The Race for What's Left: The Global Scramble for the World's Last Resources. Michael T. Klare (director, Five College Program in Peace and World Security Studies, Hampshire College). NY: Metropolitan Books (Henry Holt and Company), March 2012, 306p, $27 (e-book $12.99)

Updated views by the author of **Resource Wars: The New Landscape of Global Conflict** (2001), and nine other books on energy and security matters, stressing that *"The world is facing an unprecedented crisis of resource depletion—a crisis that goes beyond "peak oil" to encompass shortages of coal and uranium, copper and lithium, water and arable land."* The global pursuit of vital natural resources has long shaped human history, providing the impetus for campaigns of exploration and conquest across the millennia. For several decades in the 20C, resource concerns were overshadowed by ideological strife as the main cause of international conflict. "*But now the importance of natural resources has reasserted itself, and as time goes on the race for what's left will play an increasingly dominant role in world affairs."*(p209)

"The end of 'easy' everything" also threatens survival of local communities, animal species, giant corporations, and entire nations. We can avoid calamity on a global scale only by abandoning the race altogether, focusing instead on developing renewable resources and maximizing efficiency. "Eventually, perhaps, substitutes will be found for some of these materials…but these efforts will take a long time to mature." Moreover, many of the new energy systems require the use of resources that are themselves scarce or difficult to obtain.

ARCTIC RESOURCES (chapters 1 and 3)

Long considered a frozen wasteland of little interest, the Arctic region is now believed to harbor vast deposits of oil, natural gas, and valuable minerals that will become increasingly accessible as global warming melts the polar ice cap. A 2008 assessment by the US Geological Survey estimates that areas north of the Arctic Circle have 13% of the world's undiscovered oil reserves and 30% of its undiscovered natural gas. All of the nations of the Arctic region (Russia, Canada, Greenland/Denmark, Norway, and the US) have announced plans to exploit the region's great hydrocarbon potential, and all have taken steps to reinvigorate their claims in this "energy gold rush." To a great degree, the geopolitics of the Arctic region will be shaped by the outcomes of disputes over contested international boundaries (US and Russia, US and Canada, Russia and Denmark, and the complex debate over ownership of the central Arctic Ocean).

DEEP-OFFSHORE OIL AND GAS (chapter 2)

All but a few large oil fields have already reached their peak output levels and now face long-term decline. Signs of depletion are widespread in the US, Mexico, Venezuela, Russia, and the North Sea area, and the rate of decline is getting faster every year, even as demand for oil continues to grow. The need to develop new sources of oil and natural gas will be particularly important for China and the US. Offshore drilling in coastal areas has been going on for >50 years, but "deepwater" drilling at depths >1000 feet is relatively new, requiring use of sophisticated technologies. Even newer is drilling "ultra-deepwater" wells at depths of >1 mile, requiring highly specialized rigs. Offshore oil will contribute 35% of global supplies in 2020 (up from 28% in 1995), and oil from deep and ultra-deep wells will grow from 1% in 1995 to 10% in 2020. For natural gas, 27% of world gas supplies came from offshore fields in 2000; by 2020, the share will rise to 41%. The *Deepwater Horizon* disaster in April 2010 illustrates the enormous dangers of deep drilling. Offshore drilling is increasing in Canada's Atlantic provinces and Brazil's Tupi reservoir, which lies beneath 1.5 miles of water and harbors some 8 billion barrels of oil. Several other "pre-salt" fields nearby could total 50 billion barrels for Brazil. Other promising fields are off the coast of Africa (Ghana, Liberia, Ivory Coast, and Sierra Leone), the contested East and South China Seas, Greenland's west coast (some 7.3 billion barrels of oil), the Falkland Islands (which may have up to 18 billion barrels of oil), and the US state of Virginia (only 130 million barrels of oil, but 1.1 trillion cubic feet of gas).

TAR SANDS AND SHALE GAS (chapter 4)

The Athabasca tar sands in northeastern Alberta may have as much as 1.7 trillion barrels of oil equivalent (bitumen), of which some 170 billion barrels are recoverable using present technologies. If accurate, this would make Canada the world's second oil power after Saudi Arabia. But oil from tar sands is expensive, burns great amounts of energy, and involves multiple environmental risks. Even so, major energy firms are flocking to Alberta, turning parts of the region into a blackened moonscape, with vast piles of discarded rock and pools of poisonous wastewater. Accelerating development of Canada's bitumen deposits is part of the larger trend of relying on unconventional fuels.

The IEA projects that total liquid fuel output from unconventionals (tar sands, extra-heavy oil, coal to liquids, and shale oil) will triple from 3% of world output in 2008 to 9% in 2035. Unconventional natural gas is likely to grow even faster, especially in the US, as hydrofracking allows exploitation of many gas deposits once considered inaccessible. Unconventional supplies from shale, other impermeable rock formations (tight gas) and coal-bed methane accounted for more than half of US gas production in 2008, and is projected to climb to 75% by 2035. The giant Marcellus shale formation in West Virginia, Pennsylvania, and New York State is thought to have as much as 600 trillion cubic feet of untapped gas—roughly one-third of total US natural gas reserves.

Further down the road of innovation is exploiting the earth's reserves of methane hydrates, a dense substance found beneath the Arctic permafrost and at the bottom of oceans. One cubic meter of hydrate releases 164 cubic meters of natural gas, adding up to "a colossal fuel resource—potentially containing twice as much energy as all the oil, coal, and conventional gas deposits on the planet combined." No economically viable method for mining the hydrates and safely extracting the methane has yet been developed, but Japan "hopes to begin commercial production of methane gas from hydrates in 2018," which alarms environmentalists, who fear accidental release of methane gas into the atmosphere that will accelerate climate change.

MINING'S NEW FRONTIERS (chapter 5)

Most of the world's mineral ores are still being extracted from mines established in the post-WWII period. Up to now, producers have been able to cope with depletion by digging deeper into existing deposits and by employing sophisticated techniques to extract minerals from lower-quality ores. But boosting output at current locations is increasingly difficult, while global demand is growing (China is already the world's leading consumer of steel, copper, tin, and aluminum). Finding fresh sources of supply is essential. "This race for new mineral reserves extends to virtually all of the basic industrial metals, including copper, iron, tin, titanium and bauxite (the source of aluminum)." Similar to the oil and gas companies, "major mining firms seeking added reserves are finding that most of the world's easily accessed deposits have already been fully exploited." Despite environmental and political challenges in the frontier areas, major mining firms see no choice but to gamble vast sums on exploration and expansion. "As the struggle for untapped reserves becomes more intense, only the largest companies are likely to survive, and even they risk losing their investments to unscrupulous rulers or rival firms. The main victims of the contest, though, are likely to be indigenous peoples and pristine natural landscapes." (p132) Describes mining-related developments in Gabon, Guinea, Niger, Afghanistan (which may have the world's largest untapped deposit of copper and the largest unexploited iron ore deposit in Asia), Mongolia (which may have untapped mineral reserves worth >$1.3 trillion), and the Arctic region.

RARE EARTHS AND OTHER CRITICAL MINERALS (chapter 6)

Rare earth elements (REE) include 17 different metallic substances with distinctive characteristics; most are located in a continuous stretch of the periodic table of the elements (beginning with lanthanum at #57 and extending to lutetium #71). The group also includes yttrium and scandium, two lower-numbered elements. REEs are distinguished by their ability to form unusually strong and lightweight magnetic alloys with other metals, and by their unique optical properties. Many of today's portable electronic devices contain rare earths, and these materials have been used for a wide variety of other purposes, e.g. liquid crystal displays in computer monitors and TVs, advanced electromagnets, lightweight batteries, and other green technologies.

The US used to have its own domestic REE supply chain, but their extraction from composite ores usually involves using acids of various kinds that produce toxic wastes. "By overlooking the environmental risks and lowering its production costs, China was able to undercut the other REE suppliers, eventually leading nearly all of its competitors to suspend their operations." REE mine production in 2010 totaled 134,000 metric tons, of which 130,000 came from China and 2,700 tons from India. (Estimated reserves: China has 55m metric tons, former Soviet Union has 19m, the US has 13m, India 3m, and other countries about 24m). China has recently imposed more state control on the REE industry and reduced export quotas, although insisting that it will supply key customers abroad—but "at substantially lower levels than in the past."

With ever-greater demand for these materials, the incentive to establish new rare earth mines has never been greater. "*According to one estimate, global REE demand will jump from 124,000 tons in 2010 to 185,000 tons in 2015.*" (p.159) With Chinese output unlikely to grow, many expect a high-stakes race among potential REE suppliers worldwide. In the US, the greatest hope for renewed rare earth production rests on plans to rehabilitate the abandoned REE mine at Mountain Pass CA, which began operation in 1965 and was the world's leading rare earths supplier for two decades. Ambitious investors are also gearing up to establish new REE sites, especially in Australia.

Five minerals and mineral groups have been identified by the National Research Council in 2008 as particularly critical (i.e. irreplaceable and vulnerable to supply disruptions) for US commercial and military users: indium, manganese, niobium, platinum-group metals, and the rare earths. Another six elements—copper, gallium, lithium, tantalum, titanium, and vanadium—were deemed less critical but still worthy of significant attention. Extensive descriptions are provided for lithium (especially from Bolivia), platinum-group metals (widely used in automotive catalytic converters, computer hard drives, and liquid crystal displays; most world production currently comes from Russia and South Africa), and tantalum (used for specialty steels and in electronic devices).

In sum, *"many advanced green technologies depend on relatively scarce, hard-to-acquire specialty elements whose future availability cannot be ensured; as time goes on, struggles over the control of these materials could prove no less intense and significant than the past battles over petroleum, copper, and other basic commodities of the industrial age."*

GLOBAL "LAND GRABS" AND THE STRUGGLE FOR FOOD (chapter 7)

"Arable land is becoming a premium commodity, just like oil, gas, copper, platinum, and other materials." Around the world, countries flush with cash but poor in arable land are now rushing to secure vast amounts of acreage in land-rich but underdeveloped nations. In theory, such trades are "win-win" where both sides could benefit, but in practice "they usually raise extraordinarily ethical and political questions" such as privileged enclaves in the midst of poor rural communities (e.g., Saudi Arabian agricultural projects in Sudan and Ethiopia). In many parts of the world, large tracts of supposedly uninhabited land are being given away in willful disregard of indigenous populations who inhabit these areas. "Violence is likely to be an increasingly conspicuous feature of the 'land grab' phenomenon."

There are few agricultural frontiers left to explore, while existing farmland is being whittled away by desertification, urbanization, and other powerful forces. Some experts believe that technology such as bioengineered crops can help avert disaster. Others such as Lester Brown argue that topsoil is eroding faster than new soil forms on perhaps a third of world cropland, which will lead to soaring food prices.

Saudi Arabia and other Persian Gulf nations are the most avid seekers of foreign cropland, by subsidizing private or state-owned companies to grow crops abroad and export them. China, India, and South Korea are also enhancing national security in this manner, although they each have substantial cropland reserves of their own. Some 60 South Korean firms were conducting farming operations in 16 foreign countries by the end of 2010; together, these firms seek to control one million acres of foreign farmland by 2018. Indian companies are buying land in many parts of Africa, and the Chinese government has called on its firms to seek farmland abroad in a "go outward strategy," especially in Brazil and Africa.

Adding to this scramble for farmland, many private investors worldwide now regard arable land as a lucrative asset, as illustrated by the third "Global AgInvesting" conference held at the Waldorf Astoria in NYC. Similar conferences run by the agribiz consulting firm Soyatech are being held in Switzerland, Singapore, and Abu Dhabi. Dow Chemical has established a $6 billion subsidiary, Black River Investment Management, for large-scale investments in overseas farmland.

As of 2010, the World Bank estimated that fully half of cropland acquisition projects involved locations in sub-Saharan Africa, because Africa still has large untilled areas that can be acquired at comparatively low prices, and most African governments are very accommodating to potential buyers. Brief discussions of Kenya, Liberia, Mali, Senegal, and Democratic Republic of the Congo are provided, as well as areas of the former Soviet Union (where cropland has been developed, but is idle).

CONCLUSION: SHAPING THE COURSE OF HISTORY (chapter 8)

"As easy-to-access reserves of all these various resources disappear, the price of basic commodities will rise, producing extreme hardship for the poor and requiring lifestyle changes--sometimes quite significant ones—for those of greater means." (p213) The increased cost of gasoline, for example, has already forced some Americans to curb their discretionary driving. Food prices are increasing for several reasons, but, according to the World Bank, they were largely driven by rising energy costs. Most analysts believe that food prices will remain high for decades to come. "*Steady and substantial increases in the price of food are certain to produce widespread suffering among the poor and trigger periodic explosions of rage,"* as evident in the Arab Spring protests of 2011 (p214). The transition away from an easy-resource world will also set the stage for ferocious competition between major corporations and for perilous wrangling among rival nation-states. These struggles, too, will shape the course of history. "Only a handful of giant resource firms are likely to secure control of enough exploitable deposits to prosper and thrive. All others will shrink, go bankrupt, or become absorbed by the more powerful companies." (p214)

"Nations that succeed in securing supplies of vital materials will gain an elevated position in the global order, while those that fail to do so will slide downward." (p218) Among the most notable manifestations of burgeoning government involvement in acquiring critical materials is the increasing use of national funds to ensure access. More countries are also relying on military tools to secure their resource needs, thus "the risk of war is bound to increase." The most likely site for a confrontation is the East and South China Seas, which are believed to have significant oil and natural gas deposits. China claims that both seas lie mostly within its territorial waters, but Japan claims a large swatch of the East China Sea, while major portions of the South China Sea are claimed by Veitnam, the Philippines, Malaysia, and Brunei. All of these countries have deployed air and naval forces in the contested areas. Similar aggressive posturing by rival claimants has also occurred in the Arctic, the Falkland Islands, and the Celebes Sea off Malaysia and Indonesia.

"*Instead of rushing to extract what remains of the earth's vital resources, major political and corporate powers could engage in a* ***race to adapt:*** *a contest to become among the first to adopt new materials, methods, and devices that will free the world from its dependence on finite resource supplies."* (p227). This race has already begun in the struggle to claim leadership in developing "green" technology. China, in particular, openly seeks to become a dominant force in the green-technology field. The government has designated seven "strategic emerging industries" (including alternative energy, energy-efficient technology, alternative energy vehicles, advanced materials, and bioengineering), which together will rise from 3% of China's GDP in 2010 to 15% by 2020. Whereas the US was the world's top investor in clean energy up through 2008, China took the lead in 2009. Relative to the size of its economy, total US investment in clean energy now ranks #8, behind such countries as Italy, Canada, Brazil, Spain, and Australia.
"*Like the current scramble for the world's last remaining resources, the race to adapt will spell doom for slow-moving companies, and it will cause a grand reshuffling of the global power hierarchy. But it is not likely to end in war, widespread starvation, or a massive environmental catastrophe—the probable results of persisting with the race for what's left."* (Final thoughts, p.234)

REVIEWER'S NOTE

A highly original synthesis that will change your view of the near-term future. This very readable tour de force deals not only with the end of "easy" oil and gas (also see Daniel Yergin, **The Quest**; GFB Book of the Month, Nov 2011), but also with the new Arctic frontier, mining frontiers, rare earth elements, and—perhaps most important--arable land, with emphasis on economic and political implications of competing for "the world's last resources." A remarkable amount of specific factual material is synthesized, backed up by 55 pages of footnotes. The phrase "new colonialism" is not used, but could very well be applicable, especially regarding the "land grabs."

Very different in style and content, yet remarkably complementary, is **Scarcity: Humanity's Final Chapter?** by independent scholar Christopher O. Clugston of Bethlehem PA (Booklocker.com, 2012, 398p, $19.95pb; www.nnrscarcity.com), with a foreword by William R. Catton Jr., author of **Overshoot** (U of Illinois Press, 1980). Clugston analyses 89 NNRs (Non-renewable Natural Resources), of which 63 were considered globally scarce in 2008, and 28 are almost certain to remain scarce permanently, barring major new economically viable discoveries. Within "the next few years," NNR scarcity will become noticeable (as prices rise), inconvenient, disruptive, and debilitating. Supply shortfall probability by 2030 is "Nearly Certain" for cadmium, gold, mercury, tellurium, and tungsten; "Very High" for cobalt, lead, molybdenum, silver, titanium, and zinc; and "High" for natural gas (!) and coal. Each mineral is analyzed for US and global scarcity, projected peak production year, substitutes, etc. A thoughtful 17-page PDF summary of this book by John Bermingham of Denver CO is available by request at berm-j@nilenet.com .

The Clugston analysis makes Klare's book appear relatively tame. Klare consistently focuses on "the race for what's left," suggesting that easy resources are diminishing, that new discoveries will be made (albeit in dicey locations), that "substitutes will be found" for some materials, and that an expanding "race to adapt" will mitigate or resolve resource problems. Clugston assumes little or no new resource development or substitutability, and thus imminent catastrophe. In either case, the struggle for resources will gain increasing attention.