



MEETING THE WORLD'S NATURAL RESOURCE NEEDS

Confrontation Ahead?

Will scarcity threaten our future?

Joel Darmstadter looks to the past for answers.

In today's conversations about oil and other natural resources, a common worry is whether the world is "running out" and will soon begin a confrontational scramble to gain access to what's left for the picking. Before such visions become mainstream thinking, a reminder that we've been down this path before might provide some useful perspective. Every few decades, it seems, an event or conjunction of events creates enough anxiety to prompt these questions.

Such anxiety sometimes arises from circumstances that are anything but trivial. The Paley Commission's 1952 report, *Resources for Freedom*, for example, looked at the nation's resource needs and adequacy at a time when the memory of World War II shortages, the ongoing Korean War, and the intensifying Cold War did not allow policymakers to take a relaxed view of what might be in store for the country amid growing international tensions.



Like many others, a U.S. gas station in 1973 faced fuel shortages during the Arab oil embargo.

Yet in retrospect, volatility often does not justify the overreaction and policy excesses it engendered. The Arab oil embargo of 1973–1974 and the Iranian revolution of 1979–1980 were invoked to support the perversely damaging control of oil markets and lay the groundwork for a multibillion-dollar government-sponsored effort—mercifully abandoned—to augment conventional oil resources with synthetic fuels. But the steep oil price increases of the 1970s were followed by sharply lower prices in the mid-1980s. This experience offers a chastening reminder to distinguish between transitory events—however disruptive—and genuine discontinuities in trends that may signal a need for policy course corrections.

It's not yet clear whether this decade's

renewed increases in prices for oil and other natural-resource commodities find us at such a soul-searching juncture. I'll start with oil and then look at several other resources.

The Oil Conundrum

During the last six months or so, world oil prices have remained high amid persistent conditions of high unemployment and sluggish economic growth in the major industrial countries; less demand and lower prices would have been the typical course of events. But let's also take note of demand-heightening political upheavals in the Middle East and continuing fast growth in both GDP and energy consumption in industrializing economies—most notably, China and India, with energy growth averaging 7–8 percent annually during 2006–2010.

This recent surge in demand for oil is driving price increases (plotted in Figure 1). In response, T. Boone Pickens pronounced, "A global race for energy is on—and China is way out in front." And the usually more restrained *New York Times* characterized a Chinese stake in an Argentine offshore oil venture as a "beachhead." But is the increase in demand potent enough to justify these claims? This sort of language easily can lead to an alarming evocation of "resource wars" and suggests a zero-sum state of affairs: success in an effort to "lock in" energy resources would presumably occur at the expense of other countries.

This rhetoric risks conflating two distinct phenomena: the enduring or transitory scarcity of a resource, signaled by real costs and market prices, and a threatened shortage of such magnitude as to prompt a consuming country to seek dominant command over that resource. Continuing, rapid, and spreading economic growth could strain global oil supply, necessitating higher real prices to bring demand and supply into balance (by both restraining

Figure 1. U.S. Average Value of Petroleum, 1870–2010

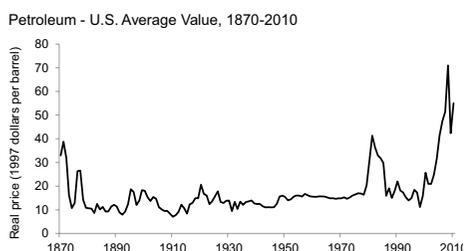
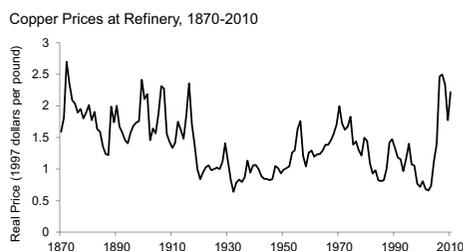


Figure 2. Copper Prices at Refinery, 1870–2010



Source: Data compiled from Tilton 2003, the U.S. Energy Information Administration, and the U.S. Geological Survey.

consumption and encouraging new supply development). But oil is traded in an international marketplace. Higher prices would confront *all* consuming countries—China included—whether or not their oil needs are satisfied by domestic production or imports and such imports originate in their own overseas assets.

Consistent with that observation, in a 2010 study of Chinese natural resource procurement arrangements, international business professor Theodore Moran concludes that “Chinese efforts predominantly help expand and diversify the global supplier system” and that rather than keeping oil supplies for itself, the country has sold them. Still, the notion of preemptive control persists: a recent *Washington Post* editorial characterizes China’s Canadian investments as “locking up more of the world’s oil production.”

Even though China no doubt has many objectives behind its quest for offshore oil and other properties—and even if the world does find itself on an extended upward path in oil prices—the terms chosen by Pickens (and the *New York Times*) still seem sensationally hyperbolic.

Nonfuel Minerals

Two cases illustrate how some of the issues considered in the oil discussion apply to nonfuels. The first and more conventional

example is copper; the second, “rare earths,” is the subject of intense current disputation.

Copper

As a general proposition, copper—a nonrenewable commodity whose ease of extractability, absent technological progress, recedes with time—shares attributes of oil, including the questionable feature of “peaking.” In an admirable 2003 RFF Press book, *On Borrowed Time? Assessing the Threat of Mineral Depletion*, John Tilton, of the Colorado School of Mines and an RFF university fellow, shows how the real price of copper has been on an unmistakable downward path for the past 130 years, never mind periodically sharp volatility along the way (Figure 2). Over the course of more than a century, he explains, the cost-reducing effects of technological progress to sustain copper’s availability more than compensated for any pressures from depletion to drive up costs. But even more important to our future welfare, in Tilton’s words, is “whether society will be able in the future to provide the needs currently being served by these high-quality mineral deposits from other resources at real prices close to or even below those that currently prevail.”

In the case of copper, industry is rising to the challenge: not only did fiber-optic transmission replace reliance on copper wire in telecommunications, but by now,

microwave towers have replaced much of the fiber optic infrastructure. Recycling is another, if less glamorous, strategy. Still, a look at the most recent period charted in Figure 2 signals caution. As with oil, copper shows a price boom that appears not yet to have run its course. And, as with oil, the prudent catchphrase should be “stay tuned.”

Rare Earths

Many people were alerted to the topic of rare earths only in October 2010, when Japan detained a Chinese trawler captain and China retaliated by suspending rare earth exports to Japan. However isolated an example, rare earths raise issues of natural

worldwide geologic occurrence is abundant, China is the only significant producer of certain of these important materials. Moreover, the country is moving aggressively to gain a dominant stake in the finished products embedding these resources—a topic addressed in a recent RFF analysis conducted at the request of the U.S. Department of Energy. (See “Rare Earths: Valuable Resource and Political Challenge” on page 44.)

In an idealized market paradigm, China’s status as a quasi-monopolist would be competed away as other rare earth producers revived or started up extraction. But China seeks to foreclose that outcome through subsidization, along with an

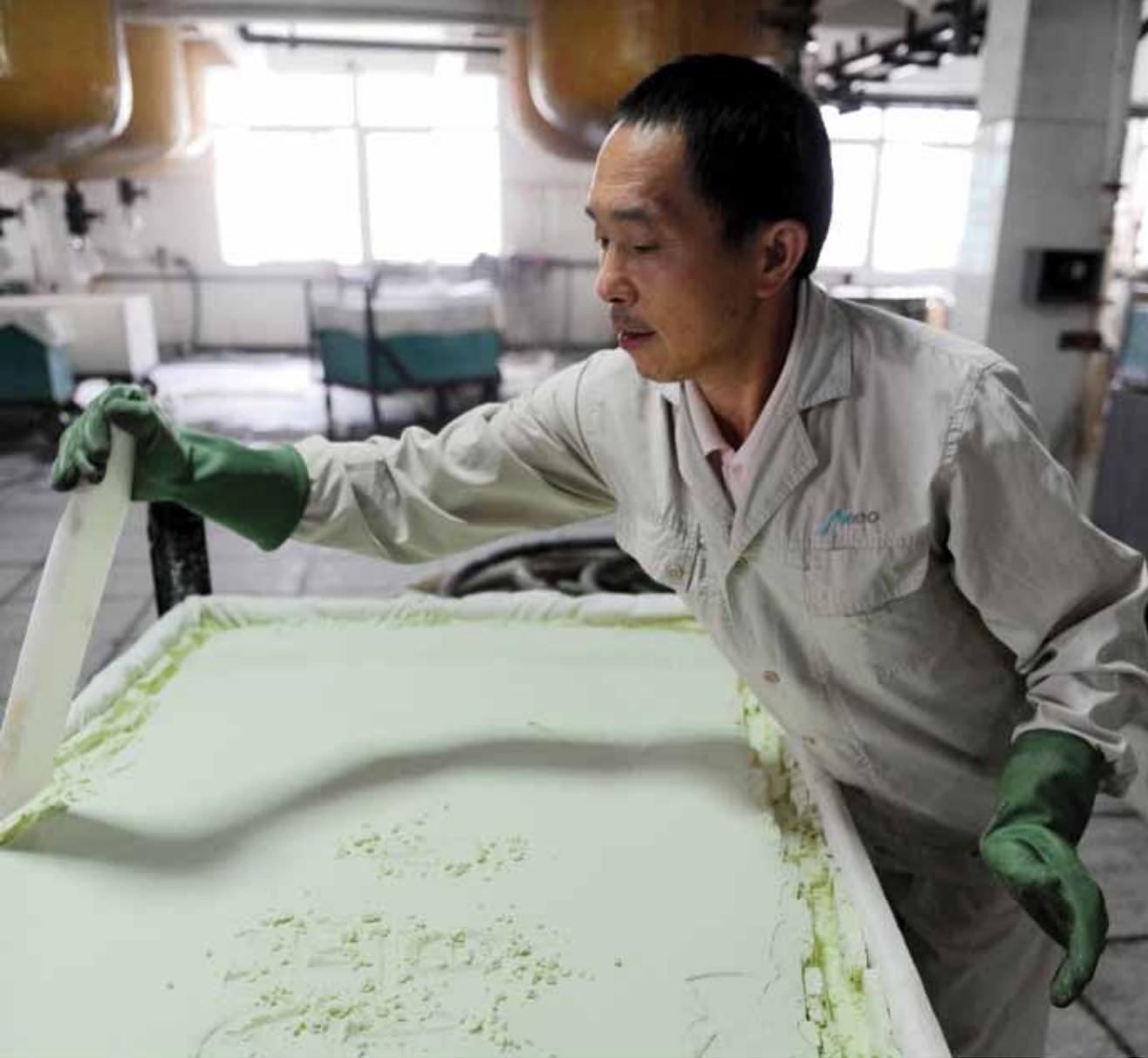
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resource markets, trade and investment policy, and—not far removed—effects on other countries, including the United States. Although rare earths can’t begin to match international oil transactions in quantitative and economic significance, their potential for stirring conflict and tension may be as real.

Rare earths are more than a dozen elements in the periodic table, primarily spanning atomic numbers 57–71, with magnetic and other properties. Their names—neodymium and dysprosium, to give two particularly important examples—hardly enjoy everyday familiarity. But they are critical inputs to energy and other systems and products that couldn’t be more familiar: batteries, lasers, computer memory, medical equipment, and photographic lenses are just a limited sampling. They have an especially vital role in energy applications, such as wind turbines. Although their

apparent willingness to tolerate some of the marked environmental impacts associated with rare earth mining. Export controls come into play as well, and at the high-value, manufacturing stage of rare earth-dependent equipment, imposition of domestic content requirements (which limit the investment stake of foreign firms) is yet another means of securing economic advantage for domestic industry.

In principle, claimed violations of World Trade Organization (WTO) rules can be filed with that body, but WTO intermediation and resolution can be a lengthy and frequently inconclusive process. Though hardly an antidote, international firms facing competitively restrictive practices have a strengthened incentive to counter with strategies of their own: development of substitutes for uncertain inputs; recycling of materials; and aggressive pursuit of technological progress. (Recall the copper example.) One



A worker at a factory in China's Ganzhou City processes yttrium, one of some 17 rare earth elements.

thing is certain: a plunge into prolonged trade conflicts—with few, if any, winners—would be an unfortunate consequence of this story.

Concluding Comments

Looking to the past to learn about the future of our natural resource supply, we see that over more than a century, the real petroleum price trend has been close to flat, despite the volatility surrounding that trend (see Figure 1). Recurrent and confident predictions of early exhaustion (or its flip side, runaway price increases) repeat-

edly have been negated by new reserve additions. As one example of a formerly economically unrecoverable resource, the Williston-Bakken shale oil formation stretching across the Dakotas and Montana has added at least an estimated billion barrels to U.S. oil reserves, with production these days running at around 200,000 barrels a day.

But these reassuring lessons from the past are not preordained to hold for the future. Consider: we probably face recourse to less hospitable and costlier producing regions; there looms the imperative of mitigating greenhouse gases and other

Rare Earths: Valuable Resource and Political Challenge

Rare earths have a variety of significant applications, including batteries, lasers, and computer hard disks, and the focus of a recent RFF study for the U.S. Department of Energy is their importance in the production of onshore and offshore wind turbines. The entire multistage supply chain begins with the extraction of rare earth ores and ends with the production of the turbines (along with key ancillary components, principally rare earth-dependent magnets).

Rare earth reserves are widely distributed around the world, with the U.S. portion estimated at around 11 percent. But China's production in recent years has accounted for close to 100 percent of the global total. With wind-generated electricity growing rapidly around the world, there is keen rivalry—not least on the part of China—in supplying the turbine market. As examined in the RFF study and attracting increasing attention by U.S. policymakers, observers have expressed concern about the prospect of a Chinese state-directed effort to parlay the country's current tight grip on the rare earth commodity market into dominance in the “downstream” segment of the supply chain as well.

For now, according to the RFF study, the U.S. economy “does not appear to be vulnerable to the exercise of market power along the supply chain.” But in the longer run, the picture could be more disturbing “if wind power deployment were to significantly exceed” the modest “baseline” growth projections of the Energy Information Administration.

For more information, see Brennan et al. 2012.

environmental risks; and a progressively more skewed geographic concentration of oil resources and reserves—hence market dominance in production capacity—seems likely. With all such factors playing out amid rapid economic growth in many parts of the world, the situation could presage a global oil profile significantly different from that of the past.

In the face of concerns over the perceived threat Chinese rare earth policies pose to U.S. competitiveness and national security, growing numbers in Congress are considering policy initiatives to blunt such impacts. The stakes associated with choosing wisely are large. It is worth asking whether it's time to update the findings of the Paley Commission by undertaking another major reconnaissance of U.S. and global resource

prospects and problems. ●

FURTHER READING

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