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The Second Wave of Mining

Posted by Ugo Bardi on September 28, 2009 - 10:39am in The Oil Drum: Europe
Topic: Environment/Sustainability
Tags: mineral depletion [list all tags]

The author with a group of Romani people (also known as gypsies) in front of a pile of scrap iron, collected for recycling. That pile has been there for more than a year. The recycling activity carried out by the Romani in Italy has been halted, in large part because the government forbade it and forced the recycling cooperatives to close down (governments don't like things they can't fully control). But, also, recycling stopped because of the collapse of market prices of scrap iron. This may be a symptom that the "second wave of mining", recovering mineral resources from waste, is late in coming. Will it ever arrive?

Human civilization started when humans learned how to exploit those concentrated mineral sources that we call "ores". After centuries of mining, most of these ores have been badly dented or even completely exhausted. The first wave of mining in human history will be over at some moment in the future. Will there be a second one in which we learn how to reuse the minerals that we have discarded?

The problem is felt everywhere and waste recycling is often presented as the miracle solution: it frees citizens from costs and bad smells, it saves the environment, it provides the economy with

raw materials and people with jobs. But is it possible to "close the cycle of production" (the "cradle to cradle" (C2C) strategy)? If it were so, we would solve once for all the problem of depletion.

Unfortunately, recycling remains a cumbersome task that keeps going only by means of government subsidies and a set of laws that force citizens and companies to do it. Recycling is especially difficult if it is necessary to restore the initial quality of the materials being recycled. In practice, recycled materials that can compete in a free market are often of poor quality and suitable only for some specific processes. Recycled plastics, for instance, can be used only for some low price applications; such as fruit crates. Recycled steel contains plenty of contamination in the form of different metals and can be used only for some specific tasks.

Because of these problems, closing the cycle by recycling alone seems to be impossible. We simply don't recycle enough. Common metals are recycled at an average of around 50% of the total produced (Papp 2005). Some cases are especially favorable, such as lead which is recycled at the level of 74%. But, even if we recycle something at 75% we are far from closing the cycle: even in that case, after ten cycles, we are left with less than 0.1% of the initial amount. Surely, we can devise better recycling strategies, but there are limits in terms of monetary costs and energy needed.

So, we can't avoid to start thinking of recovering all that material that we have so foolishly thrown away when we thought that abundance would last forever. In large part, this material has ended up dispersed in the environment as dust or ashes. But a good fraction of it is buried in landfills. Can it be recovered?

A conference held in London in 2008 examined the feasibility of landfill mining. The results have not been very encouraging. Even when the prices of mineral commodities is high, as it was in 2008, recovery from landfills has at best a marginally positive economic return. With the collapse of commodity prices that took place in late 2008, the second conference on landfill mining, originally planned for October 2009, had to be canceled.

Landfill mining turns out to be a very different task in comparison to conventional mining. Ores are normally formed of homogeneous mineral species that contain just a few chemical species. A landfill, instead, contains a large number of metals mixed together at various scales - from the micro (incinerator ashes) to the macro (undifferentiated urban waste). In addition, the composition of a landfill varies with depth: people would throw away different kind of materials depending on the technology of the time, on how rich they were, and on how efficiently recycling was implemented. Typically, old layers of landfills are richer in metals than the more recent ones.

Even though landfills are often rich in metals, recovery is very difficult. Recovering single metals out of incineration ashes is pretty impossible (Shen and Fossberg 2003). Something better can be done when waste remains unprocessed. For instance, iron items can be extracted by means of magnets. Light density materials (e.g. aluminum cans) can be separated by methods based on friction and gravity. Usually, however, these processes remain too expensive to be usable in practice on existing landfills.

So, mining landfills remains a chimera, at least by industrial methods. It is not so in poor countries, where landfills often provide the means of survival for large numbers of people. It is not something to be happy about; often, these people are extremely poor and their way of living is dangerous and unhealthy. Nevertheless, they have found a way of mining landfills that works and they are performing a useful task for the whole community.

These considerations have led to revisit the concept of waste recycling performed by individuals or by cooperatives: a concept that is called participatory sustainable waste management. The idea is that of a different paradigm in mining: not the heavily mechanized method that are typical of the mining industry, but low cost methods based, mainly, on the work of human

beings. If this work is performed with appropriate precautions for the health of the workers, and if they are paid enough, then it is a win-win strategy: it recovers precious materials for society and it provides a way of living to people who, otherwise, would have none. In the figure, here, you can see Jutta Gutberlet, of the University of Victoria, Canada, working with the *catadores* of a landfill of Sao Paulo, Brazil.

So, perhaps, the second way of mining is coming, after all. But it will be nothing like the first. Whereas, once, finding a rich ore was a good way of making a lot of money, not many people are going to strike it rich by mining landfills. It will be hard work and little pay, yet, it may be a way to face our uncertain future.

News of last week is that the Romani succeeded in selling the pile of scrap iron that you see in the picture at the beginning of this text. They made 450 Euros out of it. Not a way of becoming rich for them but, at least, that iron is back in the industrial cycle.

I would like to thank Jutta Guttberlet for having introduced me to the concept of participatory sustainable waste management and to the world of the Brazilian "catadores". You can find a description of Jutta's work at her site at the university of Victoria, Canada. I would also like to thank all the members of the Romani community of Sesto Fiorentino, Italy, in particular Mr. and Mrs. Zoran and Yelena Jankovich, for their kindness and hospitality.

References

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Shen, H. Fossberg, E. 2003 "An overview of recovery of metals from slags" Waste Management Volume 23, Issue 10,Pages 933-949

On ore depletion, see also:

"The Universal mining machine", by Ugo Bardi, The Oil Drum, January 2008, www.theoildrum.com/pdf/theoildrum_3451.pdf

"Minerals scarcity: a call for managed austerity and the elements of hope", A. Diederen, The Oil Drum, March 2009, www.theoildrum.com/pdf/theoildrum_5239.pdf

On participatory sustainable waste management, see the PSWM site at http://pswm.uvic.ca/en/welcome/index.html