# Global Commodity Markets Annex

Overview

Commodity prices have surged since their lows during the depth of the financial crisis (figure Comm.1). Since end-2008, energy prices have more- than doubled, but still remain well below their former peaks. Metals prices are up almost 170 percent while agriculture and food prices are 77 and 60 percent higher, respectively.

The 2010/11 spike in commodity markets has been driven by a recovery in demand and numerous supply constraints. Adverse weather (droughts and heavy rains) in many regions has affected several agriculture markets, as well as coal and metals production. Political unrest, mainly in North Africa and the Middle East, has resulted in a loss of oil supply—and fears of further disruptions have pushed oil prices even higher. And in so far as these commodity indexes reflect dollar prices, the depreciation of the dollar has also contributed to their rise. Between July 2010 and April 2011, the dollar has depreciated 12.9 percent against the euro and 7.7 percent against a broader group of trading partners.

Crude oil prices, which were stable during the first three quarters of 2010 (averaging $77/bbl), began to rise as demand growth accelerated and stocks fell late in the year. In 2011, prices rose sharply and exceeded $116/bbl in April

Figure Comm.1 Key price indices

$US nominal, 2000=100
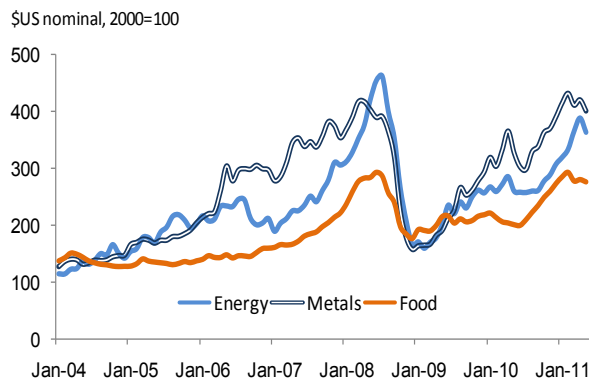
Source: World Bank.

following the loss of 1.3mb/d of Libyan oil exports (and smaller losses elsewhere). Fears of further disruptions in major oil producing countries have also underpinned prices. The loss of Libyan light/sweet crude tightened distillate markets, which were further aggravated by the loss of distillate exports from Japan following the earthquake that damaged refineries. OPEC's spare capacity is mainly medium-sour crude, thus the challenge will be to replace light/sweet crude to manufacture sufficient distillate to meet increasingly stringent low-sulfur regulations. Crude oil prices are expected to remain elevated in the near term until product markets are in better balance to meet summer demand, and fears of further crude oil disruptions subside.

Metals and minerals prices recovered sharply in 2009 due to strong demand and restocking in China. While Chinese demand growth slowed in 2010 it was offset by stronger growth elsewhere, mainly in the OECD. By February, prices of metals exceeded their May 2008 peak by 4 percent, with tin and copper reaching all-time highs due to supply constraints. Other metals markets have been less supply constrained, in particular aluminum, where China is a net exporter. Prices are expected to strengthen further in 2011 as demand recovers, notably from China.

Agricultural prices began to rise sharply in mid-2010 due to adverse weather conditions (notably drought conditions in Central Europe which saw Russia's wheat crop decline by 25 percent), and in the case of raw materials, strong demand. High energy prices have also played a role, both by diverting agricultural land to biofuel production, but also as higher fuel and fertilizer prices pushed up production costs.

Overall, agricultural prices increased 45 percent between June 2010 and February 2011 and as of May 2011, they were 6.4 percent above their June 2008 peak. By May, raw materials prices were 33 percent above their 2008 peak due to

record high prices for cotton and rubber on strong demand and supply shortfalls. Beverage prices were almost 30 percent above peaks owing to weather-related shortages of Arabica coffee supplies and political disruption of cocoa supplies in Côte d'Ivoire. High sugar prices have pushed the "other" food category to 12 percent above its earlier peak. Grains and edible oils prices remain below their former peaks on improving supply conditions for many of these commodities, although stocks remain relatively low.

Most commodity prices are set to remain high in 2011 and to weaken only modestly through to 2013, reflecting continued robust demand, low stocks and ongoing supply constraints in some cases. Crude oil prices are expected to average $107/bbl in 2011 and weaken slightly over 2012-13, assuming that political unrest in North Africa and the Middle East is contained. Metals prices are expected to rise by 20 percent in 2011 on persistently strong demand, led by China, and weak supply response for some metals, notably copper and tin. Food prices in 2011 are expected to average 20 percent above 2010 levels as well, on the assumption of a normal crop year and no further rises in oil prices (table Comm.1).

The risks to this price forecast are mostly to the upside. The spread of political unrest in the Middle East and North Africa could push crude oil prices much higher in the shorter term, especially if there is disruption to a major oil producer. Stronger demand from China could boost metals prices by more than currently expected,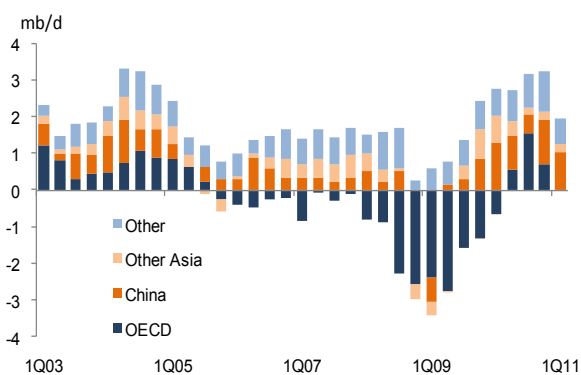 and continued supply constraints could further aggravate markets. Given low stock levels, agricultural (and especially food) prices will remain sensitive to adverse weather conditions and energy prices. Moreover, at current or higher oil prices, biofuels production becomes an increasingly attractive use of land and produce, likely increasing the sensitivity of food to oil prices. Downside risks mainly entail slower demand growth and more favorable supplies.

Energy: overview and outlook

Crude oil prices were fairly stable through the first three quarters of 2010, averaging $77/bbl, reflecting ample stocks and OPEC production restraint amid strong demand growth (3.3 percent or 2.8mb/d for 2010) versus an average 1.3mb/d over the past decade. In the fourth quarter of 2010, prices began to rise due to an acceleration in demand growth to 3.8 percent and declining stocks; prices averaged $90/bbl in December.

Oil demand in high-income OECD countries which had been declining since the fourth quarter of 2005, advanced by 1.2 percent or 0.6mb/d; while demand in non-OECD countries increased 5.7 percent or 2.3mb/d–with Chinese demand representing about 1mb/d. In the first quarter of 2011, global oil demand was 2.3 percent higher than a year earlier, with year-over-year growth rates expected to ease to near 1.5 percent (1.3mb/d) consistent with the long-term trend of the past decade (figure Comm.2).

Table Comm.1 Key nominal price indices
(Actual and forecasts, 2000=100)

	Actual						Forecast	
	2005	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*
Energy	188	221	245	342	214	271	*362*	*345*
Non-Energy	149	190	233	275	209	267	*321*	*284*
Agriculture	133	150	180	229	198	231	*277*	*230*
Food	134	147	185	247	205	224	*265*	*222*
Beverages	137	145	170	210	220	254	*286*	*238*
Raw Materials	131	160	175	196	169	237	*304*	*247*
Metals & Minerals	179	275	339	336	222	337	*406*	*395*
Fertilizers	163	169	240	567	293	280	*349*	*283*
MUV	110	112	117	125	118	121	*127*	*123*

Source: World Bank

Figure Comm.2 World Oil demand

Source: IEA and World Bank

Most of the increase in oil demand was met from increased production by non-OPEC producers and through reductions in inventories. OPEC output growth in recent months has been limited as the cartel has sought to support prices at below their recent amplified levels.

Non-OPEC output increased 2.0mb/d since 2008, reflecting both the exploitation of new fields and more intensive production from existing ones made more profitable by higher prices. The biggest increases came from the United States, Russia, China, Brazil, Colombia, Kazakhstan, Azerbaijan, Canada, and Oman, as well as from a sizeable increase in biofuels. Partially offsetting these gains were large production losses in the North Sea and Mexico.

OPEC production increased 1.9mb/d since April 2009 (prior to the loss in Libya), but still remains below its peak levels of 31.9mb/d in mid-2008.[1] Most of the increase has taken place in Saudi Arabia, Iraq, the UAE, and Nigeria (figure Comm.3).

Despite a drawdown of inventories, global stocks remain high—though outside of the United States, inventory levels at the end of winter were at the lower end of their 5-year range (figure Comm.4).

Political turmoil adds to price volatility

The spikes observed in 2011 mainly reflect political developments in North Africa and the Middle East, which resulted in the loss of 1.6mb/d in Libyan oil production and 1.3mb/d in exports. Some damage to facilities and oil fields occurred, and it is widely expected that exports will be curtailed for some time. In addition more than 0.1mb/d of crude oil production was shut down in March from unrest and strikes in Yemen, as well as smaller volumes in Oman, Gabon and Côte d'Ivoire—all non-OPEC countries. Just as importantly, oil prices were bid up by fears of larger supply disruptions in major OPEC oil producers.

The supply response from other OPEC countries has been limited—mainly because of weak demand for the medium-sour crude that OPEC has in spare capacity (the lost Libyan production is light, sweet and distillate-rich crude oil), and because the supply disruption occurred during the seasonal downturn in demand due to refinery maintenance.

Nevertheless, the pickup in global demand has drawn-down OPEC's spare capacity (excluding Libya, Iraq, Venezuela and Nigeria) to 4mb/d, down from more than 5mb/d at the end of 2010. Because of the loss of Libyan distillate-rich sweet crudes, distillate markets worldwide has tightened. As refinery demand picks up in the second quarter to meet summer demand, further upward pressure on high-quality crudes is likely.
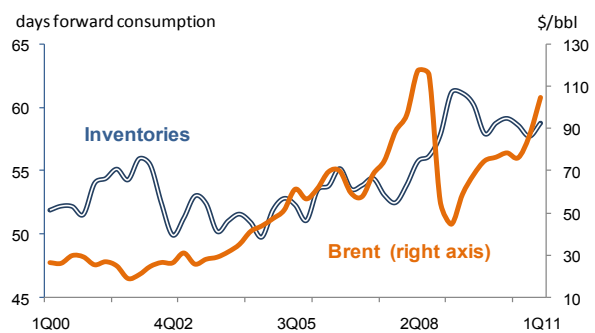
Outlook

Oil prices are expected to remain elevated as long as physical supplies are disrupted and fears persist of larger disruptions from political unrest in oil producing countries. The loss of Libyan light sweet, crude will continue to affect product

Figure Comm.3 World oil production
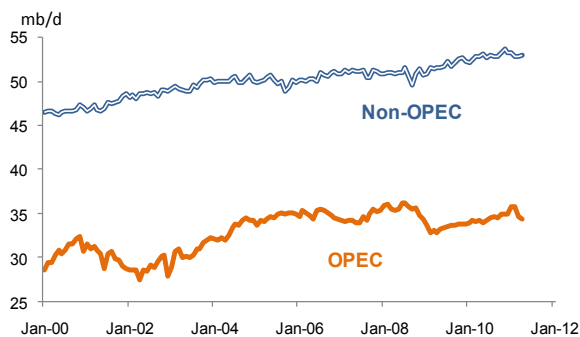
Source: IEA

Figure Comm.4 OECD oil inventories and oil price

Source: IEA, World Bank

markets, especially as increasingly stringent regulatory rules on refined products further intensify demand for light, sweet crude.

In the baseline projection, oil production is assumed to normalize toward the end of 2011, and oil prices are anticipated to decline gradually toward $80/bbl in real terms by 2020. This implies a nearer-term price profile of $107.2/bbl in 2011, easing only modestly to $98.7/bbl by

2013. Yet, individual prices may move within a wide range from each other, as has been the case during the past six months (box Comm.1).

At these prices, there are no resource constraints far into the future. At $80/bbl in real terms, production of Canadian tar sands are profitable and reserves from this source are second only to those of Saudi Arabia in crude oil. Such elevated prices should also serve to both foster production

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Box Comm.1 Different prices for different fuels

The recent run up in crude oil prices has been associated with an unusual divergence between the price of West Texas Intermediate oil (WTI) and Brent and Dubai crude oil prices. Historically, WTI has traded at a premium of about $1.30/bbl to Brent, but toward the end of 2010 the WTI price began falling below the Brent price because of a build-up in crude-oil inventories in Cushing Oklahoma, the delivery point for WTI oil in NYMEX futures contracts. Currently WTI oil is trading at about 90 percent of the Brent price (box figure Comm.1a).

The increase in inventories was mainly due to the inflow of Canadian crude through the new Keystone pipeline, and has little outlet except through refinery processing in Cushing. Bottlenecks are likely to continue until new pipeline capacity to the Gulf coast is available (2013), and from Alberta to the Pacific coast (2015).

The other major price divergence, which has been more durable, has been between oil prices and natural gas prices. Whereas the former have increased nearly fourfold since 2000, natural gas prices linked to oil (in Europe and Japan) have increased only 160percent, while those in the fully competitive U.S. market are essentially unchanged. Relatively lower natural gas prices reflect increases in supply from both new liquefied natural gas (LNG) capacity and unconventional shale gas. LNG capacity, which allows gas to be transported by sea, is projected to increase more than 50 percent between 2009 and 2013. In the United States, natural gas from shale-gas reserves has been growing rapidly due to new extraction techniques, which have not only pushed down U.S. natural gas prices, but also reduced prospective global demand for LNG.

Growing supplies of unconventional gas are expected to keep U.S. natural gas prices well below oil prices. Already, U.S. natural gas now costs less than coal. Contract prices in Europe and Japan, which are tied to oil prices, are expected to come under downward pressure as end-users increasingly push to tie these prices more closely to spot prices for natural gas (box figure Comm.1b).
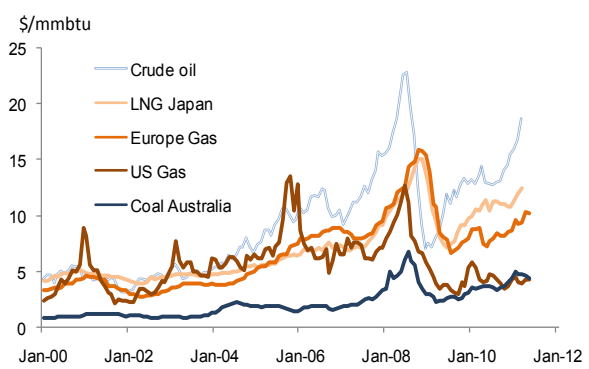
Over time, these large gaps between oil and natural gas prices can be expected to induce shifts in consumption from oil to natural gas, reducing demand for oil, and as a result reducing price pressures.

Box figure Comm.1a Brent/WTI price differential

Source: World Bank

Box figure Comm.1b Energy prices

Source: World Bank

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of alternative renewable energies and induce demand-side substitution toward other less expensive forms of energy.

The main impediments to supply growth are above-ground policies and conditions, i.e., taxation, access, environmental constraints, and geopolitical risk.

Risks to the oil outlook

On balance, short term risks are on the upside likely to emanate from further supply disruptions. Large supply-shocks can have significant impacts on oil prices and economic activity, as in the past. Environmental issues may curb non-OPEC production growth in bio-sensitive or resource-intensive areas, e.g., offshore, oil sands, and shale-rock fracturing (these sources account for more than one-third of global oil supplies).

OPEC production policies can also affect price levels. In the past, the group has taken aggressive action to rein-in production when prices fall, but has taken only limited action when prices rise, choosing instead to accept the windfall gains.

An additional risk to energy prices is the longer term impact of the Fukushima nuclear accident. Nuclear energy has played a key role in global energy consumption. Its contribution increased from of 1.6 percent during the 1970s to 6.3 percent during 2000-08 (table Comm.2). During this period crude oil's share declined from 44.7 to 35.0 percent. In effect, the decline in crude oil was compensated almost equally by increases in

Table Comm.2 Shares of global energy consumption (percent of total)

|	1971-80	1981-90	1991-2000	2001-08
Crude Oil (total)	44.7%	38.3%	36.6%	35.0%
Natural Gas	16.3%	18.2%	19.9%	20.8%
Coal and Coal Products	24.5%	25.5%	23.7%	24.9%
Nuclear	1.6%	4.8%	6.5%	6.3%
Combustible Renewables and Waste	10.6%	10.7%	10.5%	10.0%
Hydro/Other	2.3%	2.5%	2.8%	2.9%

Source: IEA and World Bank

natural gas and nuclear power. A combination of reduction in the share of nuclear and the likely environmental pressures in crude oil and coal may indeed exert additional pressure in energy prices over the longer term.

Metals: overview and outlook

Metals and minerals prices have recovered strongly in the last two years due to robust demand, with the aggregate price index in May 2011 up 155 percent since its recession-induced lows of December 2008. Strong price increases were observed in markets that experienced supply constraints. For example, copper and tin reached all-time nominal highs in 2011 (up 220 and 200 percent, respectively from their 2008/09 lows) (figure Comm.5). Most metals prices have at least doubled, but price increases were more moderate for those where supplies were ample as in the case of aluminum.[2]

Figure Comm.5 Copper and aluminum prices
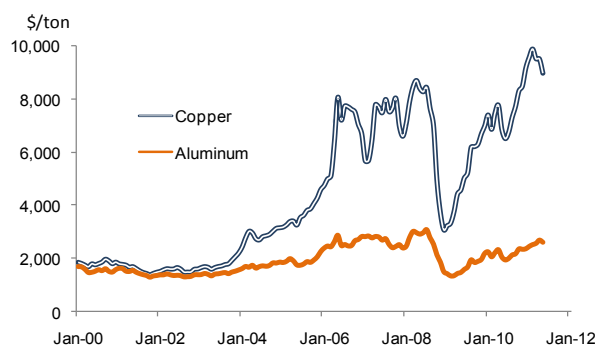
Source: .World Bank.

Figure Comm.6 World metals consumption
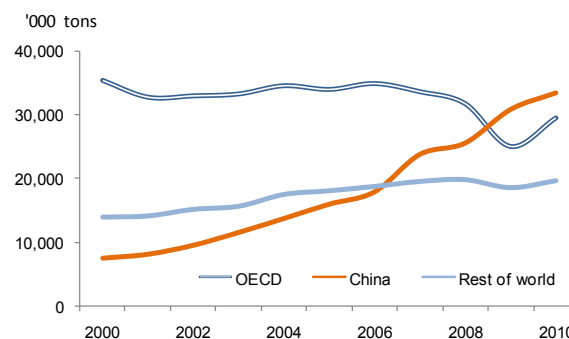
Source: World Metal Statistics

The recovery in metals during 2009 was led by large restocking in China, world's largest metal consumer (figure Comm.6). As can be seen for aluminum (which accounts for nearly half of world consumption of the six base metals), China's demand growth surged in 2009, with significant volumes for restocking, providing the key driver to prices. Demand in China slowed in 2010 but this was offset by strong demand elsewhere, particularly in developed countries, also for restocking (figure Comm.7).

Most metals inventories in 2011 are relatively high, and have increased as China's import demand has slowed (figure Comm.8). For some metals, prices are in 'contango' (future prices above near-by prices) and a large portion of stocks are tied up in warehouse financing arrangements and not available to the market—which gives an appearance of market tightness and has helped support prices. Inventories are expected to remain high until China's import demand strengthens.

Outlook

Over the past decade, global metals markets have struggled to meet the strong demand particularly from China, especially in the copper and nickel markets (box Comm.2). As a result prices have increased to ration demand and balance the market.

The causes of the supply shortfall are numerous. Inadequate investment early-on has played a role, especially given the long lead times required for new mines. Because of years of low prices and limited expansion, the industry also suffered shortages of skilled labor, equipment and materials during the upturn—which have pushed up costs. In addition, technical problems, strikes, and geopolitical risk prevented new projects form moving ahead quickly.

Looking forward, supply is expected to be more elastic—partly because of higher prices, which have boosted the industry's large cash flow, and is expected to generate record capital expenditures in 2011.

In the copper sector, where supply has been very tight, development of new 'greenfield' and 'brownfield' projects is expected to deliver sufficient capacity to meet moderate demand growth over the medium term. Much of the incremental supply will be in South America and in Africa's copper belt, i.e., Zambia and the Democratic Republic of Congo. High copper prices have also increased recycling and induced substitution toward other, cheaper products (mainly aluminum and plastics). These trends are expected to push the copper balance into surplus later in 2012 and beyond.

The global market for aluminum is expected to remain in surplus for the foreseeable future. The addition of new capacity and prospects for the reactivation of idle capacity threatens prices in the near term. New plants in China, India, the Middle East and Russia are expected to exploit low-cost power sources and minimize the upward pressure on aluminum prices from

Figure Comm.7 Aluminum consumption growth
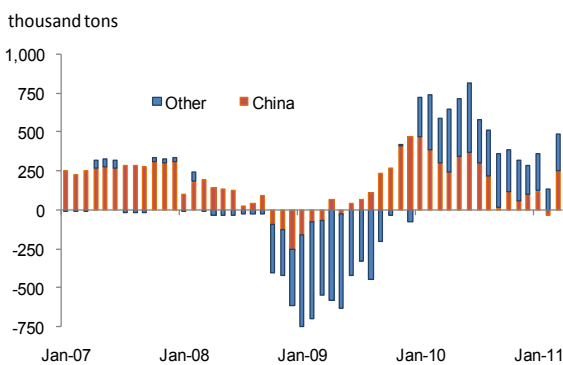
Source: CRU

Figure Comm.8 Copper prices and LME stocks
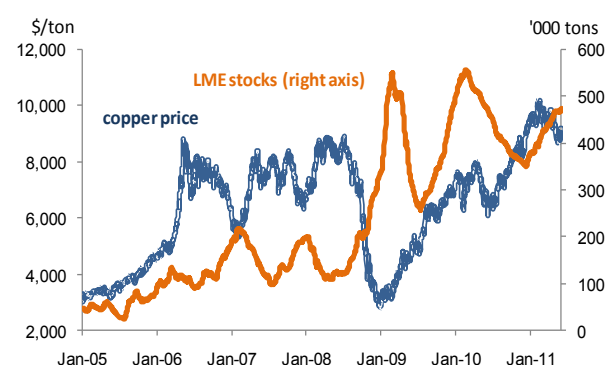
Source: Datastream

higher oil prices. A key uncertainty for supply concerns Chinese authorities' efforts to restrain power consumption in the sector, which may slow the pace of new aluminum plants or result in the closure of older plants.

The nickel market is expected to move into surplus this year and beyond as a wave of new capacity hits the market. Several large-scale projects in Brazil, Madagascar, New Caledonia, and Papua New Guinea, as well as smaller projects elsewhere, are coming on line that are the lagged result of earlier price hikes. In addition, supply will be bolstered by recovering production from strikes in Canada and the steady growth of nickel pig iron in China. One potential uncertainty for the nickel industry comes from new plants 'High Pressure Acid Leach' (HPAL) processes, a complex technology that has resulted in severe production problems in the past.

Box Comm.2: China, global metal demand, and the super-cycle hypothesis

Chinese demand has been the key driver of metal demand over the past decade (see figure Comm.8). China is clearly in an extremely metals-intensive phase of its development. Compared with other developing countries at similar income levels, the metals intensity of China's GDP is well above average (for example, China's copper and aluminum intensity were 1.8 and 4.1 kgs per $1,000 of real GDP for 2007-09, compared with world averages of 0.4 and 0.7, respectively.)

Between 2000 and 2010 Chinese consumption of the main base metals (aluminum, copper, lead, nickel, tin, and zinc) rose by 16 percent per annum. Consumption for the rest of the world was flat for the decade. Currently China accounts for 41 percent of global refined metal consumption (box figure Comm.2a).

Indeed, metal consumption by China during the past decade has been so strong that it effectively reversed the global metal intensity (metal consumption per unit of GDP), a turnabout that continues today. For example, global metal intensity in 2010 was the same as in the early 1970s (box figure Comm.2b). On the contrary, food and energy intensities continued their downward trend.

Many observers looking at the extremely robust demand for commodities over the past decade, and the rapidly rising metals intensity of the Chinese economy, argue that commodity demand will continue to outstrip supply resulting in a super-cycle where prices stay very high for an extended period (perhaps for a few decades). Such risk seems particularly acute if China continues to increase its metals intensity, or if other developing countries begin to follow a metals intensive development strategy – something that has not as yet occurred.

Super-cycles of this nature have taken place in the past rather albeit infrequently (e.g., the industrial revolution in the United Kingdom. and the early 1900s in the United States). Several authors have argued that some metals (especially copper and iron ore) may be going through a super-cycle period because of Chinese demand (see Heap 2005 and Jerrett and Cuddington 2008).
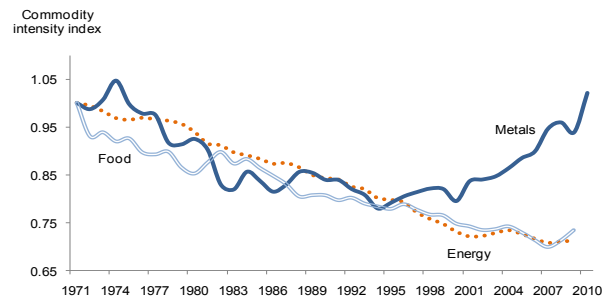
If such a super cycle endures, high prices will be needed to curb demand and generate sufficient supplies to bring the market into balance, and also to stimulate alternative technologies and materials.

Box figure Comm.2a Global metal consumption growth, 2000-10
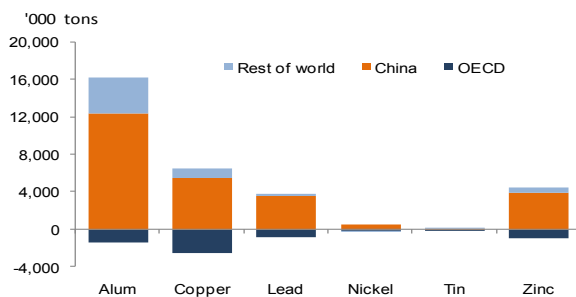
Source: World Metal Statistics and World Bank

Box figure Comm.2b Global commodity intensity

Source: World Bank

Overall, metals prices are expected to rise in 2011 compared with 2010, owing to increasing demand, but are expected to ease thereafter, as new capacity comes on line and keeps markets in surplus. A key risk to the forecast is continued difficulties within the industry delivering adequate supply to the market, whether related to operations, technology, labor, or government policy.

Agriculture: overview and outlook

By early 2011 most agricultural prices either reached or exceeded their summer 2008 peaks. In April 2011, the agricultural price index averaged 12 percent above its June 2008 peak, while the food index has just matched its 2008 peak. Beverages (tea, cocoa, and coffee) and raw materials are 31 and 57 percent above their 2008 highs.

Yet, the 2010/11 price spike differs from the one in 2007/08 in a number of respects.

1. It is more uniform in terms of commodities involved, in that it includes most food commodities (grains and edible oils, except for rice), beverages, and raw materials. The 2007/08 spike (led by crude oil and fertilizers) saw food and grains prices increase, largely reflecting the surge in rice.

2. The current increase is less steep in the sense that the percent change in 2011:Q1 from a year ago are much smaller than occurred in 2008:Q2 when measured over the same period (figure Comm.9).

3. The supply conditions for grains that led to the 2010/11 spike were less binding than the conditions that led to the 2007/08 spike. The rice market has been very stable—rice is a thinly traded commodity and politically sensitive for food security, especially in East Asian countries.

4. The recent price spike did not trigger as broad a policy reaction—apart from the Russian wheat export ban in the summer of 2010. Martin and Anderson (2011) estimated that 45 percent of the increase in rice prices and 30 percent of the increase in wheat prices during the 2007/08 price spike was due to insulating trade measures.

Grain prices, especially maize and wheat, began rising in the summer of 2010 when it became apparent that wheat production in Eastern Europe and Central Asia and was going to be seriously affected by the heat wave running through the region at that time. In the event, countries in the region—which between 2005-2009 accounted for almost a quarter of world wheat exports—were only to supply half of that amount. Later maize prices rose as it became clear that the U.S. crop would disappoint. As a result, the maize stock-to-use ratio declined to 0.15 from the 0.18 average of 2007-09.

By April 2011, maize prices had surpassed their June 2008 highs by 12 percent while wheat prices were just 4 percent short of their 2008 peak. Rice prices, however, have been relatively stable, trading in a band of $450-$550/ton during the past two years—a wide band by historical standards but narrow when comparing rice to other commodities during 2008.

Edible oils prices rose more than 40 percent in the first quarter of 2011 from a year earlier, almost reaching their June 2008 all time highs in February 2011. In addition to suffering sporadic weather-induced production shortfalls (especially soybean oil in South America and palm oil in South-East Asia) and diversion for biodiesel production in Europe, a key factor behind the price rally has been strong demand.

Figure Comm.9 The price spikes of 2007/08 and 2010/11
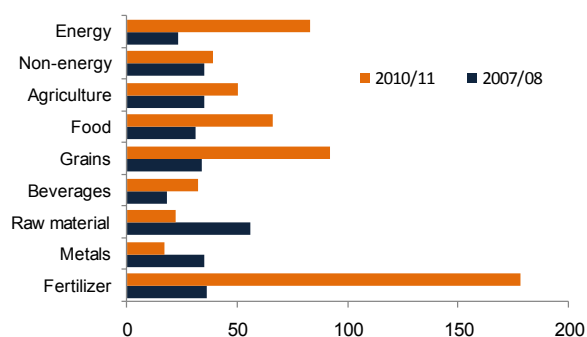
Source: World Bank

Unlike grains, where demand tends to be relatively stable after incomes reach a certain level, per capita demand for edible oils continues to rise even in high income countries, as a rising share of food consumed is prepared in professional establishments and in packaged form, both of which are oils consuming processes.

Beverage prices increased in 2010/11, unlike in 2008 when their prices were relatively stable. The coffee market—especially arabica coffee—experienced tight supplies and strong demand while the hike in cocoa prices reflected political instability in Côte d'Ivoire (which accounts for almost 40 percent of global cocoa supplies).

The **cotton market** suffered from tight supplies (in addition to a partial export ban imposed by India to protect its domestic textile industry). Strong demand, especially by middle income countries, contributed to high price as well. Cotton prices experienced, perhaps, the sharpest increase in history of the sector; they exceeded $5.00/kg in March 2011, up 350 percent from two years ago. And **natural rubber prices** reached historic highs due to weather-related supply disruptions in South-East Asia rubber producing countries (accounting for almost all global production), strong tire demand from emerging markets, and high oil prices (natural rubber competes with synthetic rubber) a by-product of crude oil.

Despite high oil prices, **fertilizer prices**—a key input to the production of food commodities—declined 5 percent in 2010 due to ample supply and relatively stable natural gas prices (nitrogen fertilizer is made directly from natural gas).

Outlook

Agricultural prices increased 17 percent in 2010, slightly exceeding their 2008 levels. They are expected to gain an additional 20 percent in 2011; such increase assumes that prices will ease somewhat during the second half of 2011. Specifically, for 2011 wheat and maize prices are expected to average 34 and 45 percent higher than 2010 levels, while rice prices are

anticipated to remain almost unchanged. Soybean and palm oil prices are expected to be 18 and 22 percent higher, respectively.

A number of assumptions underpin this outlook. First among these is that crude-oil prices stabilize and begin to decline. Second, it is assumed that the 2011/12 crop year is a normal one. Actual outturns will depend importantly on

Figure Comm.10 Global balance of key grains
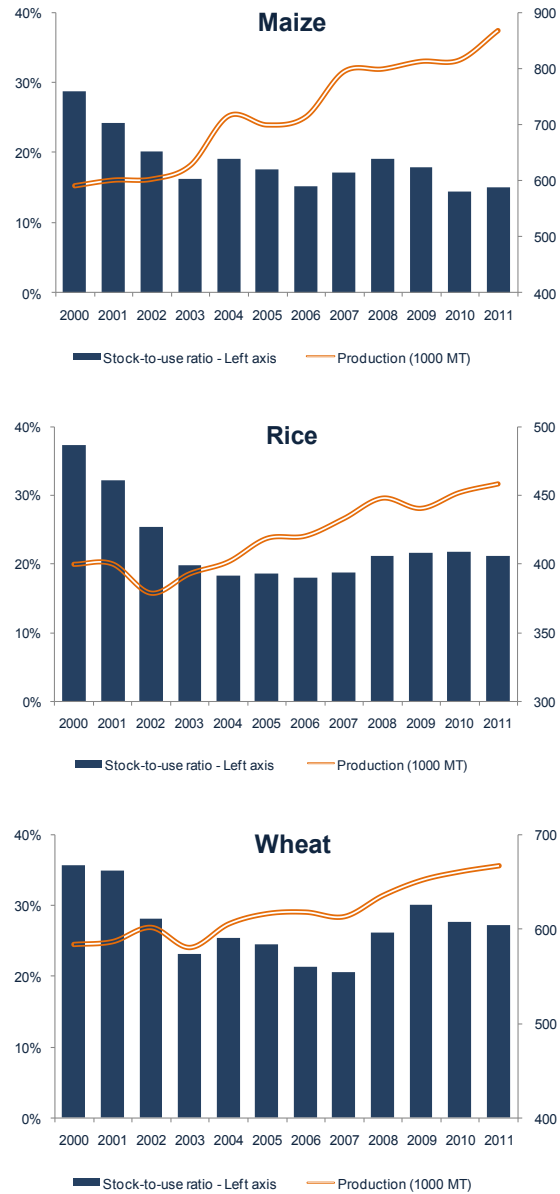
Source: U.S. Department of Agriculture (May 11, 2011 update).
Note: years refer to crop years (e.g., 2011 refers to 20011/12

oil prices and weather. Either another poor crop year or a further hike in oil prices could result in significantly higher prices for many commodities.

During its first assessment for the 2011/12 crop year (published in early May), USDA projected that global production of maize will rise 6.4 percent, wheat by 3.3 percent and rice by 1.4 percent (figure Comm.10). Yet, because of continued tight inventory positions, the USDA argued that prices may remain "volatile with tight exportable supplies of corn and wheat. In contrast, the rice world supplies are relatively abundant." The report also noted that uncertainty continues to cloud these projections because of delayed maize plantings in the United States, reduced U.S. winter wheat production, continued dryness in the EU, and wet conditions in Canada.

Energy is a particularly important determinant of agricultural prices and hence an important risk for higher food prices. While low stocks and poor crops were the major factors underpinning last year's price hikes, the nearly 60 percent increase in food prices since the 1990s has more to do with the 3-fold increase in energy prices that has occurred during that time.

Energy feeds into food prices through three main channels: (i) as a cost of production (fuel for agricultural machinery and transporting produce to markets); (ii) indirectly through fertilizer and other chemical costs (e.g., nitrogen-based fertilizers are made directly from natural gas),

and (iii) via competition for land and produce from biofuels—maize in the United States, edible oils in Europe and sugar cane in Brazil (Box Comm.3). Indeed, agriculture is more than four times more energy intensive an activity than manufacturing, with the ratio varying across countries depending on crops raised and intensity of fertilizer use (figure Comm.11).

Econometric estimates suggest that for every 10 percent increase in energy prices, food prices will rise by between 2 and 3 percent (Baffes 2009). In fact, this is almost exactly what has been observed: with the 223 percent increase in the average oil price between the period 1986-2002 and 2003-2010 is associated with a 50 percent increase in the average food prices index (figure Comm.12).

Risks to the food price outlook

In an effort to evaluate the sensitivity of food price forecasts to the quality of future crops and oil prices, several simulations were run. Table Comm.3 reports results based on a reduced form econometric model that explains grain prices as a function of cost factors (including oil), and weather events (proxied by deviations of output from trend increases and stock-to-use ratios to allow for non-linear effects when stock levels are low). Other variables include exchange rates, interest rates, time trend as a proxy for technical change, and income growth.

This work suggests that a weather-induced

Figure Comm.11 Energy intensity of agriculture and manufacture

Cost of energy component measured in 2007, percent
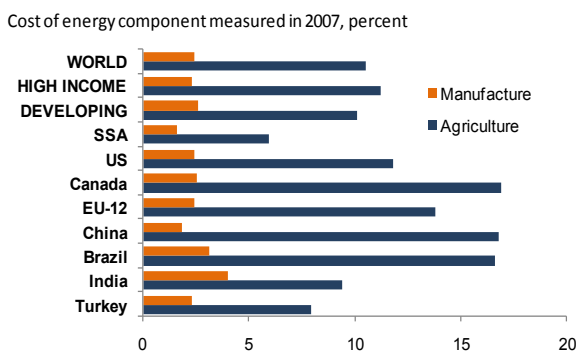
Source: GTAP preliminary release 0, version 6.

Figure Comm.12 Energy and agricultural prices: 1986-2010

nominal indices, 2000=100
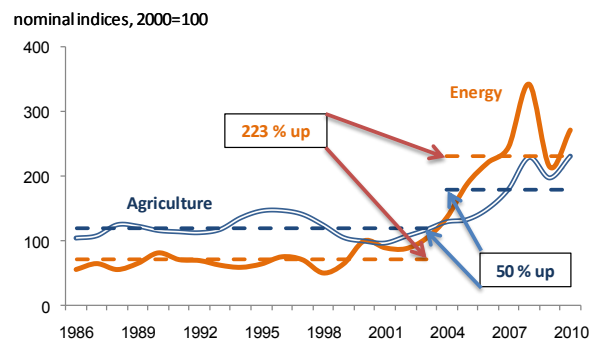
Source: World Bank

production shortfall on the order of 5 percent (equivalent to one standard deviation reduction in global output) can be expected to induce an increase in grain prices of between 2 and 8 percent. And a 50 percent increase in crude oil prices above the baseline of $107/bbl, would induce grain prices increases on the order of 6 and 14 percent. Under a scenario where the 2011/12 crop year proves disappointing and oil prices rise by $50/bbl, grain prices could rise between 9 and 22 percent above the baseline scenario.

If any of these scenarios materialize, it will have important budgetary implications for food

Table Comm.3 Food Prices: History, baseline, and upside risks ($US per ton)

Year	Wheat	Maize	Rice	Soybeans	Palm oil
Historical Prices					
2006	192	123	305	269	478
2007	255	164	326	384	780
2008	326	223	650	523	949
2009	224	166	555	437	683
2010	224	186	489	450	901
Baseline					
2011	300	270	500	530	1,100
2012	250	230	480	450	900
5% production shortfall (compared to baseline)					
2011	306	279	518	547	1,186
2012	255	238	497	464	970
5% production shortfall and 50% increase in energy prices (compared to baseline)					
2011	336	294	573	602	1,337
2012	280	251	550	511	1,094

Source: World Bank

importing countries as well as poverty implications for consumers who spend a substantial part of their disposable income on food. Consider, for example, that the 2010/11 grain price increases may have pushed as many as 44 million people into poverty according to World Bank latest estimates (World Bank, 2011a).

In addition to higher prices, volatility in commodity prices, especially food commodities, is an issue of increasing concern. For example, during the November 2010 summit, leaders of the G-20 requested that all international financial institutions and research organizations to work with key stakeholders "to develop options for G20 consideration on how to better mitigate and manage the risks associated with the price volatility of food and other agriculture commodities, without distorting market behavior, ultimately to protect the most vulnerable" (see G-20 Report on Price Volatility 2011).

Although it is analytically challenging to distinguish factors that affect price volatility from those affecting price levels, the increasing role of investment fund activity during the past few years (sometimes referred to as the "financialization of commodities") is often cited as a key factor behind the price variability observed during the past few years. It has been estimated that as of the end of 2010 as much as $380 billion was invested in commodities, three

Box Comm.3 The role of biofuels

The mandated increase in the quantity of high-income crops and cropland dedicated to biofuel production (chiefly ethanol-based corn in the United States, and edible oil-based biodiesel in Europe) and the more or less simultaneous rise in food prices, suggests another mechanism by which energy prices are affecting food prices.

During 2010/11, 28 percent of the U.S. maize crop went to biofuel production (in fact, 40 percent of the US maize crop went for biofuel use; however, 30 percent of that went back to the feed industry, resulting in a net of 28 percent). Although that corresponds to about 11 percent of global maize production, it's magnitude is comparable to the global exports of maize. Indeed, most studies concur that the U.S. biofuel mandate was the largest demand-side factor in the run up of grain prices during the 2007/08 price spike (Timilsina and Shrestha 2010).

Perhaps more important than their historic role in shaping the rise in food prices—to the extent that important food crops like maize are economically viable alternative sources of energy—their comportment will cease to be that of a typical agricultural product, where price fluctuations are mainly the result of supply shocks (demand remaining relatively stable), and become more like an industrial commodity, especially at current high energy prices. For example, estimates suggest that maize-based ethanol and edible oil-based biodiesel biofuels may become profitable even without mandates at oil prices between $80-$100/bbl (U.S. Government Accountability Office 2009).

quarters of which in energy markets, compared to less than $20 billion at the beginning of the decade.

The relationship between investment fund activity and commodity prices is a hotly debated topic. Some have argued that such funds have sufficiently large weight to unbalance the market thus impairing the price discovery mechanism (e.g., Soros 2008, Berg 2011). However, others have praised these investment vehicles claiming that they inject liquidity in commodity markets (e.g., Verleger 2010, Sanders and Irwin 2010). Despite such contrasting views, the empirical evidence is, at best, weak.

As was discussed in the January 2011 edition of GEP (World Bank 2011b, p. 26), "Despite the 'smoking gun' … most studies have failed to establish a link between these investment and rise in commodity prices." The report also noted that more recent academic papers and analysis are increasingly leaning towards the view that these new investment vehicles may have been responsible for at least part of the post-2005 volatility in commodity prices. Indeed, a number of academic studies have shown just that (see, for example, Singleton 2011, Silvennoinen and Thorp 2010, Tang and Xiong 2010).

Movements in domestic food prices

The discussion so far has focused on price movements in US$ terms. However, what matters most to consumers is the price they pay for their food basket. It is not uncommon for prices paid by consumers to differ considerably from international prices, at least in the short run. Reasons include exchange rates movements, trade policies that often insulate domestic markets, large distances of domestic trading centers form ports adding considerably to marketing costs, quality differences, and different composition of the food basket.

Figure Comm.13 depict changes in domestic wholesale prices of key food commodity price indices (weighted by the country's caloric intake from such commodities). The period chosen is based on a comparison between 2009:Q1 (the

post-financial crisis low price) and 2010:Q4, (the most recent data available for 35 countries). In addition to maximizing the numbers of countries included in the sample, the period was chosen in order to capture most of the 2010/11 food price spike.

During this period, the real (U.S. CPI-deflated) U.S. dollar-based World Bank food price index increased 34 percent. Yet, the results show that—with the exception of Asian countries where real wholesale prices moved in synch with world prices—in both Latin America and the Caribbean and Sub-Saharan Africa regions, real

Figure Comm.13 Price changes—2009:Q1 to 2010:Q4
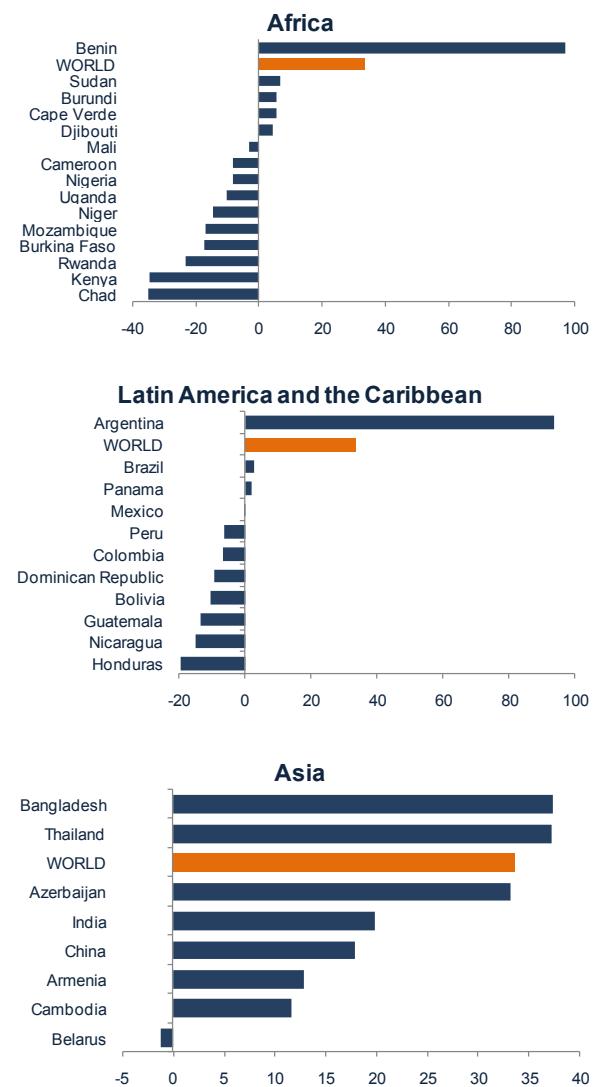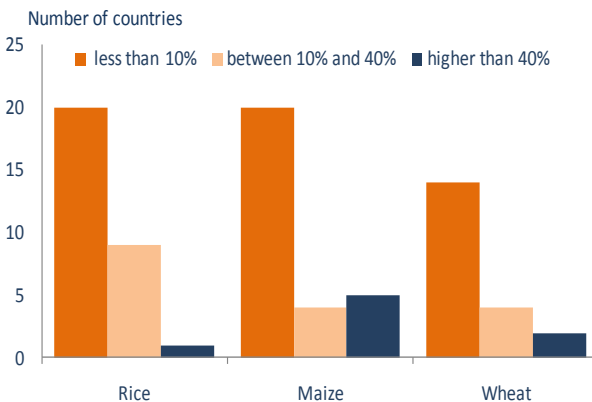

Source: World Bank

prices either increased modestly or declined. It should be noted that results do not necessarily imply that domestic price movements move independently of world prices. The apparent weak correlation between world and domestic prices most likely reflect low pass-through.

To identify the degree of pass-through, an error-correction model was used to estimate the pass-through price elasticities for wheat, rice, and maize. The countries included in the analysis were categorized into three groups: little pass through, where less than 10 percent of international price variability is transmitted into domestic prices, moderate pass through, with transmission between 10 and 40 percent, and high pass-through, with more than 40 percent transmission (figure Comm. 14).

A number of interesting results emerged from the analysis. First, more countries exhibited very little pass-through compared to moderate or high pass-through combined; this is consistent with the results discussed earlier. Second, price pass-through is higher in rice than maize and wheat. Third, countries that exhibited high pass-through in one commodity are likely to have high pass-through in the other commodities as well (e.g., Argentina, South Africa, Thailand, Uganda).

To summarize, pass-through results based on both econometric estimates and the ones based on simple price change calculations gave a rather mixed picture from both a country and a

Figure Comm.14 Domestic prices of key commodities do follow world price signals in many countries

Source: World Bank

commodity angle. From a country policy perspective, the results suggest that, to the extent possible, policy responses should not focus entirely on short run price movements observed in international markets. Instead policies should target specific commodity sectors and, above all, target the portions of the population with the highest probability of being affected.

The policy dimension of low pass-through

Low pass-through may reflect the fact that some countries insulate their domestic food (and fuel) markets by introducing or increasing existing subsidies or taxes. In addition to their distortionary impact on both domestic and world market level, subsidies in these countries may face fiscal sustainability issues. Indeed, taxpayer-funded subsidies in OECD countries increased considerably—between 2000-04 and 2005-09, transfers from taxpayers to consumers of agricultural products increased by more than 25 percent (from $24.6 to $31.0 billion). From a fiscal sustainability perspective, however, more important are fuel subsidies which during 2010 reached globally an estimated $250 billion, up from $60 billion in 2003 (Coady *et al* 2010).

From a policy perspective, addressing insulating trade policies should be a priority, for at least two reasons. In addition to constraining domestic supply response at the time it is most needed, such policies amplify the cycles in world prices, thus destabilizing global markets with negative consequences to countries that play by the rules and, more importantly, the ones that do not have the fiscal space to protect the poorest segments of their populations.

Other avenues to pursue should include adequate funding for research and development in order to arrest the decline in productivity growth observed during the past decade as well as minimizing post-harvest losses, very common in poor countries, especially in Sub-Saharan Africa. Policies and investments addressing the likely impact of permanent shifts in weather patterns, and improving food aid are areas of concern as well. Detailed policies and investment strategies addressing some of these issues were discussed

at the Development Committee meeting during the 2001 joint World Bank/IMF Spring meetings (World Bank 2011c).

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Notes

1. OPEC countries account for 72 percent of the world's known oil reserves (*Oil and Gas Journal*, Dec. 6, 2010). However, OPEC's production share of total world liquid fuels is just below 40 percent and its share of crude oil production is 33.5 percent. With OPEC's spare capacity at about 6 mb/d (December 2010) and substantial known reserves, the oil market does not appear afflicted by resource scarcity. Indeed, oil production continues to grow in both OPEC and non-OPEC regions.

2. The divergence between copper and aluminum prices during the past decade has been driven mainly by China, world's largest copper importer. Because of various operational and project development problems, the industry has struggled to keep pace with demand. Meanwhile China has developed substantial aluminum smelting capacity and is a net exporter of aluminum. Bauxite, the raw material to produce aluminum, is one of the most abundant minerals.