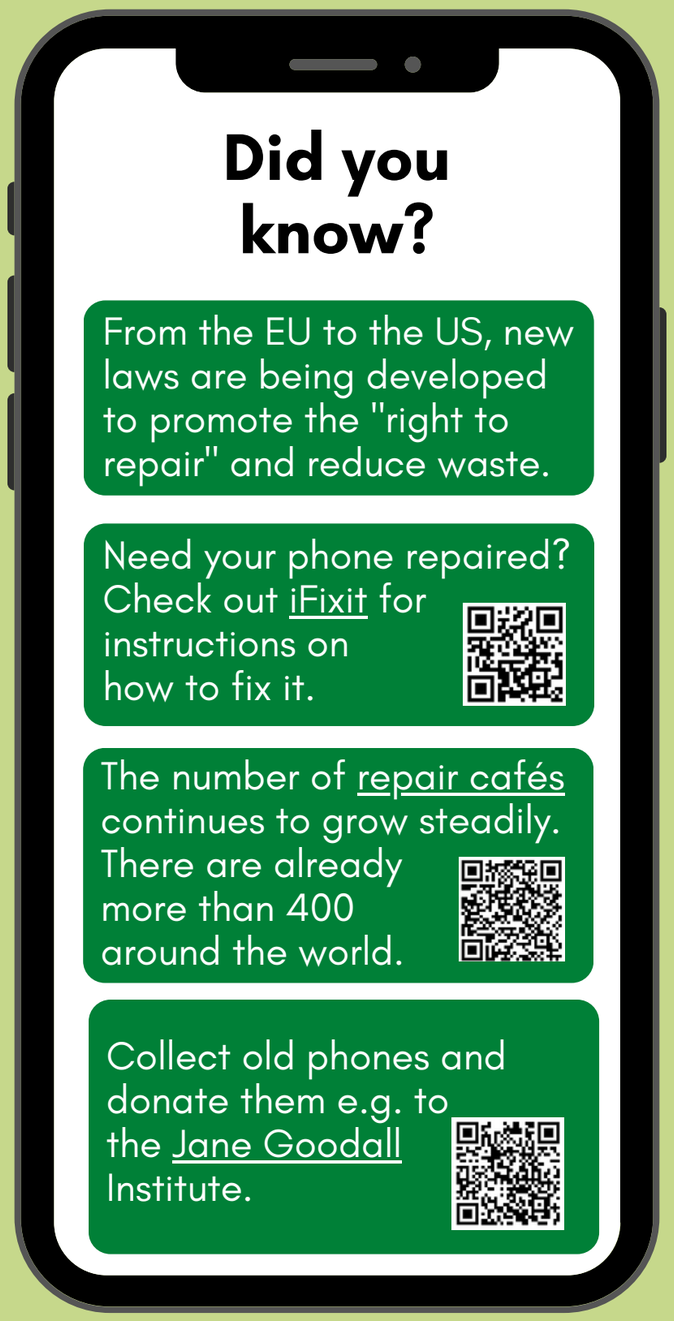
Use this to loosen and open stuck areas. If the glue does not come off, blow it out with a hair dryer.

lever tool

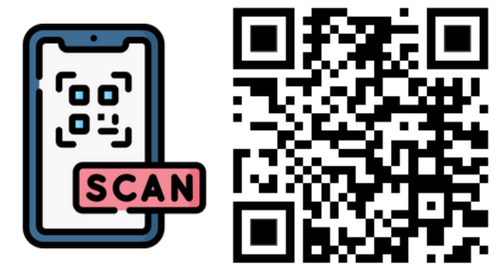
This tool also helps you to prise open parts of the unit.

screwdriver

Use a suitable 0.8 mm screwdriver to open the star-shaped screws.



HOW TO DISASSEMBLE A SMARTPHONE!



1. Get ready.

First read through the Do's and Don'ts. Prepare the tools you need. Make sure you have enough space and prepare a magnetic screwdriver mat on which you can collect the small parts. Choose a phone that you want to disassemble.

2. Examine the smartphone.

Remove all superficial things such as the phone cover or the protective film.

3. Use tools for disassembling the phone.

Try to find the SIM card and the battery. Use the tools shown to remove them. Try out which screwdrivers you need to open the phone.

4. Open the phone.

Attach the suction cup to the display or the back of the phone. Lift the suction cup firmly. In addition, use the lever tools by pushing them between the housing and the display of the phone.

5. Srcews, screws, screws ...

Find the right screwdrivers to unscrew as many parts inside your phone as possible.

GOOD LUCK!!!



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Authors: Lena Stangl, Barbara Schubert, Katharina Mom, Nina Grünberger und Petra Szucsich

UNBLACK THE BOX!

WHAT ARE THE COMPONENTS IN YOUR PHONE?



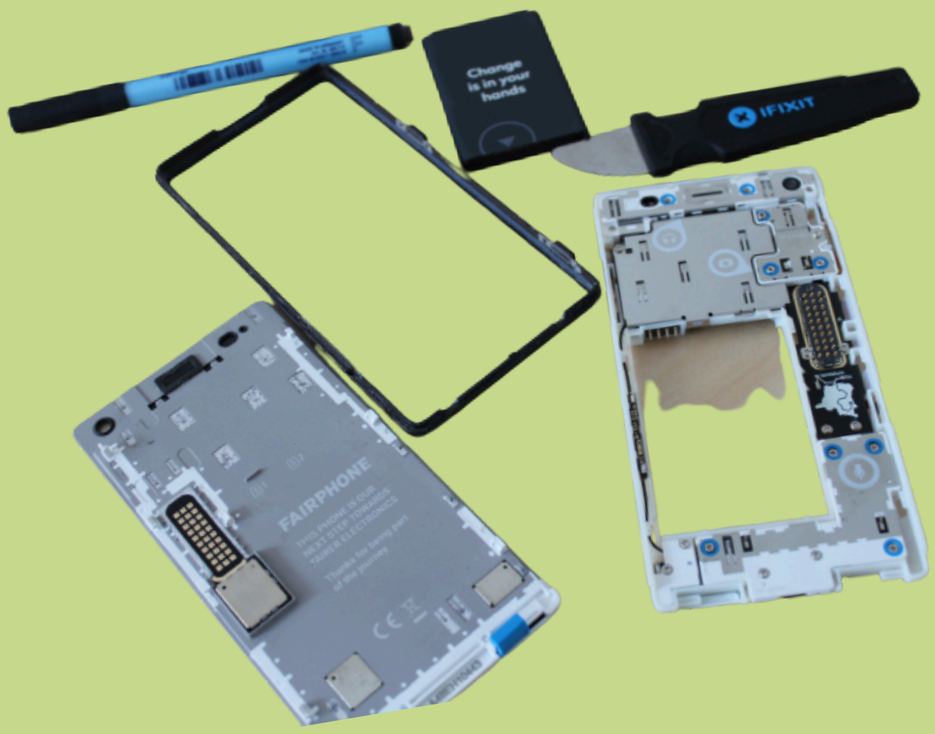
Disassembling a Fairphone



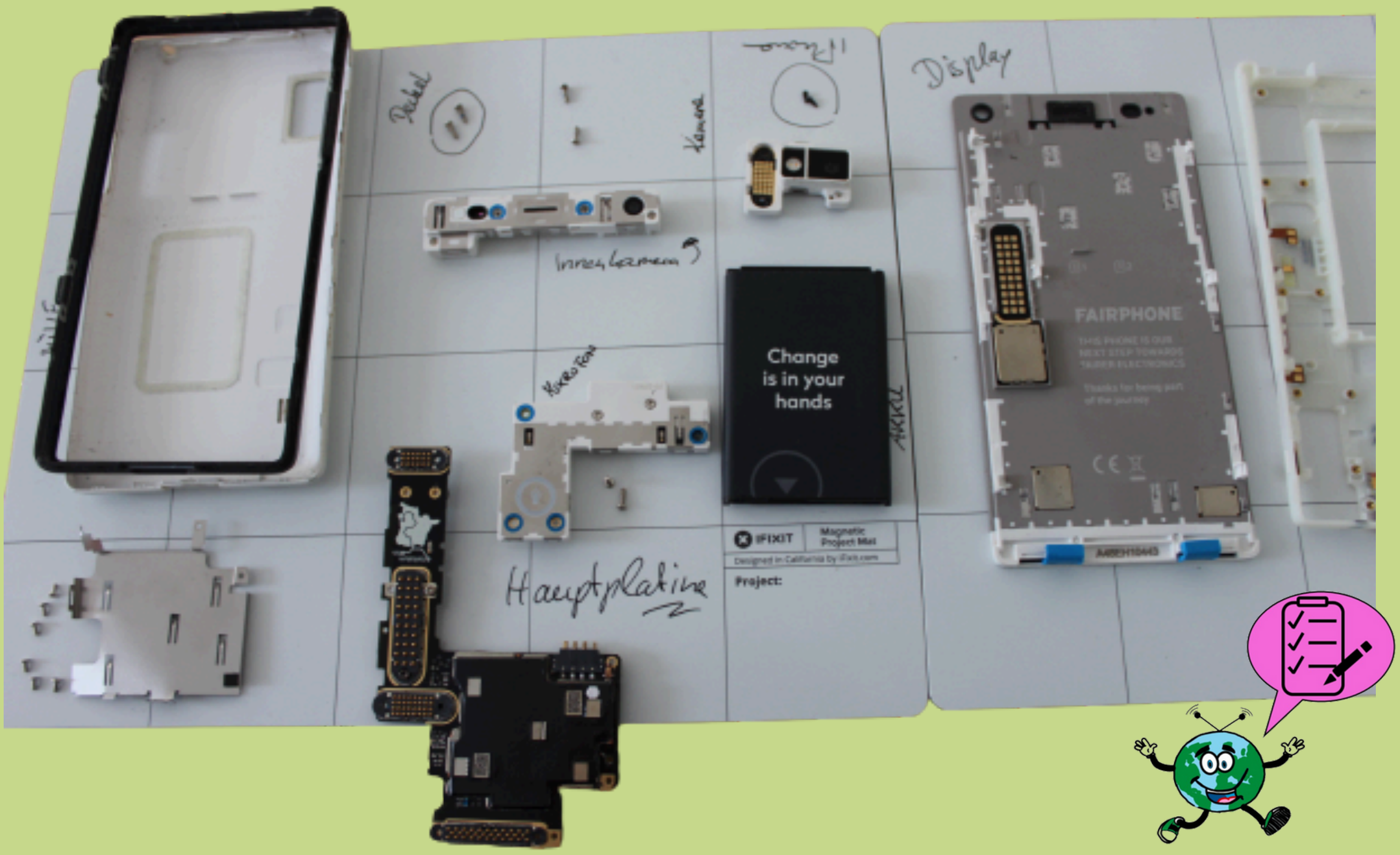
Fairphone
Urban
Mining

video

SCAN



Look at the phone parts and try to name them. What parts of a phone can you identify?



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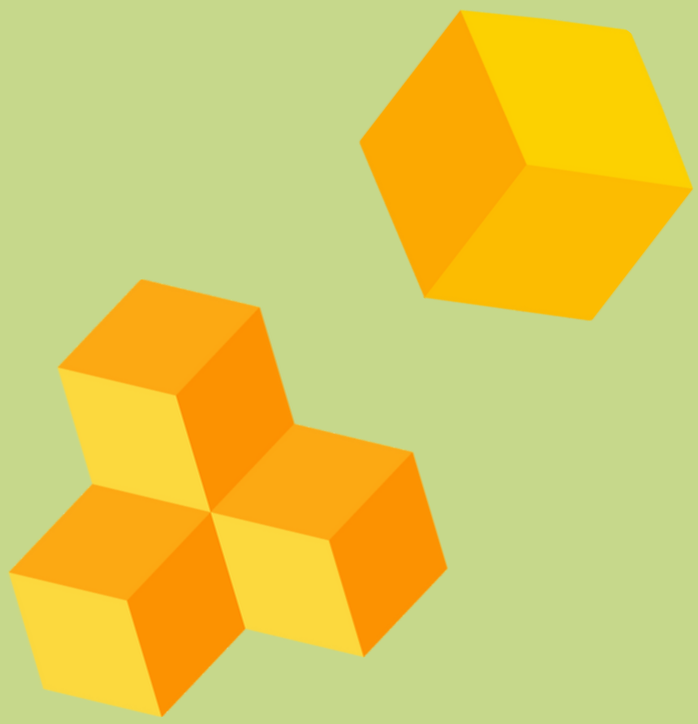
Author: Petra Szucsich

WHAT'S INSIDE YOUR PHONE?

WHAT RAW MATERIALS DOES A PHONE ACTUALLY CONSIST OF?



Mobile phones are our daily companions. But what raw materials go into them? Why are some of them really precious? And how much of which material can we find in a phone?



What's inside your phone?

There are sets of 100 coloured cubes each in front of you.

Explore the cubes. What are they all about?

Look at the provided diagrams. Group the cubes according to their colour. Then try to match them with the materials.

Compare with the key. Were you right? The diagrams are from the year 2015. Discuss – have the materials changed?

As a next step, discuss the following questions:
What materials could be used to make a mobile phone more sustainable?
For instance, could there be a mobile phone made entirely of wood?
Why/why not?





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Author: Petra Szucsich

WHAT'S INSIDE YOUR PHONE?

Fill in the number and colour of cubes!
100 cubes = raw materials in a phone
1 cube corresponds to 1 %



number of cubes	colour	
		Plastics
		Glass and Ceramics
3		Others
25		There are 25 metals. Among these are ...
		Copper
		Aluminum
		Iron
		Gold, Silver and others
		Nickel
		Tin

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Author: Petra Szucsich

WHAT'S INSIDE YOUR PHONE?

Match the phone parts with the raw materials!



Gold

Gallium

Plastics, Ceramics



Platinum
Palladium
Copper
Silver
Gold
Tantalum
etc.



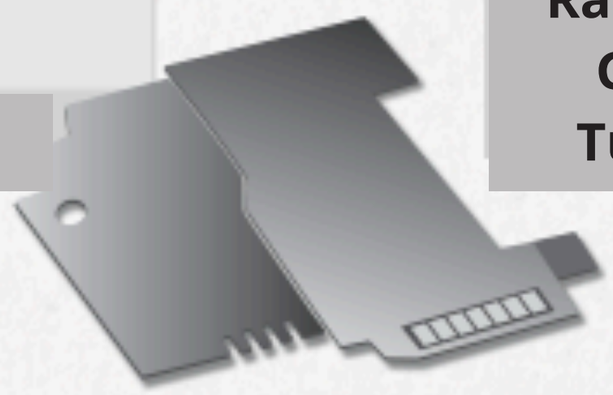


Indium

Tantalum
(from coltan)

Tin

Aluminum



Rare earths
Gallium
Tungsten



Iron



Gold



Copper



Cobalt
Coltan
Lithium



Author: Petra Szucsich

Mascot “SAM” by Judith Neuthard

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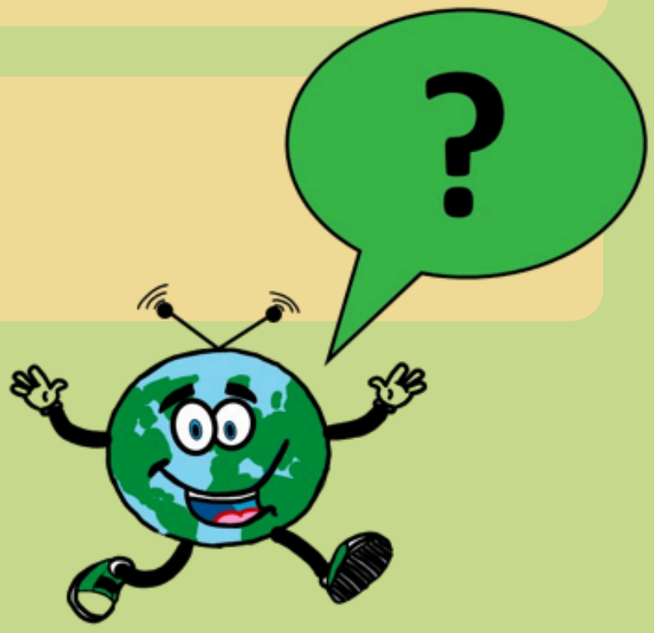
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WHAT'S INSIDE YOUR PHONE?

Match the phone parts with the raw materials.
Then compare with the key!

Part of a Phone	Raw Material
phone case, cover	Silver
display	Aluminum
solder joints	Iron
SIM-card, contacts	Glass and Ceramics
shielding plate	Copper
speakers, microphones	Plastics
flat cables, wires	Tin
main circuit board	Gold



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Author: Martin Sankofi

WHAT'S INSIDE YOUR PHONE?

KEY

Part of a Phone	Raw Material
phone case, cover	Silver
display	Aluminum
solder joints	Iron
SIM-card, contacts	Glass and Ceramics
shielding plate	Copper
speakers, microphones	Plastics
flat cables, wires	Tin
main circuit board	Gold

Nickle is found in contacts and capacitors (capacitors store electrical charges). Nickle, Cobalt, Coltan and Lithium are found in phone batteries.

WHAT'S INSIDE YOUR PHONE?

KEY

Part of a Phone	Raw Material
phone case, cover	Plastics
display	Glass and Ceramics
solder joints	Tin to connect individual components to the board
SIM-card, contacts	Gold (~ 0,3 gram)
shielding plate	Aluminum to shield the electronics from electromagnetic radiation
speakers, microphones	Iron
flat cables, wires	Copper to conduct electricity
main circuit board	Silver (~ 0,034 gram)



Nickle is found in contacts and capacitors (capacitors store electrical charges). Nickle, Cobalt, Coltan and Lithium are found in phone batteries.

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WHAT'S INSIDE YOUR PHONE?

KEY

SIM-card

Gold

LED and camera

Gallium



phone case, cover

Plastics, Ceramics



main circuit board

Platinum
Palladium
Copper
Silver
Gold
Tantalum
etc.



display

Indium



capacitors

Tantalum (from coltan)



solder joints

Tin

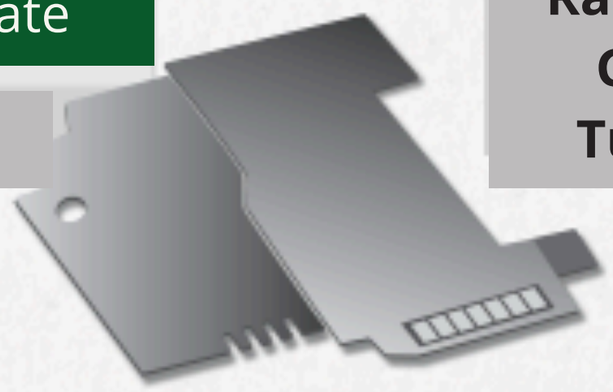
loudspeaker, microphone

Rare earths
Gallium
Tungsten



shielding plate

Aluminum



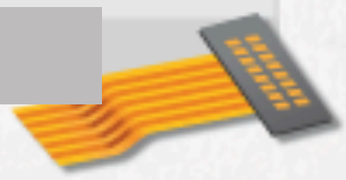
screws

Iron



contacts

Gold



flat cables, wires

Copper



battery

Cobalt
Coltan
Lithium



WHAT'S INSIDE YOUR PHONE?

KEY

number of cubes	colour	
56	mint green	Plastics
16	blue	Glass and Ceramics
3	yellow	Others
25		There are 25 metals. Among these are ...
15	brown	Copper
3	orange	Aluminum
3	black	Iron
1	gold/silver	Gold, Silver and others
2	white	Nickel
1	grey	Tin



Mascot “SAM” by Judith Neuthard Author: Martin Sankofi

WHAT'S INSIDE YOUR PHONE?

KEY



Diagram 1: Raw materials in a mobile phone

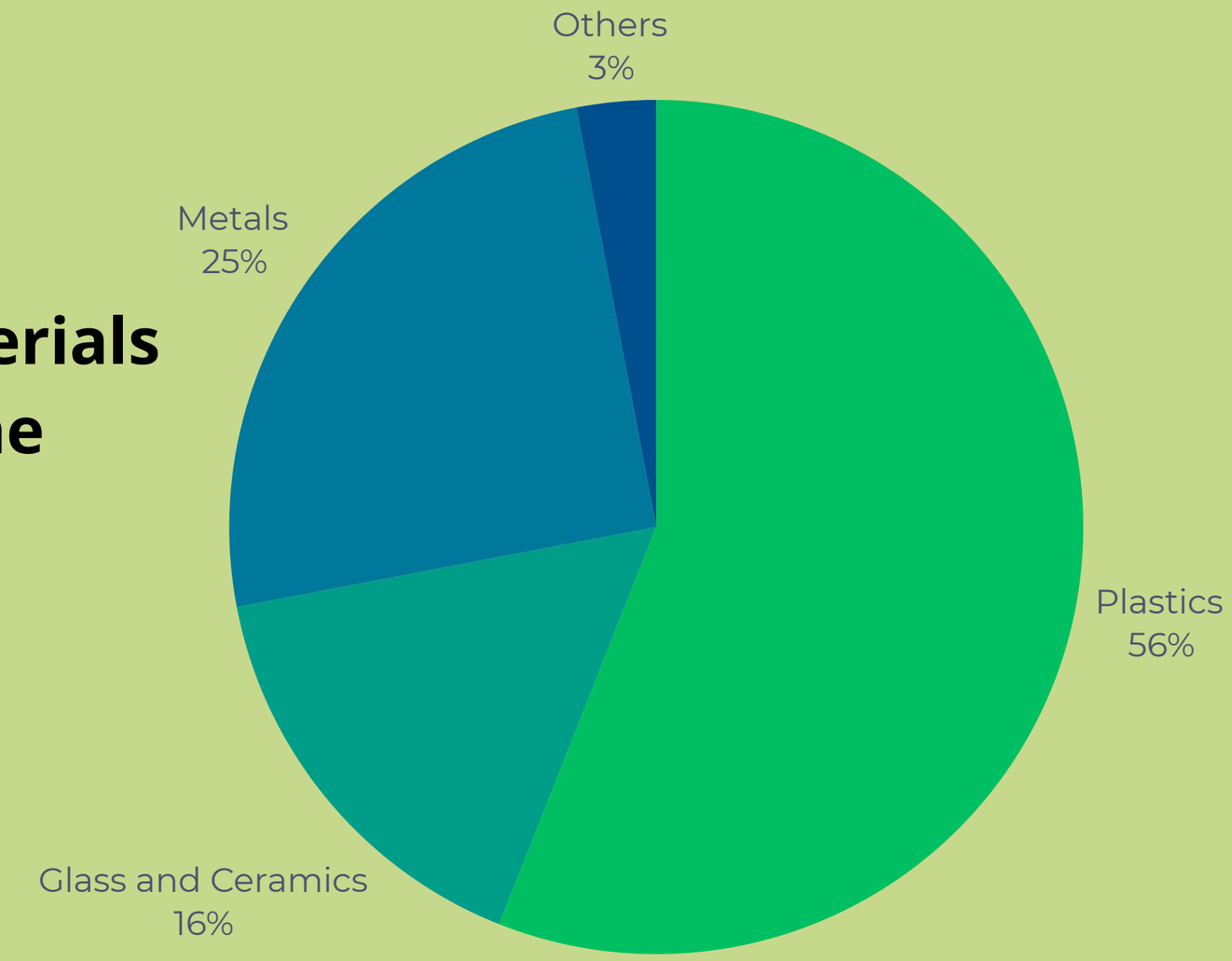
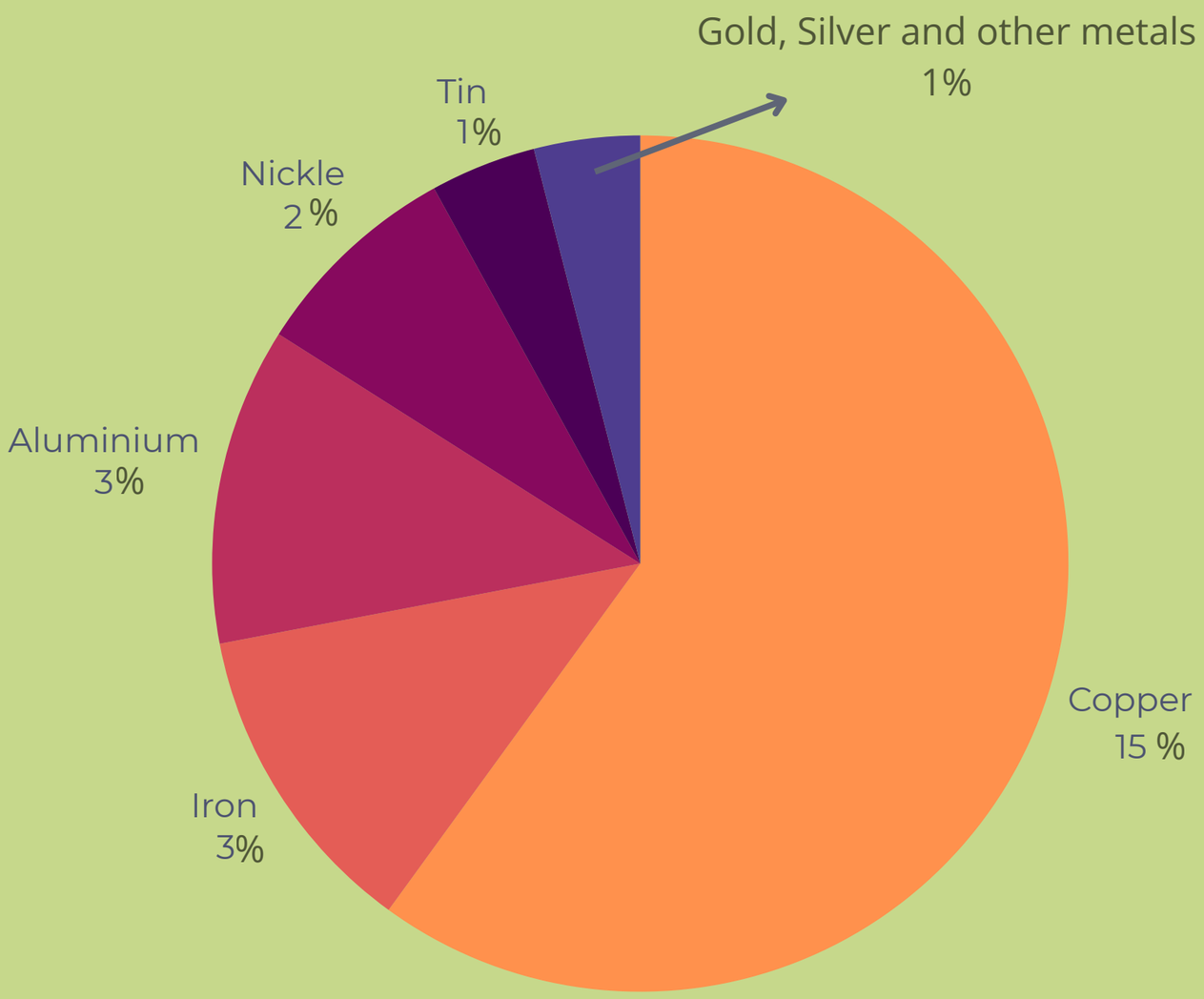


Diagram 2: Metals in a phone





1 % others = e.g.
Gold, Silver, Platinum and Palladium
Other rare metals, e.g.
Cobalt, Gallium, Indium and Tungsten
Rare earths e.g. Neodymium

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Author: Petra Szucsich

WHAT'S INSIDE YOUR PHONE?

KEY







Author and Picture: Petra Szucsich

PIN THE PLANET!

FIND THE COUNTRIES OF ORIGIN OF RAW MATERIALS



Making a mobile phone requires a wide range of metals and other raw materials from all around the world.
Many of these are mined under difficult and problematic conditions and are therefore known as "conflict minerals".
But where do they actually come from?

Where do the raw materials come from?

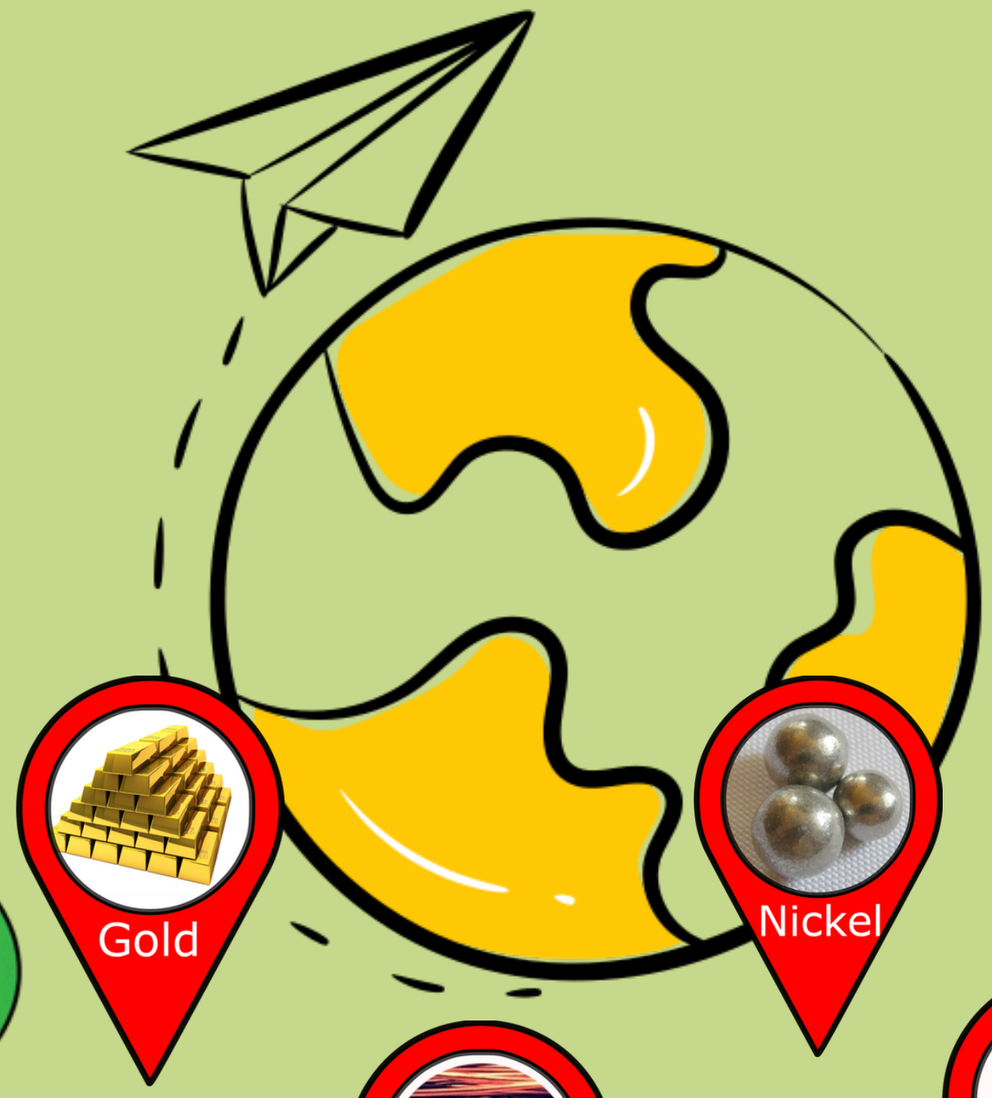
Look at the world map and the pins with the resources. Cut the pins out.

Research where the raw materials come from.

Match the pins with the countries of origin.
Note: There are several possible answers for most of the resources!

Discuss: Which continents and countries are particularly rich in raw materials? Where are they located?

Match the countries of origin!





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PIN THE PLANET!

FIND THE COUNTRIES OF ORIGIN OF RAW MATERIALS

You can find all these resources in a mobile phone! Cut them out and explore in which countries they can be found. Choose the country where most of this metal is mined!

















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PIN THE PLANET!

FIND THE COUNTRIES OF ORIGIN OF RAW MATERIALS



Now look at the countries. Which country is which? And – where is which mineral mined? Cut them out as well and match the pairs! Then pin the places on the world map!















The countries are:

Democratic Republic of Congo, China, China, Australia, Indonesia, Peru, Indonesia





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PIN THE PLANET!

FIND THE COUNTRIES OF ORIGIN OF RAW MATERIALS



Now look at the countries. What do you think:
Where is which mineral mined? Cut them out as well and match the pairs!
Then pin the places on the world map!















Can you find these countries on the map?
Democratic Republic of Congo, China, China, Australia, Indonesia, Peru, Indonesia





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PIN THE PLANET!

FIND THE COUNTRIES OF ORIGIN OF RAW MATERIALS



Cobalt comes mainly from the **Democratic Republic of Congo** and is used for **rechargeable batteries**.

Unfortunately, this raw material is becoming increasingly scarce. One battery contains approx. 6.3 grams of cobalt.

Aluminum is an important building material and is found in **Australia**. Aluminum is used in cell phones, for example, to **shield the electronics from electromagnetic radiation.**

Nickel comes from **Indonesia**. It is used in a cell phone for **electrical connections** and **so-called capacitors**. These are components for storing electrical charges.

The most important country that mines **tin** is **China**. In electronic devices, tin is used for **soldering**, where it bonds individual components to the copper layer of the circuit board.

Silver comes from **Mexico** and is used for the **keyboard mat** and the **circuit board** of a cell phone.
In one smartphone contains around 306 milligrams of silver.

Yes, really - there is real **gold** in a cell phone! It is mined in **China**, for example, and used for the **contacts of** the **SIM card** and on the **battery**.

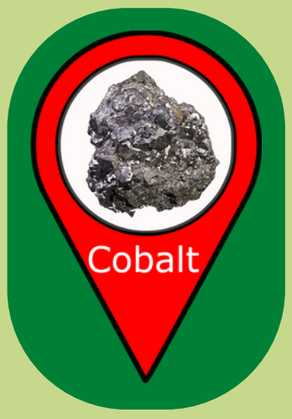
Copper comes from **Chile**, for example. It is a very important metal for **wires** and **printed circuit boards**.



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KEY – PIN THE PLANET!



Democratic Republic of Congo (DR Congo)



Australia, China, Guinea, Brasilia, India.



Indonesia, Philippines, Russia, New Caledonia, Canada, Australia, China.



China, Indonesia, Malaysia, Vietnam, Peru, Bolivia, Brazil, DR Congo, Niger, Rwanda, Nigeria and Australia.



Mexico, Peru, China.



China, Australia, South Africa, Russia, USA, Canada.



Chile, Russia, China.



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SOURCES – PIN THE PLANET!

FIND THE COUNTRIES OF ORIGIN OF RAW MATERIALS

Sources of Pins (as of April 2022)

Cobalt mined e.g. in the Democratic Republic of Congo
https://de.wikipedia.org/wiki/Cobalt#/media/Datei:Skutt%C3%A9rudite.jpg
Aluminum mined e.g. in Australia
https://de.wiktionary.org/wiki/Aluminium
Nickel mined e.g. in Indonesia
https://de.wikipedia.org/wiki/Nickel#/media/Datei:Nickel_kugeln.jpg
Tin mined e.g. in China
https://de.wikipedia.org/wiki/Zinn#/media/Datei:Zinn_Mory_Barren.jpg
Silver mined e.g. in Mexico
https://upload.wikimedia.org/wikipedia/commons/1/16/Silver_Bar_01.jpg
Gold mined e.g. in China
https://pixabay.com/de/illustrations/gold-goldbarren-barren-feingold-1013618/
Copper mined e.g. in Chile
https://pixabay.com/de/photos/draht-kupfer-elektro-stop-closeup-2681887/

Sources of countries (as of April 2022)

Democratic Republic of Congo
https://de.wikipedia.org/wiki/Demokratische_Republik_Kongo
Australia
https://de.wikipedia.org/wiki/Australien
Indonesia
https://de.wikipedia.org/wiki/Indonesien
China
https://de.wikipedia.org/wiki/Volksrepublik_China
Mexico
https://de.wikipedia.org/wiki/Mexiko
Chile
https://de.wikipedia.org/wiki/Chile



Mascot “SAM” by Judith Neuthard
Author: Petra Szucsich

FROM TRASH TO TREASURE!

USE THINGS YOU FIND AND TURN THEM INTO CREATIVE TREASURES

There are always creative ways to turn supposed trash into new treasures! You can make pictures, lamps, whatever you want actually! Trash Design is about re-making old stuff. It's about upcycling and re-using things, which have already been produced.



an old bicycle wheel



old flower pots

Did you know what these things are made of?



old jeans



the drum of a washing machine



It's about seeing things with new eyes.

What does "Upcycling" mean?

Upcycling means reusing things (even trash) in a way as to create a product of higher quality or value than the original.

Look for things you no longer need. You can also use electronic parts from old electronic equipment, for example, the small parts you find inside an old phone.

Choose one of the picture frames and create your own unique picture. Draw things and make a treasure out of trash!

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MY SMARTPHONE AND ME

DISCUSSION: REFLECT ON YOUR OWN USE OF DIGITAL DEVICES



Think about the questions below and answer them, first alone.
Then compare them with a partner. What differences do you see?
How many digital devices (mobile phones, tablets, computers, etc.) do you have at home? Who in your family uses which device(s) for what?

Device	Who owns it?	What is it used for?
smartphone	my mother	make calls, take photos, ...

Think about when and for how long you use your mobile phone/smartphone. How often and for how long do your parents or grandparents use their mobile phones during the day?

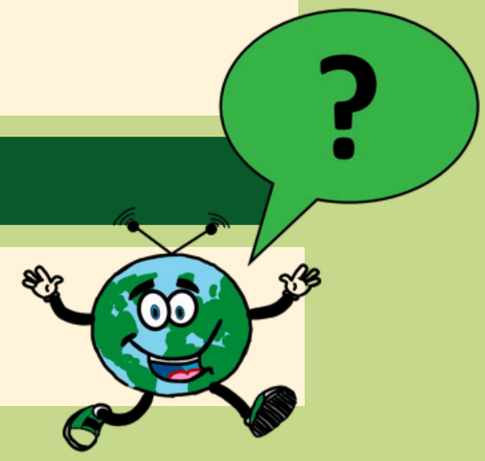
What happens in your family to digital devices that are no longer used (you have them at home, you donate them to charity, etc.)?

How many mobile phones have you had in your life?

How often do you ask for a new smartphone? Do you get it?

Why do you want a new smartphone (because it is broken, you saw an ad, your friends have a new model, etc.)?

Does your "old" phone still work when you get a new one?



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Authors: Petra Szucsich and Martin Sankofi

THE SMARTPHONE OF THE FUTURE

DESIGN IT YOURSELF

Do you have your own phone? Are you happy with it?
Or – what model of phone would you like to have?
TASK: Draw or write which model you have or would like to have.
Include pictures of the apps you like to use most.

What does your dream phone look like? Describe it!



What should the phone of the future have/not have to help to protect the environment?

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