The secret life of your mobile phone: metal supply and digital devices

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If you wish to design and sell a competitive mobile phone you must deliver exceptional performance in the smallest volume for the cheapest price. In order to push towards the limits of what is possible you will need to select the most optimised technologies, and these often depend on the use of very particular materials, exploiting the unique physical properties of individual metallic elements. There may be no substitute that can deliver anything like the same performance.

Although the amounts employed in each unit may only be measured in micrograms, last year 1.9 billion phones were produced and next year this will probably rise to 2.5 billion. Since the average life of a typical phone is short (in the USA only 21 months) the consumption of certain specific resources represents a large proportion of the World production of critical metals (the vast majority of which are now produced only in the Republic of China).

China happens to be very good at mining and extraction of these minerals, and other producers are either unable or have chosen not to economically work known geological reserves elsewhere. Hence, in the near term at least, the supply risks are mainly political. Even in the long term, there are probably deposits still to be discovered that would satisfy needs for a good many years.

That, it turns out, is not the long term problem. Extraction of metals tends to require large amounts of energy, which still relies mainly on the use of fossil fuels. The ultimate constraint on our consumption may well be the increasingly pressing need to stop adding carbon dioxide to the atmosphere.

It might at first appear that the vast stock of obsolete electronic devices might be a useful recycling resource, able to provide these critical metals at lower energy costs than primary mining. Unfortunately not! Our highly optimised designs using small but critical amounts of rare minerals tend to disperse the material into lower concentrations than found in natural deposits, thus placing them in combinations that increase the extraction energy requirements and making reclamation uneconomic.

Even some of the apparent answers to the climate problem, such as the widespread electrification of transport, rely on ultra-high field magnets that must incorporate rare earth elements. We may be caught between a rock and a hard place and all need to learn to hang onto our phones for longer.

This was a highly informative and well delivered talk about an important topic.