As you read this, most of you could reach out and touch at least one device containing cobalt that may have been extracted from the Democratic Republic of the Congo, or lithium that may have come from Australia, among scores of other metals and rare earth metals. Over half of the 30 elements in the average smartphone are increasingly scarce and many are being obtained through unsustainable and unjust mining practices.

Mining is having a widespread impact on people and ecosystems. The first study of the effects of mining-related pollution on newborns in sub-Saharan Africa demonstrated a link between birth defects and paternal mining-related work in the Democratic Republic of the Congo (Van Brusselen *et al.*, 2020). The health of miners has grown into a national policy issue but the drivers of resource extraction, namely consumer demand and industry pressure, are international in scope.

Demand for technology is often used as a reason to push for mining, including deep-sea mineral exploration. The transition towards efficient electrification will increase our demand for batteries and, therefore, for rare earth metals. At the same time, technology is transforming mining through automation, reducing the risk to miners and improving efficiency (McKinsey & Company, 2018).

The benefits of the circular economy

To enjoy the benefits of advanced technology, products must be produced more sustainably, last longer and be recycled at their end of life. Our track record in these areas is weak.

Manufacturing waste exceeds post-consumer waste by an order of magnitude (Lepawsky, 2019). E-waste is the fastest-growing waste stream. In 2019, each person produced 7.3 kg, on average, but only 1.3 kg underwent environmentally sound recycling (Forti *et al.*, 2020). In other words, 83% of e-waste is undocumented. Globally, 54 million metric tonnes of e-waste were discarded in 2019 and we shall most likely throw away more than 75 million metric tonnes each year by 2030 (Forti *et al.*, 2020).

The term 'planned obsolescence' refers to the design of a product to ensure that it becomes rapidly outdated, either because it cannot be repaired or is intentionally subject to early failure, obliging the customer to replace the product. The combination of planned obsolescence and repair monopolies has contributed to shorter product lifespans and undermined our ability to understand and fix our own belongings, particularly when they involve advanced technologies.

Although proponents argue that early obsolescence drives rapid innovation and economic growth, consumers and sustainability experts wish products to last longer. Today's buyers pay for products with ever-shorter lifespans: in 2013, 8.3% of appliances were replaced within five years due to a defect, compared to 3.5% in 2004 (Prakash *et al.*, 2016).

In 2015, France made history by passing Hamon's Law, which made planned obsolescence illegal and obliged French manufacturers to identify if, and for how long, replacement parts would be available for a given product.

Recycling is hindered by repair monopolies and the transition away from standardized modular construction that would enable the sale and re-use of parts. Consumers are beginning to demand the 'right to repair' the technology they purchase.

In the USA, right-to-repair legislation is being considered at the federal level for the first time, thanks to the Covid-19 pandemic. The Critical Medical Infrastructure Right-to-Repair Act* of 2020 would permit technicians to perform critical repairs of hospital equipment without fear of a lawsuit if they break a digital lock. In advance of federal legislation, 20 of the 50 US states have considered right to repair bills for specific sectors. However, major corporations have successfully lobbied against several state proposals.

Such lobbying has also stymied repair bills in Canada, despite a 2019 poll by the Innovative Research

Group showing that 75% of Canadians support right-to-repair legislation. Similarly, according to a 2014 Eurobarometer survey, 77% of European Union citizens would rather repair their goods, even though the current cost of repairs and service options leads most to replace or discard their belongings (EU, 2014).

The European Commission is working towards a right to repair for consumers, including a right to update obsolete software (see chapter 9). In 2019, it adopted eco-design measures to increase the energy efficiency and reparability of household appliances.** From 2021, manufacturers will have to make appliances last longer and supply spare parts for machines for up to 10 years.

In Bangladesh in 2020, the Department of the Environment published the draft *Hazardous Waste (E-Waste) Management Rules*, restricting the use of 15 chemical substances in certain electrical products and outlining procedures for company recycling of e-waste. Since 2019, entities seeking to import machinery and other accessories for initiatives with an environmental focus like waste management can access the Green Transformation Fund managed by the national central bank (see chapter 21).

Our choices will define our legacy

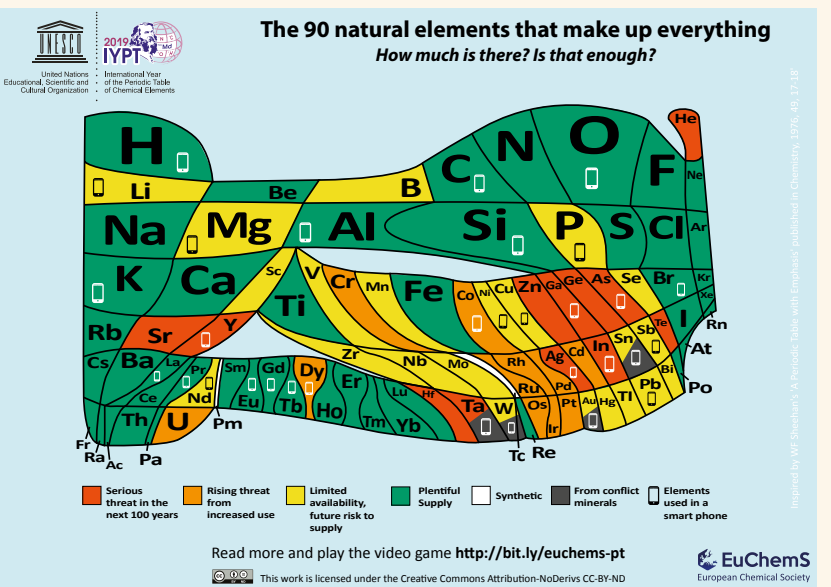
Our choices about technology consumption and production will define our legacy. For example, the process of modern steel production is contaminated with radionuclides carried in the air, as background radiation in the atmosphere has increased since the start of the nuclear era in the 1940s. To meet the demand for uncontaminated, low-background steel, pillagers are seeking to retrieve metals from shipwrecks that predate the nuclear era.

UNESCO is supporting the efforts of countries to identify and manage such sites through the Convention on Underwater Cultural Heritage but pressure is mounting for unregulated retrieval of non-irradiated metals. This begs the age-old question of preservation versus re-use: what are we prepared to give up of our past to create the future we want?

Source: compiled by Tiffany Straza

* See: https://tinyurl.com/congress-USgov-right-to-repair

** See: https://tinyurl.com/EC-rules-sustainableappliances



Graphic produced in 2019 for the International Year of the Periodic Table of Chemical Elements designated by UNESCO to mark the 150th anniversary of the Mendeleev periodic table

Source: European Chemical Society and UNESCO