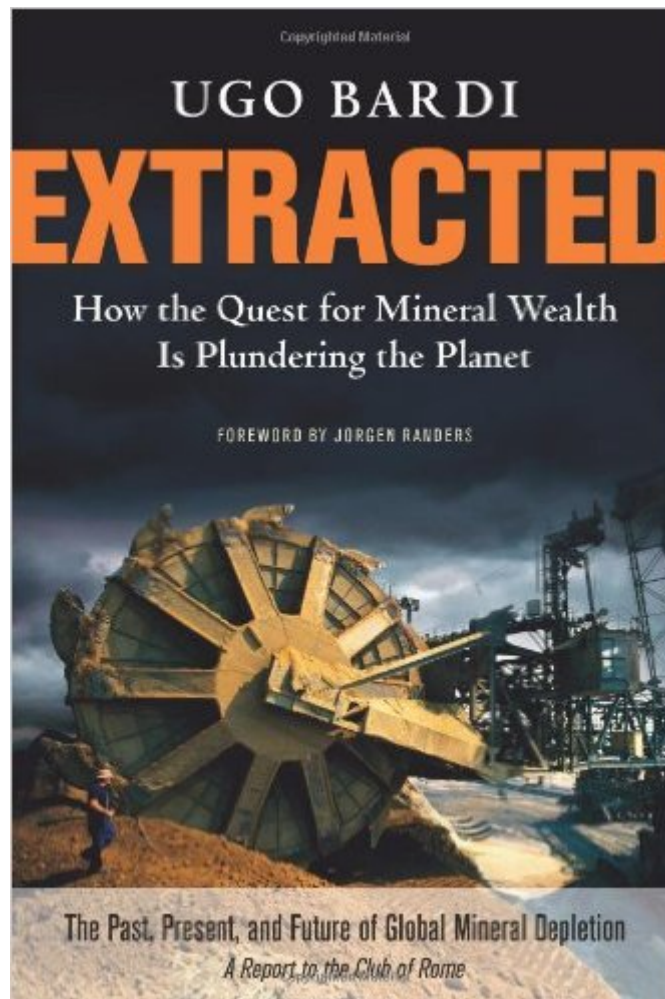


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# Extracted: How The Quest For Mineral Wealth Is Plundering The Planet



## Synopsis

As we dig, drill, and excavate to unearth the planet's mineral bounty, the resources we exploit from ores, veins, seams, and wells are gradually becoming exhausted. Mineral treasures that took millions, or even billions, of years to form are now being squandered in just centuries—or sometimes just decades. Will there come a time when we actually run out of minerals? Debates already soar over how we are going to obtain energy without oil, coal, and gas. But what about the other mineral losses we face? Without metals, and semiconductors, how are we going to keep our industrial system running? Without mineral fertilizers and fuels, how are we going to produce the food we need? Ugo Bardi delivers a sweeping history of the mining industry, starting with its humble beginning when our early ancestors started digging underground to find the stones they needed for their tools. He traces the links between mineral riches and empires, wars, and civilizations, and shows how mining in its various forms came to be one of the largest global industries. He also illustrates how the gigantic mining machine is now starting to show signs of difficulties. The easy mineral resources, the least expensive to extract and process, have been mostly exploited and depleted. There are plenty of minerals left to extract, but at higher costs and with increasing difficulties. The effects of depletion take different forms and one may be the economic crisis that is gripping the world system. And depletion is not the only problem. Mining has a dark side—pollution—that takes many forms and delivers many consequences, including climate change. The world we have been accustomed to, so far, was based on cheap mineral resources and on the ability of the ecosystem to absorb pollution without generating damage to human beings. Both conditions are rapidly disappearing. Having thoroughly plundered planet Earth, we are entering a new world. Bardi draws upon the world's leading minerals experts to offer a compelling glimpse into that new world ahead.

## Book Information

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## Customer Reviews

Ugo Bardi is a great story teller, and there is a lot of interesting information in "Extracted." Who would have thought that the first mines were dug 40,000 years ago, and that deer antlers were used for digging? Ugo has a lot of interesting information about how the world seems to have been formed, how the amount of oceans seems to be gradually decreasing, and how Gaia "self-balances." I would recommend the book, simply for the historical information in the book, and the various historical charts. Where the book is not as good is on what is likely to happen going forward. Bardi gives you all possible options in terms of models. He talks about the whale oil model, Hotelling's model, Jevons' model, Sollow's "factors of production," Hardin's "tragedy of the commons, Lotka and Volterra's dynamic model of population, the use of the Hubbert curve for projection, and the Seneca effect. Later he gives various options for the future: "the economic crisis that started in 2008 could be the first hint that decline is immanent," substitution and recycling may help, the future US direction may be somewhat similar to the collapse of the Former Soviet Union based on Orlov's work, the forecast in Randers' 2052 may be correct, or we may simply return to a purely agrarian society. He also talks about building a new industrial economy using renewable energy. (The footnote he gives is to an article that talks about getting heat from charcoal and biofuels, and electricity from hydroelectric and "renewable hydrogen.") I got the impression that Bardi was going out of his way avoid explaining how bad things could be in the future. When he talks about going back to an agrarian society, he never mentions that this very likely would require a drop in world population. He shows image after image of projections of future fossil fuel extraction, assuming a Hubbert Curve, but never shows what the effect would be if a Seneca Curve would take over instead. When he talks about what the Limits to Growth model says, he says, " We can say that the Limits model leads to results similar to those obtained by the simpler Hubbert one" that is, a bell-shaped curve for industrial and agricultural production. The production of mineral resources does not explicitly appear in the figure, but it is bell-shaped, too." If a person goes back to 1972 Limits to Growth, we find it says, "The basic behavior more of the world system is exponential growth of population and capital, followed by collapse." The chart in the 1972 book shows a very steep drop in food per capita and industrial output per capita, items Bardi conveniently leaves out of

his chart.

It has been said that scientists form their own 'silos' or 'interest groups', largely unrelated from the rest of us. Professor Bardi has had the interest and sense of duty both as a teacher and a scientist to emerge from his own speciality and to bring with him his developed critical faculty and his understanding of quantitative assessment. He uses expert assessments to look at the vast changes that the acceleration of industrial activity has wrought on the globe's stores of mineral and other resources. Such stores have been retrieved from hitherto impenetrable regions. Great bulk carriers have brought mass cargoes of ore, for example iron ore from the back of Brazilian jungles, at low unit cost to furnaces fired by almost unimaginable 'fossil' energies retrieved from other distant sources. The synergism of energy and bulk materials has allowed ever larger economies to swallow and digest, as it were, these resources at an ever increasing rate. For many minerals the easy-to-reach and richer sources are long gone. Rates of use now outpace new discoveries, or lead industries to use more energy to extract ingredients from ever more dilute or difficult reservoirs. The limits to how much is available are becoming visible. Inconvenient residues pile up in our air, water soils and oceans and wreak their own dangerous changes. Substitution of one ingredient or source for another becomes a more and more difficult option. It follows that we are in a world with finite limits where costs begin to weigh on the value of the products. It also follows, in my view, that we join Professor Bardi and clamber out of our own comfort zones and interest groups and take a look at the emerging big picture as it rises inevitably before our very eyes.

The industrialized society, our economy is based on energy and resources. Understanding where we are and what options there are in a world already overexploited is critical to get out of the current crisis. I recommend this book to anyone interested in these issues and most importantly, entrepreneurs and politicians, who can not make wise decisions without having a clear idea of what the planet can still give.

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