

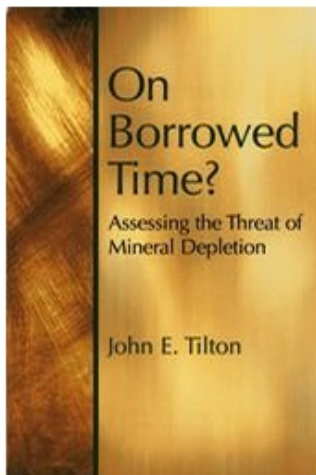


## Book Review: On Borrowed Time? Assessing the Threat of Mineral Depletion

Posted by [Rembrandt](#) on May 15, 2009 - 10:25am in [The Oil Drum: Europe](#)

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For the last couple of weeks, I have been reading about the issue of mineral depletion, since I want to do some research on this topic. The basic question is whether we can keep relying on producing (rare) metals from the earth to (re-) build our society in the foreseeable future.

The only recent book that I could find on the topic was [On Borrowed Time? Assessing the Threat of Mineral Depletion](#), published in 2002. It was written by John E. Tilton, who is an Emeritus Professor in Mineral Economics at the Colorado School of Mines. He has studied the topic for over 30 years.

I can recommend this book to non-experts as it gives a good concise overview on the thinking on mineral depletion. The text is less than 140 pages long and is presented in an accessible non-technical manner. This made it possible for me to read the book in less than 3 hours.

One major drawback to the book, in my opinion, is a pervasive bias regarding how impending scarcity is assessed. Because of the author's background, he believes that price change is the best way to foresee whether mineral scarcity is approaching. Nonetheless, John E. Tilton is honest in stating his views and has done his best to provide an objective text by incorporating other views critical of his own. These views include arguments raised by Ecological Economists, something which in my experience is rare in books written by economists of the traditional school.

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### Outline of the book

The book has six main chapters starting with a historical overview of the main scientific views over time on the threat of mineral depletion. It then covers the general geological and economic methods and their criticisms in a chapter with the fitting title *Imperfect Measures*. Since the author sees the traditional economic approach of using different price and cost assessment as the best approach for understanding mineral depletion, the next chapter is devoted to historic economic studies on mineral depletion. He shows several price trends of minerals over time and the different interpretation that economists have given on these trends. The underlying concept of this chapter is the idea from the economic field that a general price increase over a long duration of time would be a signal of mineral scarcity, while a price decrease over time would signal increasing availability. The chapter shows that mineral commodity prices have been declining for nearly all of the 20th century, leaving many economists (although not all described in the book) to believe that scarcity is decreasing rather than increasing. Given the boom and (temporary) bust in mineral prices that has occurred after the book was written, it would be interesting to investigate whether a change is occurring in the field of economics on this topic.

After a short discussion regarding why the past cannot be used as a reliable indicator for the future, the author continues with an assessment of several factors that need to be taken into account to understand the future of mineral depletion. He concludes without any new insights, as the author finds that there is insufficient geological and economic data on mineral deposits to give a meaningful answer. This data could probably be obtained if society were willing to invest money in doing so. But, speaking as a true economist, John E. Tilton comes to the conclusion that we value the present usage of money over future usage, and hence are not interested in assessing currently uneconomic or nearly uneconomic geological mineral deposits. Only when concerns over mineral scarcity grow high does he expect increasing investigation in geological data, so that we may better know what future awaits us.

By this time, the main conclusion of the book has already been given, but there are still two more chapters. One of these chapters is on the environmental and social costs of mineral extraction. These additional costs are sometimes called *externalities* in economics, as environmental costs are usually not incorporated in prices of goods. In this chapter, John E. Tilton mainly focuses on the costs of pollution due to mining.

The book ends with a chapter called *Findings and Implications*, which is basically a recap of Chapter 5, with an extension into topics that have previously not been dealt with in the book--namely, conservation, recycling, and policy decisions. In this chapter, the author provides a stronger concluding statement than that of Chapter 5. He sees mineral depletion as not likely to be a big problem in the next 50 to 100 years. Mineral depletion could be a threat after this period according to the author, but this depends on "the race between the cost-increasing effects of depletion and the cost-reducing effects of new technology."

### **Review conclusion**

The nice thing about this book is its relative objectivity in most of its chapters. Although John E. Tilton does state in his conclusion that he does not think there will be a problem in the next 50 years, he does in several places acknowledge that the pessimists may be right after all, even though they have been wrong in the past. He nicely summarises this with the quote: "That the alarmists have regularly and mistakenly cried "wolf!" does not a priori imply that the woods are safe (Neumayer 2000 in Tilton 2002)."

The final concluding chapter seems to me to be a bit out of place, as there is no detailed reasoning in the book that provides significant substance to Tilton's conclusion that there is not likely to be a problem for 50 to 100 years. I can follow his reasoning, but it is not clear on what basis this time period was chosen. John E. Tilton basically believes that technology will continue to outweigh depletion costs for at least the first half of the 21st century--even while he acknowledges the uncertainty of geological data and the effects of compounding growth.

What the book lacks in my opinion is a discussion of the omissions in the theoretical framework underlying mineral depletion in economics. Three important issues involved in assessing mineral depletion are not discussed in depth in the book, which is likely a reflection of the general (economic) field. First, the geological assessment has barely been integrated with an economic approach, although the author tries to overcome this by discussing cumulative supply curves which give the number of available minerals depending on the cost of production. Second, limiting boundary factors that are likely to increase mining costs in the future such as energy are not taken into consideration. Third, the author tends to assume that technological innovation will continue in the next 50 years to 100 years at a similar scale as in the past, which I see as a doubtful assertion.

These three issues could very well lead to an outcome that contradicts the economic belief that a general price increase over a long duration of time would be a signal of mineral scarcity, while a price decrease over time would signal increasing availability. The underlying implication is that technological change as well as physically limiting production factors occur gradually over time,

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<http://www.oildrum.com/node/5374>  
but these changes could also happen in a much shorter time span.



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