

Apprentissage de la programmation

Séance 6 – Impacts environnementaux du numérique

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Lien racine : <https://bit.ly/2DmV7fe>

Quels impacts

1. Déplétion de ressources non renouvelables
2. Toxicité
3. Impact sur le réchauffement climatique

1. Ressources non renouvelables

ELEMENTS OF A SMARTPHONE

ELEMENTS COLOUR KEY: ● ALKALI METAL ● ALKALINE EARTH METAL ● TRANSITION METAL ● GROUP 13 ● GROUP 14 ● GROUP 15 ● GROUP 16 ● HALOGEN ● LANTHANIDE

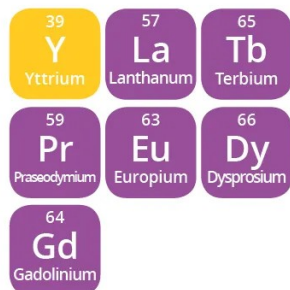
SCREEN



Indium tin oxide is a mixture of indium oxide and tin oxide, used in a transparent film in the screen that conducts electricity. This allows the screen to function as a touch screen.



The glass used on the majority of smartphones is an aluminosilicate glass, composed of a mix of alumina (Al_2O_3) and silica (SiO_2). This glass also contains potassium ions, which help to strengthen it.



A variety of Rare Earth Element compounds are used in small quantities to produce the colours in the smartphone's screen. Some compounds are also used to reduce UV light penetration into the phone.

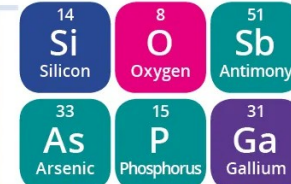
ELECTRONICS



Copper is used for wiring in the phone, whilst copper, gold and silver are the major metals from which microelectrical components are fashioned. Tantalum is the major component of micro-capacitors.



Nickel is used in the microphone as well as for other electrical connections. Alloys including the elements praseodymium, gadolinium and neodymium are used in the magnets in the speaker and microphone. Neodymium, terbium and dysprosium are used in the vibration unit.



Pure silicon is used to manufacture the chip in the phone. It is oxidised to produce non-conducting regions, then other elements are added in order to allow the chip to conduct electricity.



Tin & lead are used to solder electronics in the phone. Newer lead-free solders use a mix of tin, copper and silver.

BATTERY



The majority of phones use lithium ion batteries, which are composed of lithium cobalt oxide as a positive electrode and graphite (carbon) as the negative electrode. Some batteries use other metals, such as manganese, in place of cobalt. The battery's casing is made of aluminium.

CASING



Magnesium compounds are alloyed to make some phone cases, whilst many are made of plastics. Plastics will also include flame retardant compounds, some of which contain bromine, whilst nickel can be included to reduce electromagnetic interference.



2. Toxicité

- Extraction des métaux et terres rares
- Gestion des déchets électroniques (économie informelle dans des pays émergents : Inde, Chine)

3. Réchauffement climatique

1. Phase de production

2. Transport

3. Phase d'utilisation

Unité de mesure : l'équivalent kg CO₂ (kgCO₂eq)

3. Réchauffement climatique

Ordres de grandeur

- jogging d'une heure : 400 g CO₂eq
- 1kg de boeuf : 13 – 60 kg CO₂eq
- 1kg de porc : 2,5 – 7 kg CO₂eq
- legumes : 0,1 – 4 kg CO₂eq

3. Réchauffement climatique

Ordres de grandeur

- A/R Paris/Tokyo : 3 T CO₂eq
- construction d'une voiture : 10 T CO₂eq
- voyage de 100km (5L/100) : 15 kg CO₂eq
- 100km en train : 1 kg CO₂eq
- 30mn chauffage électrique (France) : 50 g CO₂eq
- 30mn chauffage électrique (UE) : 300 g CO₂eq

3. Réchauffement climatique

Ordres de grandeur

Moyennes annuelles par habitant :

- France (2014) : 7T CO₂eq
- UE (2014) : 8,4T CO₂eq
- USA (2013) : 16T CO₂eq
- Chine (2013) : 7T CO₂eq
- Inde (2013) : 2T CO₂eq
- Qatar (2016) : 37T CO₂eq
- Maroc (2014) : 1,8T CO₂eq
- Moyenne Monde : 5T CO₂eq

3. Réchauffement climatique

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« Budget » pour contenir le réchauffement à 1,5°C :
0,8T CO₂eq / an / habitant

3. Réchauffement climatique

1. Phase de production

2. Transport

3. Phase d'utilisation

Unité de mesure : l'équivalent kg CO₂ (kgCO₂eq)

3. Réchauffement climatique

	Laptop	Smartphone	Serveur
Production	500 kg CO2	50 - 100 kg CO2	600 kg CO2
Transport	50 kg CO2	~5 kg CO2	50 kg CO2
Utilisation	~10 kg CO2	~1 kg CO2	?

F

D

C

B

A

SAMSUNG

SONY



FAIRPHONE

oppo



HUAWEI

Lenovo



vivo

ASUS



Microsoft

mi

acer



amazon

Google



LG

#GreenerGuide

Sources

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- Examining the Fairphone's environmental impact, Merve Guvendik (2015)
- CarbonBrief, 2019
- <https://ourworldindata.org/food-choice-vs-eating-local>