Apprentissage de la programmation

Séance 7 – 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

49 In Indium
50 Sn Tin
8 O Oxygen

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.

13 Al Aluminium
14 Si Silicon
8 O Oxygen
19 K Potassium

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.

39 Y Yttrium
57 La Lanthanum
65 Tb Terbium
59 Pr Praseodymium
63 Eu Europium
66 Dy Dysprosium
64 Gd Gadolinium

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.

29 Cu Copper
47 Ag Silver
79 Au Gold
73 Ta Tantalum

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.

28 Ni Nickel
66 Dy Dysprosium
59 Pr Praseodymium
65 Tb Terbium
60 Nd Neodymium
64 Gd Gadolinium

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.

14 Si Silicon
8 O Oxygen
51 Sb Antimony
33 As Arsenic
15 P Phosphorus
31 Ga Gallium

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

50 Sn Tin
82 Pb Lead

BATTERY

3 Li Lithium
27 Co Cobalt
8 O Oxygen
6 C Carbon
13 Al Aluminium

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.

6 C Carbon
12 Mg Magnesium
35 Br Bromine
28 Ni Nickel

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 CO_2 ($kgCO_2eq$)

3. Réchauffement climatique

Ordres de grandeur

- jogging d’une heure : 400 g CO_2eq

- 1kg de boeuf : 13 – 60 kg CO_2eq
- 1kg de porc : 2,5 – 7 kg CO_2eq
- legumes : 0,1 – 4 kg CO_2eq

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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Moyennes annuelles par habitant :

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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

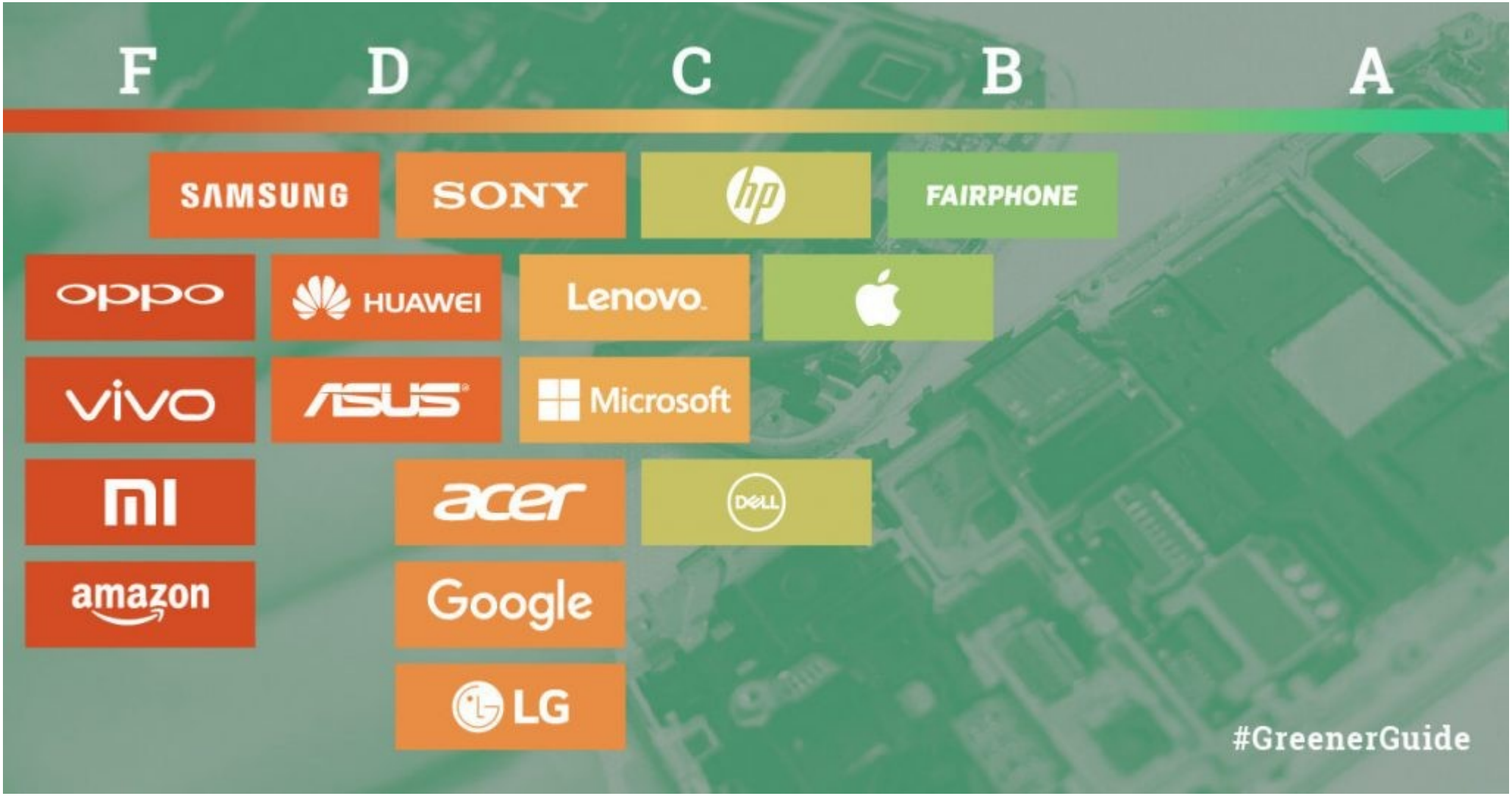
2. Transport

3. Phase d’utilisation

Unité de mesure : l’équivalent kg CO_2 ($kgCO_2eq$)

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	?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#GreenerGuide

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