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McKinsey Global Institute
McKinsey Sustainability & Resource Productivity Practice




September 2013

Resource Revolution: Tracking global commodity markets

Trends survey 2013

The McKinsey Global Institute

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MGI research combines the disciplines of economics and management, employing the analytical tools of economics with the insights of business leaders. Our "micro-to-macro" methodology examines microeconomic industry trends to better understand the broad macroeconomic forces affecting business strategy and public policy. MGI's in-depth reports have covered more than 20 countries and 30 industries. Current research focuses on five themes: productivity and growth; the evolution of global financial markets; the economic impact of technology and innovation; urbanization; and natural resources. Recent research covers job creation, infrastructure productivity, cities of the future, and a new wave of disruptive technologies.

MGI is led by McKinsey & Company directors Richard Dobbs, James Manyika, and Jonathan Woetzel. Yougang Chen, Michael Chui, Susan Lund, and Jaana Remes serve as MGI principals. Project teams are led by a group of senior fellows and include consultants from McKinsey's offices around the world. These teams draw on McKinsey's global network of partners and industry and management experts. In addition, leading economists, including Nobel laureates, act as research advisers. The partners of McKinsey & Company fund MGI's research; it is not commissioned by any business, government, or other institution. For further information about MGI and to download reports, please visit www.mckinsey.com/mgi.

McKinsey & Company's Sustainability & Resource Productivity Practice

Greater pressure on resource systems together with increased environmental risks present a new set of leadership challenges for both private and public institutions. McKinsey & Company's Sustainability & Resource Productivity Practice (SRP) works with leading institutions to identify and manage both the risks and opportunities of this new resource era and to integrate the sustainability agenda into improved operational performance and robust growth strategies. SRP advises companies on how to capture emerging opportunities in energy, water, waste, and land use, as well as harnessing the potential of clean technologies to create smarter systems, new jobs, and competitive advantage. SRP helps governments to incorporate sustainability into their long-term economic growth plans, supporting the welfare and prosperity of their people and protecting the natural capital of their countries.

The practice draws on more than 1,000 consultants and experts across McKinsey's offices with academic backgrounds in fields such as development and environmental economics, chemical engineering, oceanography, weather modeling, waste engineering, and international affairs. This expertise combines with McKinsey's deep industry insights developed through decades of advising companies in sectors from energy, mining, and forest products to consumer goods, infrastructure, and logistics. The practice is led by Jeremy Oppenheim and Scott Nyquist, together with a global leadership team including Tomas Nauclér (global knowledge), Stefan Knupfer (global learning), Martin Stuchtey (strategic resources, including low carbon economics, water, materials and waste, bio-systems, and clean technologies), Johan Ahlberg (green operations), and Stefan Heck (sustainable transformations, including corporate transformation, sustainable cities, and country and regional green growth). For further information about the practice and to download reports, please visit http://www.mckinsey.com/client_service/sustainability.aspx.

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Executive summary

Trends in resource prices have changed abruptly and decisively since the turn of the century. During the 20th century, resource prices (in real terms) fell by a little over a half percent a year on average. But since 2000, average resource prices have more than doubled. Over the past 13 years, the average annual volatility of resource prices has been almost three times what it was in the 1990s.[1] This new era of high, rising, and volatile resource prices has been characterized by many observers as a resource price "super-cycle." Since 2011, commodity prices have eased back a little from their peaks, prompting some to question whether the super-cycle has finally come to an end. But the fact is that, despite recent declines, on average commodity prices are still almost at their levels in 2008 when the global financial crisis began. Talk about the death of the super-cycle appears premature.

Some of the key findings of our analysis are:

- Despite intense current focus on shale gas and its impact on reducing natural gas prices in the United States, most, if not all, resource prices remain high by historical standards—even at a time when the world economy has not fully emerged from its post-recession period of slow growth.

- The volatility of resource prices has also been considerably higher since the turn of the century. While short-term volatility is influenced by many factors, such as droughts, floods, labor strikes, and restrictions on exports, there also appears to be increasing evidence of a more structural supply issue that is driving longer-term volatility. Supply appears to be progressively less able to adjust rapidly to changes in demand because new reserves are more challenging and expensive to access. For example, offshore oil requires more sophisticated production techniques. Available arable land is not connected to markets through infrastructure. Mineral resources increasingly need to be developed in regions that have high political risks. Such factors not only increase the risk of disruptions to supply but also make supply even more inelastic. As supply becomes increasingly unresponsive to demand, even small changes in that demand can result in significant changes in prices. Investors may be deterred by the volatility in resource prices and become less inclined to invest in new supply or resource productivity initiatives.

- The prices of different resources have been increasingly closely correlated over the past three decades.[2] While rapid growth in demand for resources from China has been an important driver of these increased links, two additional factors are also important. First, resources represent a substantial

1 Volatility is measured by the standard deviation from the mean commodity price.

2 Correlation is measured using Pearson's correlation coefficient. It is calculated by dividing the covariance of the two variables by the product of their standard deviations. The Pearson correlation is +1 in the case of a perfect positive correlation and –1 in the case of a perfect negative correlation. If the variables are independent, Pearson's correlation coefficient is 0.

proportion of the input costs of other resources. For instance, rising energy costs in fertilizers drive higher production costs in agriculture. Second, technology advances are enabling more substitution between resources in final demand—for instance, biofuels link agriculture and energy markets. As a result, shocks in one part of the resource system today can spread rapidly to other parts of the system.

- With the notable exception of shale gas, long-term supply-side costs continue to increase. While the world does not face any near-term absolute shortages of natural resources, increases in the marginal costs of supply appear to be pervasive and put a floor under the prices of many commodities. At the same time, there is no shortage of resource technology, and higher resource prices are likely to be a catalyst for faster innovation. Technology could transform access to both resources and its productivity. For example, 3D and 4D seismic technology could significantly improve energy exploration, while organic chemistry and genetic engineering could foster the next green revolution. In the years ahead, resource markets will be shaped by the race between emerging-market demand and the resulting need to increase supply from places where geology is more challenging, and the twin forces of supply-side innovation and resource productivity.

- The historical and future drivers in energy, metals, and agriculture (food and raw materials) vary:

  — **Energy.** Prior to the 1970s, real energy prices (including those of coal, gas, and oil) were largely flat as supply and demand increased in line with each other. During this period, there were discoveries of new, low-cost sources of supply, energy producers had weak pricing power, and there were improvements in the efficiency of conversion of energy sources in their raw state to their usable form. This flat trend was interrupted by major supply shocks in the 1970s when real oil prices increased sevenfold in response to the Yom Kippur War and the subsequent oil embargo by the Organization of Arab Petroleum Exporting Countries (OAPEC). But after the 1970s, energy prices entered into a long downward trend due to a combination of substitution away from oil in electricity generation in Organisation for Economic Co-operation and Development (OECD) countries, the discovery of low-cost deposits, a weakening in the bargaining power of producers, a decline in demand after the break-up of the Soviet Union, and subsidies. However, since 2000, energy prices (in nominal terms) have increased by 260 percent, due primarily to the rising cost of supply and the rapid expansion in demand in non-OECD countries.[3] In the future, strong demand from emerging markets, more challenging sources of supply, technological improvements, and the incorporation of environmental costs will all shape the evolution of prices.

3 The role of gas in the energy index is important to note. Gas represents just over 12 percent of the energy index. There has also been significant regional divergence in global gas prices, as we describe later in this survey.

— **Metals.** Real metals prices overall fell by 0.2 percent (increased by 2.2 percent in nominal terms) a year during the 20th century. However, there was some variation among different mineral resources. Steel prices were flat, but real aluminum prices declined by 1.6 percent (increased by 0.8 percent in nominal terms) a year. The main drivers of price trends over the last century included technology improvements, the discovery of new, low-cost deposits, and shifts in demand. However, since 2000, metals prices (in nominal terms) have increased by 176 percent on average (8 percent annually). Gold has increased the most of the major metals, driven predominantly by investors' perceptions that it represented a safe asset class during the volatility of the financial crisis, rising production costs, and limited new discoveries of high-grade deposits. Copper and steel prices (in nominal terms) have increased by 344 percent and 167 percent, respectively, since the turn of the century, even taking into account recent price falls. Many observers of these price increases have pointed to demand from emerging markets such as China as the main driver. However, McKinsey's Basic Materials Institute finds that, while demand from such emerging markets has played an important role, the changing cost of supply, driven by a combination of geological issues and input cost inflation (particularly energy), has also been an important factor behind rising prices—but one that has received less attention to date. In the future, a similar set of factors as in the case of energy—namely demand from China, more challenging access to supply, logistical and skills challenges, and the incorporation of environmental costs—will all shape metals prices.

— **Agriculture.** Food prices (in real terms) fell by an average of 0.7 percent (increased by 1.7 percent in nominal terms) a year during the 20th century despite a significant increase in food demand. This was because of rapid increases in yield per hectare due to the greater use of fertilizers and capital equipment, and the diffusion of improved farming technologies and practices. However, since 2000, food prices (in nominal terms) have risen by almost 120 percent (6.1 percent annually) due to a declining pace of yield increases, rising demand for feed and fuel, supply-side shocks (due to droughts, floods, and variable temperatures), declines in global buffer stocks, and policy responses (e.g., governments in major agricultural regions banning exports). Non-food agricultural commodity nominal prices—including timber, cotton, and tobacco—have risen by between 30 and 70 percent since 2000. Rubber prices have increased by more than 350 percent because supply has been constrained at a time when demand from emerging economies for vehicle tires has been surging. In the future, agricultural markets will be shaped by demand from large emerging countries such as China, climate and ecosystem risks, urban expansion into arable land, biofuels demand, and the potential for further productivity improvements.

Related MGI and McKinsey research

McKinsey Insights iPad app (September 2013)

This new app provides mobile access to the latest perspectives from McKinsey, MGI, and *The McKinsey Quarterly*. Our articles and reports address the most challenging issues facing senior leaders around the world, spanning countries, industries, and all business functions to examine leadership and corporate strategy to organization, technology, marketing, and operations. The app is available from the Apple App Store.

Urban world tablet app for iPad and Android (May 2013)

An unprecedented wave of urbanization is driving the most significant economic transformation in history, as the center of economic gravity shifts decisively east. MGI's new tablet app offers an intuitive sense of this new urban world, showcasing GDP, population, and income levels for more than 2,600 cities worldwide in 2010 and 2025. The app is available from the Apple App Store and Google Play.

Urban world: Cities and the rise of the consuming class (June 2012)

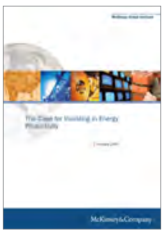
This finds that the 600 cities making the largest contribution to a higher global GDP—the City 600—will generate nearly 65 percent of world economic growth by 2025. However, the most dramatic story within the City 600 involves just over 440 cities in emerging economies; by 2025, the Emerging 440 will account for close to half of overall growth.

Resource Revolution: Meeting the world's energy, materials, food, and water needs (November 2011)

Meeting the world's resource supply and productivity challenges will be far from easy—only 20 percent of the potential is readily achievable, and 40 percent will be hard to capture. There are many barriers, including the fact that the capital needed each year to create a resource revolution will rise from roughly \$2 trillion today to more than \$3 trillion.

Pathways to a low-carbon economy: Version 2 of the global greenhouse gas abatement cost curve (McKinsey & Company, January 2009)

This report includes an updated assessment of the development of low-carbon technologies and macroeconomic trends, and a more detailed understanding of abatement potential in different regions and industries. It also assesses investment and financing requirements and incorporates implementation scenarios for a more dynamic understanding of how abatement reductions could unfold.



The case for investing in energy productivity (February 2008)

MGI research finds that the economics of investing in energy productivity—the level of output we achieve from the energy we consume—are very attractive. This detailed report assesses the additional investment and key actions needed to capture the productivity potential. Additional annual investments in energy productivity of \$170 billion through 2020 could cut global energy demand growth by at least half while generating average internal rates of return of 17 percent. Such outlays would also achieve significant energy savings and cuts in greenhouse gas emissions.

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