**In 2016 Amnesty International published this report called This is What We Die For. It focussed on Cobalt mining in the Democratic Republic of the Congo or DRC.**

**And it wasn’t an easy read.**

**Cobalt is a key component in most types of Lithium-ion batteries and its extraction has been increasing massively as our global society races towards an interconnected world driven by an internet of things of all shapes and sizes, from watches and fitness trackers, through to mobile phones, tablets and laptop computers, and all the way up to large static medical devices, industrial machinery and of course Electric Vehicles.**

**Something like 60% of all the world’s Cobalt comes out of the DRC and this report showed how extraction from thousands of small unregulated operations known as Artisanal Mines, with appalling working conditions and widespread use of child labour, was getting mixed in with cobalt from larger, well regulated, mechanised operations, to enter the supply chains of many of the world’s biggest electronics brands and battery manufacturers.**

**There was no way to sugar coat the news : the modern industrialised world had to face the fact that it now had yet another very big problem to add to the ever growing list of very big problems that modern industrialised activity was causing, only this time that problem involved some of the very companies who were claiming to be moving us to a cleaner, greener, more sustainable future.**

**In response to Amnesty’s ground-breaking document many companies including Apple, BMW, Daimler, Renault and Samsung immediately committed to publishing data about their supply chains so that they could be publicly scrutinized.**

**So, here we are in 2020, 4 years on from this original bombshell report, and the obvious question has to be… have we actually made any real progress?**

**Hello and welcome to Just Have a Think**

**Cobalt is one of the elements in the periodic table and it exists in our planets crust mostly in a form that’s chemically combined with other things. It’s predominantly extracted as a by-product of copper and nickel mining.**

**According to Statista, in 2016, when Amnesty International first released their research, world production of cobalt totalled 123 thousand metric tons.**

**Production quantities rose to 148 thousand tons in 2018 before dropping back a little to 140 thousand tons in 2019. Despite that year on year reduction, if the world’s big tech firms fail to find alternative battery technologies, then this EU report suggests that cobalt extraction could reach almost TWO hundred and forty thousand tons a year by 2030, by which time, according to Bloomberg New Energy Finance, Electric vehicle sales will have rocketed up to around 33% of the total global vehicle market.**

**The DRC is one of the poorest countries in the world, battered by decades of war and corrupt governments. Artisanal mining became a source of subsistence living for many people in the country when the state mining industry collapsed back in the 1990s largely as a direct result of precisely that conflict and corruption.**

**In an attempt to revive the industry, in 2002 the DRC government, led by President Joseph Kabila, published a new mining code to try to attract foreign investment and rebuild a properly controlled mining sector that’d be acceptable to international investors.**

**The new code did shut down artisanal mining in many areas, but it didn’t ban it completely.**

**It also provided no guidance whatsoever on safety equipment and safe handling of potentially hazardous substances like cobalt dust that can cause asthma, decrease pulmonary function and potentially lead to fatal lung disease.**

**Most artisanal mine workers don’t have any access to basic protective equipment like gloves, clothing and facemasks. These hand-dug, unventilated mines can extend for tens of metres underground and, because they’re usually not properly structurally supported, they often collapse, with obvious consequences.**

**And then there’s child labour.**

**Nobody knows the true extent of child labour in the DRC but back in 2014 UNICEF estimated there were about 40,000 boys and girls working in mines all across the southern regions of the country, many of them of in these artisanal cobalt mines.**

**Needless to say, that’s a shocking number that should be unconscionable to any right-minded human being.**

**So, what to do?**

**Well, while the scale of the challenge is undeniably enormous, pressure from groups like Amnesty International**

**and lawsuits like this most recent one are resulting in real changes to the way that Cobalt is sourced.**

**In 2016 the OECD published the third edition of its Due Diligence Guidance for Responsible Mineral Supply Chains.**

**That document contains five core principles to help steer large corporations towards the right path. [on screen]**

**In 2018, Microsoft published a one hundred and eleven page report looking at the sustainability of all the devices they sold. The report specifically highlighted Cobalt as the most significant risk factor material in their products.**

**For full transparency the report published the names and locations of all the mines and smelters used in their supply chain and it made this statement-**

**“We have continued our partnership with entities like the Responsible Minerals Initiative [ ] to identify key factors, defining clear expectations for the responsible sourcing of cobalt, and independently validating due diligence [] for all OECD Due Diligence Guideline risks, which includes child labour.“**

**Apple has also developed robust procedures to follow the OECD guidelines. For the last 12 years they’ve produced an annual Supplier Responsibility Progress Report covering all suppliers including those in the Cobalt supply chain.**

**Their 2018 report audited 756 suppliers in 30 countries and did find 44 core violations of labour rules, all of which they say were in newly appointed supply partners and all of which have now been addressed and remedied.**

**The majority of tech firms have followed Apple and Microsoft’s lead, and all the major automotive manufacturers have also now committed to producing annual audits of Cobalt supply.**

**Volkswagen and Ford have joined with IBM, Apple, and battery makers including LG Chem to form a consortium that’ll use blockchain to achieve full transparency in their supply chains.**

**Mercedes and BMW are also developing Block Chain technologies to improve their own audit trails.**

**We’ve all heard of Block Chain in the context of bitcoin, but it’s a technology already being used by the world’s largest brewery company Ab inBev to improve transparency and eradicate corruption in their agricultural supply chain using a simple mobile app that offers farmers a secure, immutable platform that records their transactions.**

**There are already more than 20,000 Ugandan barley and sorghum farmers and 2,000 Zambian cassava farmers on the platform. And of course, the system works both ways, so not only does the farmer have proof of transaction, but AB InBev automatically has an irrefutable audit trail for their annual inspections.**

**Publishing transparent and verifiable supply chain data really is an essential step forward, and of course those companies should be commended for showing a bit of leadership in that regard, albeit only after pressure groups had raised public awareness of the issues.**

**But it doesn’t change the fact that we currently still have a rampant and apparently insatiable global appetite for cobalt as an integral component of the batteries and devices that power our modern world.**

**So how do we tackle the conundrum of finite supply and global resources?**

**Well, one very significant and effective way is good old recycling.**

**Recycling all the components of a lithium ion battery has until quite recently been complicated and expensive, but a great deal of research and development has been taking place over the last decade or so to make the process easier and more efficient.**

**Scientists at Rice University in Houston Texas are a good example. They’re developing something called a deep eutectic solvent made from water soluble salts and ethylene glycol, which can already recover a significant amount of cobalt from lithium ion batteries.**

**Over in China the battery recycling sector is growing rapidly. One of the country’s largest recyclers, GEM, already recycles about 5000 tons of cobalt and 10,000 tons of nickel every year.**

**In December 2019, Audi and Tech Recycler Umicore successfully completed the test phase of a strategic research cooperation that now means that more than 90 percent of the cobalt and nickel in the high-voltage batteries of Audi’s e-Tron electric vehicle can be recovered.**

**In January 2020 the partnership started work on what they call a ‘closed loop supply chain’ for cobalt and nickel, recovering the vast majority of used materials for recycling and integration into new battery cells.**

**And there are plenty of other examples too numerous to mention here. As always though, I’ll leave links to all the research articles in the description box below.**

**Electric vehicle batteries are also being used more and more widely as second life energy sources, long after the end of the life of the cars they were originally installed in.**

**In their 2019 Impact Report, Tesla used data from the 1 million Tesla vehicles on the road today to show that, even after 200,000 miles their batteries only degrade by about 15% and can easily be removed and re-used for all sorts of other purposes.**

**So, it seems like we’ve got some environmental awareness and traction within the industry itself resulting in good positive progress that knits perfectly with the circular economy concept.**

**But as the world moves away from centralised power generation sources that are heavily reliant on the burning of fossil fuel and relentlessly towards distributed power grids driven more and more by renewables like solar, wind and hydro, so the search for alternative energy storage technologies has accelerated dramatically. And a big part of that work is aimed at finding ways to minimise or even eradicate cobalt from batteries altogether.**

**Battery chemistry is an intricate and complicated science that’s outside the scope of this video, but in very basic terms Cobalt tends to get used in most modern lithium ion batteries because it increases the strength and longevity of the cathode that forms one element of the electrolytic process that moves electrons from A to B and allows batteries to charge and discharge their energy.**

**There are three main variations of lithium batteries powering our devices today.**

**Lithium Cobalt Oxide or LCO batteries are used mainly for cell phones and small electronic devices. The cathodes in these batteries are about 60% cobalt.**

**Lithium Nickel Manganese Cobalt Oxide or NCM batteries are used in larger machinery, industrial tooling and some electric vehicles. Their cathodes are typically around 30% cobalt content.**

**Lithium Nickel Cobalt Aluminium Oxide or NCA batteries are used by the vast majority of Electric vehicle manufacturers including Tesla. These batteries have only a very fine coating of cobalt on the cathode, typically accounting for less than 20% of the total cathode weight.**

**But how about just not using cobalt in lithium batteries at all?**

**Well it turns out that not only is that idea perfectly feasible but cobalt free lithium batteries already exists at scale, all over the world. They’re called Lithium Iron Phosphate or LFP batteries.**

**Their relatively low cost, low toxicity, well-defined performance and long-term stability has made them a good choice for utility scale stationary applications, and backup power.**

**They don’t quite pack the punch of NCA batteries but nevertheless in February 2020 Tesla announced that they’re working with Chinese battery supplier CATL to replace NCA batteries with 100% cobalt-free LFP batteries for their Model 3 production vehicles in China.**

**If that initiative were to be extended to Tesla’s US production, then it’d a pretty revolutionary change in their battery strategy and would certainly result in a very significant reduction in Cobalt extraction.**

**These rapid developments in battery technology, second life repurposing and recycling will undoubtedly have a positive impact, not only on reductions in the overall use of Cobalt but also in the reduction of carbon dioxide emissions from fossil fuels in energy, industry and transport.**

**But that kind of brings us right back around to the issue that started off the entire debate in the first place, which is Human Welfare.**

**It’s all very well for nice comfortable westerners like me to make videos like this that press for change and eradication of harmful production processes, but what do the hard-working families in those regions get left with? Many of those people have been risking their lives to dig those Cobalt mines not because they want to, but because they simply have no other choice. And they’re still going to need a way to make a living and feed their children after the artisanal mines are gone.**

**In the case of the DRC, that’s a challenge that’s being met head on by the United Nations and The African Development Bank.**

**They’ve set up an ambitious initiative called The Support Project for Alternative Welfare of Children and Young People Involved in the Cobalt Supply Chain, which they have wisely abbreviated to PABEA-COBALT.**

**This program seeks to ensure the social reintegration of nearly 15,000 children working in cobalt mines, mainly by targeting the welfare of the children’s parents, all of whom are pretty young themselves. The salvation for these families will be agriculture, which the UN and the Development Bank assess to be the sector with the greatest potential for economic diversification.**

**The project covers Lualaba and Haut-Katanga Provinces, which between them account for more than 65% of global cobalt reserves. It supports and strengthens the existing National Strategy for the Exit of Children from the Copper and Cobalt Ore Production Chain in those regions.**

**11,250 direct agricultural jobs and thousands of indirect jobs are being created and 1,250 youth agricultural cooperatives are being restructured to provide a greater level of income and stability for the families involved.**

**To ensure the longevity of the strategy, 2 vocational training centres will be built, and facilities will be put in place to support the rehabilitation of social structures like education, health, and water-sanitation.**

**The project is backed by The Organization of African First Ladies for Development.**

**Women make up three-quarters of the African agricultural labour force and produce as much as 80 percent of the continent’s food.**

**African women on average spend 90 percent of their earnings on feeding, schooling and providing healthcare to their families, compared to about 35 percent spent by African men.**

**In most African markets, the majority of traders are women. Yet women are marginalized when it comes to access to finance to grow their businesses.**

**So, a scheme called the Affirmative Finance Action for Women in Africa, backed by the African Development Bank is helping to plug the $42 billion financing gap between women and men.**

**According to the Food and Agricultural Organization, with better access to finance, women farmers could produce 20-30 percent more food than they currently do, which would mean 150 million fewer hungry people across the continent.**

**Make no mistake though, Cobalt mining today remains a problem of human rights abuses that is not fully resolved. Far from it.**

**The extraction of minerals and metals around the planet is an understandably emotive topic, and no doubt you have your own views on the subject, so I’ll be keen to read your thoughts in the comments section below.**

**That’s it for this week though.**

**A massive thank you as always to the channel’s supporters over at Patreon who make these programs possible, and I must just give a shout out to the folks who joined the Patreon team since last week, with pledges of ten dollars or more a month.**

**They are**

**Alec Thomas**

**Saurabh Gupta**

**Chris Southwell**

**Mark Larsen**

**Thomas Snow**

**Wojciech Olechowski**

**David Sperber**

**Sean Connolly**

**David Hastings**

**John Andrew Metza**

**Matias Wolf**

**Rob van den Berg**

**Andrien Lee**

**David Lorenzo-Papp**

**Buchan Follachs**

**Who gets a special commendation for showing us that the old English art of the spoonerism is apparently still alive and well!!**

**And of course, a big thank you to everyone else who’s joined our Patreon page since our last video.**

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**As always, thanks very much for watching,**

**Have a great week and remember to just have a think**

**See you next week.**