

## Ethical perspectives on mining and the use of copper, bronze and brass

This fact sheet provides some basic information on copper which is present throughout modern life (cars, computers, electricity etc), but also often used in sculptures, singing bowls and other ritual objects in the form of bronze (copper and tin alloy) and brass (copper and zinc alloy).



Copper<sup>1</sup> can be found throughout the earth's crust, but is worth extracting when there is about 2 kg of copper per 1,000 kg of ore. Ninety per cent of copper ore is mined using the open pit method<sup>2</sup> which is an excavation or cut made at the surface of the ground for the purpose of extracting ore. To expose and mine the ore, it is generally necessary to excavate large quantities of waste rock.<sup>3</sup>

Chuquimata Copper Mine in Northern Chile. Note the trucks at the bottom left to get a sense of the scale.

### Waste rock and water pollution

Mining waste rock often contains sulphide minerals which when exposed to air and water may form an acidic solution in which metals are released. This process can occur naturally, but is referred to as acid mine drainage (AMD) when accelerated by mining activity. The environmental impact of AMD can be severe, with adverse effects on fish, aquatic plant communities and humans. In the US alone, over 19,300 km (12,000 miles) of rivers and streams and over 730 km<sup>2</sup> (180,000 acres) of lakes and reservoirs are contaminated by acidic water draining from abandoned mines. To remedy the problem, industry spends millions of dollars a day reclaiming mine sites to prevent pollution.<sup>4</sup>



Mining companies are working to improve technology to mitigate pollution, but pollution can carry on for decades after the closure of a mine. Britain is still trying to deal with the pollution legacy from 19th century mines<sup>5</sup>. Also, accidents can happen; only last year (2014), a dam at Mount Polley Mine in Canada breached and sent contaminated waste water and metal-laden sand into nearby lakes, triggering a water-use ban in nearby towns<sup>6</sup>. And mining uses vast quantities of water in the processing of the ore. For example, in Chile, producer of around a third of global copper, the government forecasts that water use for mining will average 24.6 cubic meters *per second* by 2025.<sup>7</sup> That is enough for six months of average water use for a UK family or a whole year's water use for 12 people in Cambodia.<sup>8</sup>

### Energy use

There are various technologies for copper refining. One is called heap leaching where the mined ore is crushed into small chunks and heaped on an impermeable plastic or clay pad and irrigated with sulphuric acid to dissolve the valuable metals<sup>9</sup>. Heap leaching is lauded by companies for using less energy but in many cases, copper ore is still refined using the smelting process. This involves first heating it between 500°C and 700°C to remove some sulphur and dry the ore, followed by a second heating to 1200°C in order to melt it.<sup>10</sup> The mining industry is energy intensive and most of the power grids are at the limit in providing power to existing mining operations. Chile's mining industry alone is expected to nearly double its electricity consumption between now and 2025 as multibillion-dollar investments come to fruition (22 terawatt hours currently to 40 TWh).<sup>11</sup> This is the sort of energy needed to power 6.7 million UK households in 2014 (28.1 TWh).<sup>12</sup> Or to put it in terms of the impact on climate change, the global greenhouse gas emissions of copper

production currently are estimated to be about 60 million tonnes of CO<sub>2</sub> per year<sup>13</sup>, that is roughly the sum of the personal carbon footprints of the whole of the UK population (average UK carbon footprint per person is 10 tonnes of CO<sub>2</sub> per year<sup>14</sup>).

### **Social impact: human suffering and conflict**



In 2012, 34 South African miners were shot by the police when striking over pay at a mine run by platinum giant Lonmin. An inquiry into the massacre found evidence that police falsified and withheld documents, and gave fabricated accounts of events.<sup>15</sup>

Communities living near mines can also be affected by violent conflict over mineral-rich land and water resources. Many communities have been displaced to make way for mines and find their human rights are further violated when protesting. The

Peruvian ombudsman reports that there are 142 ongoing socio-environmental conflicts of which most are related to mining and oil-projects<sup>16</sup>. Local communities perceive the army or police to be acting in the interests of mining companies. Last year, a Colombian parliamentarian published information from Colombia's Comptroller General on the existence of 103 contracts between the Ministry of Defence and extractive companies worth \$24 million for the army to defend the interests of these companies<sup>17</sup>. Given the human rights record of the Colombian army, this is of great concern.

One example of the level of human suffering that such conflicts can entail is the police torture in 2005 of protesters against the then British-owned Rio Blanco copper mine in Northern Peru<sup>18</sup>. To date, no-one has been convicted of the mistreatment of protestors. Last year, the mine's new owners, Chinese firm Zijin, agreed to make compensation payments of an undisclosed size to 33 claimants following legal proceedings in the UK. The firm denies any involvement in the abuses.<sup>19</sup> While attributing responsibility for human rights abuses in relation to mining is difficult and controversial, what is certain is that there is a pattern of conflicts and human rights issues linked to mining across the world<sup>20</sup>.



### **Recycling**

Copper has many uses: a computer contains around 1.5 kg of copper, a typical home about 100 kg and a wind turbine 5 tonnes. And the total weight of copper in a car ranges from 15 kilos for a small car to 28 kilos for a luxury car. In Europe, 41.5% of copper comes from recycling<sup>21</sup>. With available ore deposits becoming more difficult to mine and demand expected to increase from 18 million tonnes in 2010 to 37 million tonnes in 2030<sup>22</sup>, the demand for recycled copper will also increase sharply. This means that if one sources recycled copper / bronze for making a rupa, the recycled copper / bronze used will no longer be available for making a wind turbine for example. Overall, we could get by with the existing copper but only if we use this recycled copper for absolutely essential things where no alternatives exist.

## **What can we do?**

Our personal choices with regard to metal consumption won't suddenly change the mining industry, just as going vegetarian is not going to completely stop cruelty in the meat industry. But we could start reflecting on the use of copper and metals in our personal lives and at our Buddhist Centres. Some options to consider:

### *1. When possible, avoid buying new items with copper and/ or other metal components*

Try to keep your old phone, computer and car (if you can't do without) as long as possible, this also contributes to reducing your carbon footprint as any energy savings from more energy efficient models are cancelled out by the carbon footprint of the manufacturing and transport of new items. This is also true for hybrid cars<sup>23</sup>. If you need to replace items, try to buy second hand. Buying recycled copper does not help much as it adds to the overall existing demand for copper driving up prices and thereby the incentive to mine more.

### *2. Recycle any unused items with copper and/or metal components.*

Because copper is so valuable these days, there are many metal recycling companies who will buy household cables and wires, brass, bronze and other items from you. This way you contribute to an increase of the amount of recycled copper on the market, reducing the need for mining. Go to the British Metal Recycling Association to find your nearest metal recycling company: <http://www.recyclemetals.org/>.

### *3. Reflect on the use of bronze and brass objects used as part of Buddhist practice*

If you are considering purchasing new rupas or other objects, you may like to research alternative materials. Ethically sourced wood is one option. Although gypsum mining and plaster<sup>24</sup> manufacturing also have an environmental impact, the information I have found to date suggests that gypsum is mined relatively “pure” in comparison to metals such as copper (1000kg of rock for 2kg copper), and thus produces less waste and pollution.

For outdoors rupas, one option is stone, but given that stone / marble quarrying has been linked to environmental issues<sup>25</sup> and child labour<sup>26</sup> in India and elsewhere, a more ethical option may be to source the stone from a UK quarry and even visit the quarry to understand its socio-environmental impact. Modern fibreglass with resin is an affordable and very durable material with an almost infinite amount of possibilities in terms of finish / look, although here it is also recommended to check with the supplier what sort of resin is being used. The most ethical option might be to contract UK based artists. For example, these Yoda busts are made from fibreglass and painted to look like faux Silver and Bronze by <http://www.amanda-ward.co.uk>.



For more information, please contact Karen at the Croydon sangha. [k.elderflower@gmail.com](mailto:k.elderflower@gmail.com). Please get in touch if you are interested in working together to further research alternatives.

- 1 This fact sheet focusses on copper as it makes up over 80% of modern bronze, but information on other minerals can also be provided.
- 2 <http://www.copperalliance.org.uk/copper-and-its-alloys/processes>
- 3 [http://www.mine-engineer.com/mining/open\\_pit.htm](http://www.mine-engineer.com/mining/open_pit.htm)
- 4 Summarised from [http://ecore restoration.montana.edu/mineland/guide/problem/impacts/amd\\_formation.htm](http://ecore restoration.montana.edu/mineland/guide/problem/impacts/amd_formation.htm)
- 5 <http://www.bbc.co.uk/news/uk-england-derbyshire-17315323>
- 6 <http://visibleearth.nasa.gov/view.php?id=84202>
- 7 <http://www.reuters.com/article/2015/01/13/us-chile-copper-water-idUSKBN0KM1VG20150113#>
- 8 [http://www.worldmapper.org/posters/worldmapper\\_map324\\_ver5.pdf](http://www.worldmapper.org/posters/worldmapper_map324_ver5.pdf)
- 9 [http://en.wikipedia.org/wiki/Heap\\_leaching](http://en.wikipedia.org/wiki/Heap_leaching)
- 10 <http://www.copperalliance.org.uk/copper-and-its-alloys/processes>
- 11 <http://www.emersonprocessxperts.com/2014/12/energy-consumption-the-constant-struggle-in-mining/>
- 12 <http://www.renewableuk.com/en/news/press-releases.cfm/electricity-needs-of-more-than-a-quarter-of-uk-homes-powered-by-wind-in-2014>
- 13 <http://cfsites1.uts.edu.au/find/isf/publications/muddetal2012copperemissionscleanenergy.pdf>
- 14 <http://www.carboncalculator.co.uk/averages.php>
- 15 <http://www.independent.co.uk/news/world/africa/police-in-south-africa-lied-about-killing-34-miners-during-pay-strikes-8827787.html>
- 16 <http://www.defensoria.gob.pe/conflictos-sociales/home.php?sec=1&pag=5>
- 17 <http://www.radiolaprimerisima.com/articulos/4813>
- 18 <http://www.theguardian.com/world/video/2009/oct/16/peru-protest-montericco-torture>
- 19 <http://www.perusupportgroup.org.uk/news-article-564.html> and <http://www.statecrime.org/testimonyproject/peru>
- 20 For more information, see <http://www.minesandcommunities.org/>, <http://business-humanrights.org/en/sectors/natural-resources/mining>, <http://www.cidse.org/business-a-human-rights.html>, <https://www.globalwitness.org/>, <http://www.miningwatch.ca/>
- 21 <http://www.copperalliance.org.uk/copper-and-its-alloys/recycling>
- 22 <http://www.aqmcopper.com/s/copperfundamentals.asp>
- 23 How to Live a Low-Carbon Life, *The Individual's Guide to Tackling Climate Change*, by [Chris Goodall](#)  
<http://www.betterworldbooks.co.uk/9781844079100-id-9781844079100.aspx>
- 24 <http://plasterboardpartnership.org>
- 25 <http://www.theguardian.com/environment/2012/oct/02/kerala-quarrying-sea-erosion>
- 26 <http://www.indianet.nl/pdf/fromquarrytograveyard.pdf>