

Byron McIntosh

iPhone's Hidden Value

What exactly is in your iPhone, and what are the costs of making them?



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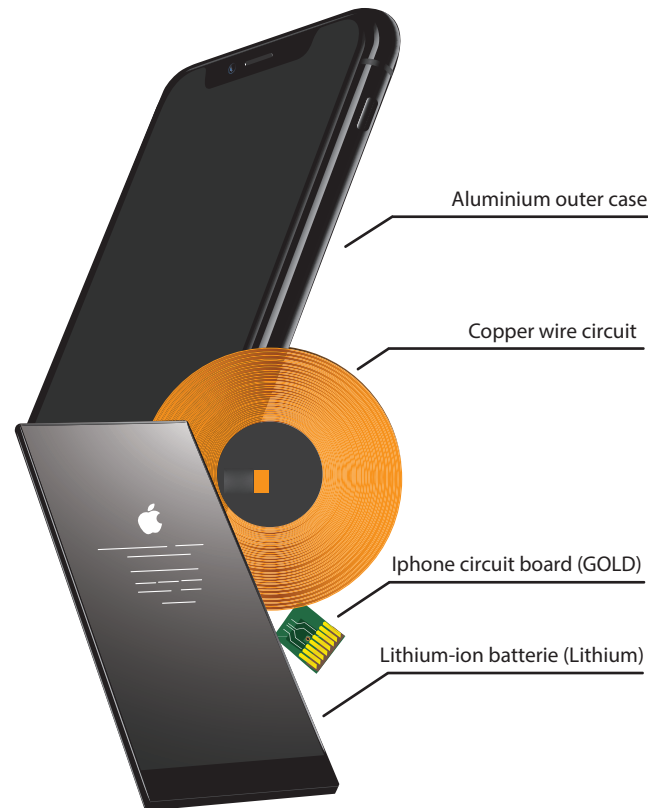
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Ever since the initial release of the iPhone in 2007, Apple has progressively developed and improved the quality of the iPhone with modern technologies and hardware. However, such hardware components are high in demand for model reproduction purposes to sell to the masses upon release. So, what are these components and how are they obtained?

The iPhone has a complex structure of modern technology and hardware components that requires mined materials to function. There are many elements used to manufacture an iPhone, ranging from 46 to 75 elements. However, the number of elements varies to different models of iPhone. From the variety of elements, the main makeup of the iPhone are metals. The main fundamental metals found in the iPhone are Aluminium, Iron, lithium, gold, and Copper.

Aluminium is 24% of the iPhone's mass and is used to manufacture the iPhone's outer case component. Its lightweight, strong, and anti-corrosive properties are what persuaded the change of stainless steel to aluminium in recent models.

Iron makes up around 14% of the iPhone's mass. It is used in multiple components in the iPhone.



iPhone batteries use Lithium-ion technology (Lithium). Lithium-ion batteries charge faster (rechargeable), have a higher power density and last longer in comparison with earlier gen batteries. Its high-power efficiency in comparison to size is what made Apple decide to use this component in the iPhone.

Gold is in high demand for making electronic devices, such as the iPhone, for its high chemical stability and electrical conductivity. This valuable material is used in small quantities to manufacture the circuit board. Circuits receive a thin cover of gold to ensure durable connection and to protect the circuits from corrosion.

Copper is a prime material used to conduct electricity in a circuit, usually as electrical wiring, for all kinds of electronics. In this form, copper wire conducts electricity efficiently and is in high and growing demand in the electronics industry. Although copper is used in multiple components in the iPhone, the prime component is the copper wire circuit for charging, and in the latest models it is used as a wireless charging pad.

While these metals are not particularly common, mining these resources is a globally recognised

industry. Supply chains are dynamic and so are the conditions of how the materials are mined.

Raw aluminium is extracted from the bauxite ore through strip mining. It is a sedimentary rock that is commonly found in India, Brazil, Australia (which also supplies Iron from Iron ore), and China being the biggest Producer. Apple (US) is supplied Aluminium from “Elysis”, a Canadian aluminium smelting exporter.

Gold extractions are mainly supplied from Peru, US (74% Nevada) and Australia, Russia and China. Typical mining methods are vein and placer mining.

Main extraction sites for lithium and copper are situated in Chile. Mining for lithium is preceded by drilling and pumping lithium to the surface from underground saltwater reservoirs. It is then left to dry in direct sunlight. Copper is usually extracted using open-pit mining.

All minerals are non-renewable and pose serious environmental threats locally and globally. Most of these mining extractions may potentially cause permanent ecological damage and severe air pollution (contribution to greenhouse gas emissions from mining and transportation). Altering biodiversity directly from deforestation or to noise pollution, inflicting water pollution to

local water bodies, infecting groundwater, and soil fertility. Apples recent attempts to nullify this is to recycle materials from other iPhones and similar devices for future productions. E-waste alone has its detrimental pollutant effects due to its toxicity and pollution through landfill and other dumping methods.

In some areas, Mining exploits its workers in different ways. The social implications of the workers and locals have been investigated and classified in human rights abuse. Rates of violence, low health and safety standards, abuse, community dislocation, and unfair labour. Negative impacts vary due to location (due to economical and government stability). However, increase job opportunities for workers and support for small business and local organisations tend to rise.

A fair assumption would be for apple to commence a higher e-waste recycling plan sooner than their original target. Apple’s decrease in demand for raw materials may significantly decrease the production rate in (selective) high extraction mines. This would benefit the environmental and social stability of local areas without decreasing the quality of future model iPhones.



References:

Pal. A. (2020). *The Cycle Of An iPhone*. Retrieved (16/10/2021) from <https://storymaps.arcgis.com/stories/7ae15dbd2b994128ae16dfda268d8e92>

Ananda. A (2020). *The Journey of the Incredible iPhone*. Retrieved (15/10/2021) from <https://storymaps.arcgis.com/stories/7ae15dbd2b994128ae16dfda268d8e92>

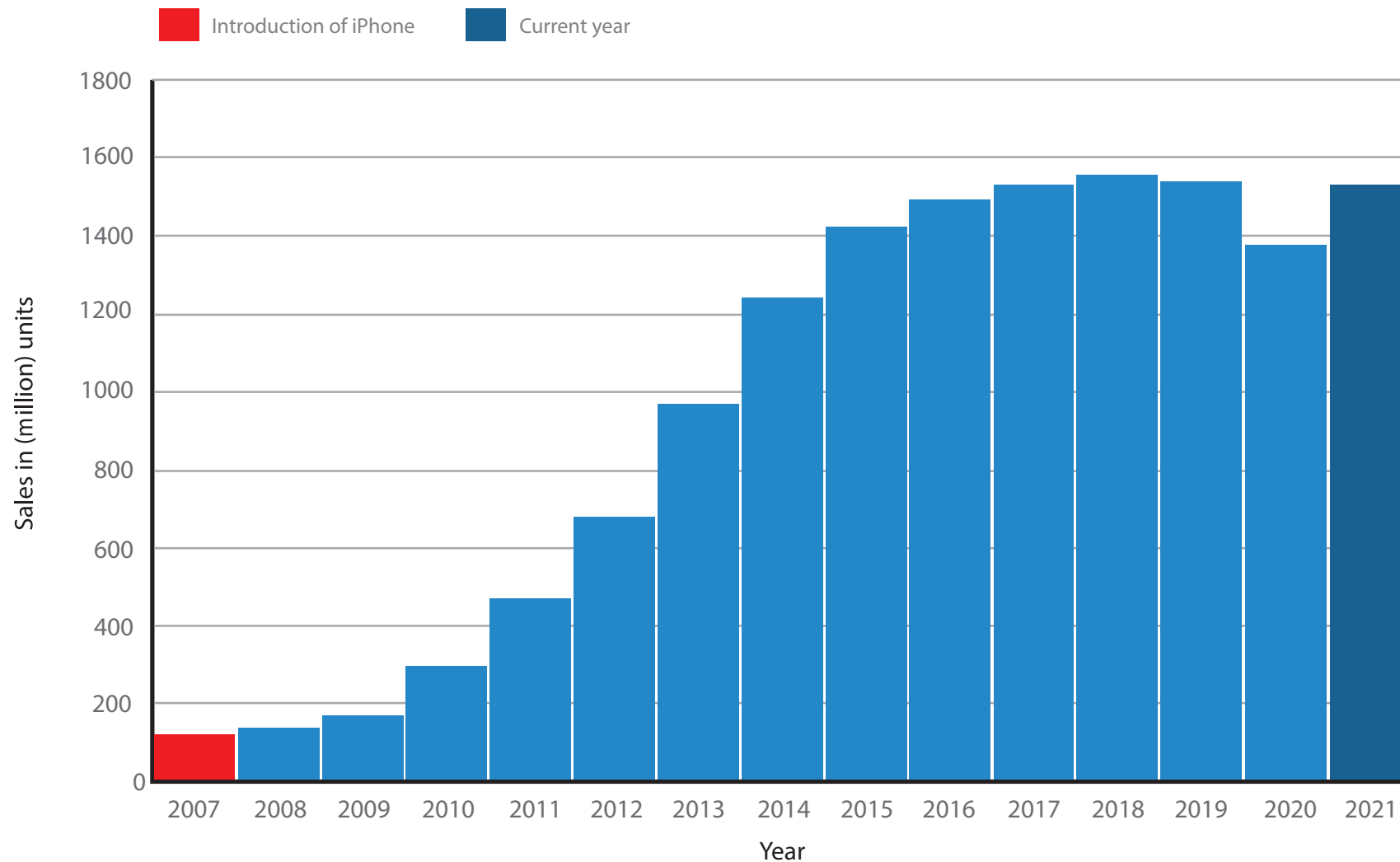
Berke. J. (2018). Here’s how much metal it takes to make your iPhone. Pedestrian Group. Retrieved (17/10/2021) from <https://www.businessinsider.com.au/how-much-metal-in-an-iphone-2018-6>

Apple Inc. (2020). iPhone 12 Product Environmental Report. Retrieved (15/10/2021) from https://www.apple.com/environment/pdf/products/iphone/iPhone_12_PER_Oct2020.pdf

Apple Inc. (2019). Material Impact Profiles. Retrieved (17/10/2021) from https://www.apple.com/environment/pdf/Apple_Material_Impact_Profiles_April2019.pdf

Apple Inc. (2016). Environmental Responsibility Report. Retrieved (17/10/2021) from https://www.apple.com/environment/pdf/Apple_Environmental_Responsibility_Report_2016.pdf

Smartphones sold worldwide from 2007 - 2021

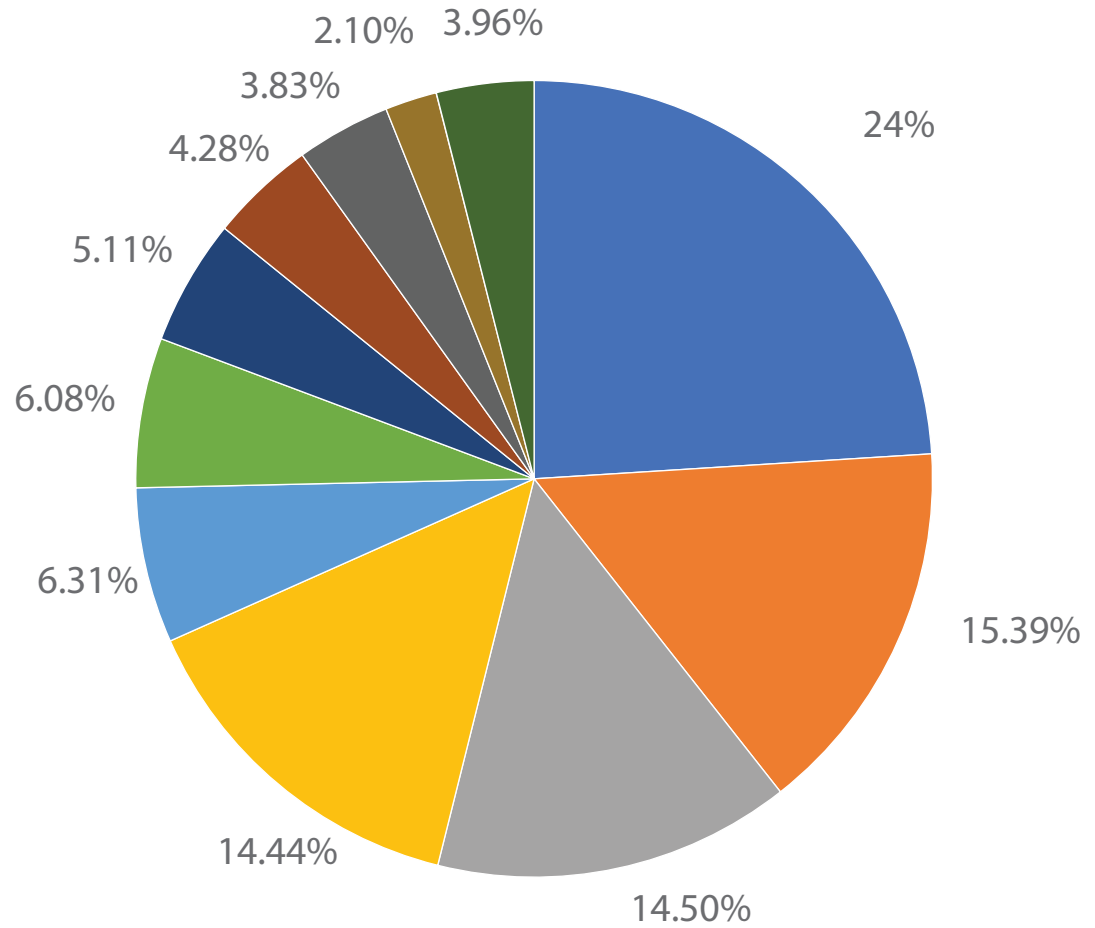


Sources:

- <https://www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/>
- <https://www.statista.com/statistics/268789/countries-with-the-largest-production-output-of-lithium/>
- <https://www.statista.com/statistics/264628/world-mine-production-of-gold/>
- <https://www.vice.com/en/article/433wyq/everything-thats-inside-your-iphone>

Materials inside the iPhone (General)

Element	Weight
Aluminium	31.14 g
Carbon	19.85 g
Oxygen	18.71 g
Iron	18.63 g
Silicon	8.14 g
Copper	7.84 g
Cobalt	6.59 g
Hydrogen	5.52 g
Chrome	4.94 g
Nickel	2.72 g
other	4.904 g
Total	129 grams



Mineral mining production rate (2010-2020)

