Pacific Economic Cooperation Council

Cooperation and Competition in the Extractive Industries Sector:

Perspectives from Demand and Supply Sides

Executive Summary

INTRODUCTION

From roughly 2001 till the onset of the Global Financial Crisis, commodity prices boomed largely as a result of the rapid increase in demand associated with robust growth in emerging markets. While nominal global GDP grew by 8% annually between 1964 and 2011, total commodity trade for the major minerals and metals grew significantly faster, at an annual 11%. In the more recent period 2004 to 2011, the trade value for primary commodities grew by 18% while nominal global GDP grew by 7%.

This boom was largely led by Asia's fast-growing economies which have driven and most likely will continue to drive extractive industry markets, especially for energy, in the coming decades.

In this context, what are the key policy issues for exporting and importing economies of the products of the extractive industries and how might regional cooperation make a contribution to resolving those issues?

TRENDS IN MARKETS

ENERGY MARKETS

Global primary energy demand increased by 160% over the past four decades, reaching 13.1 billion tons of oil equivalent (Btoe) in 2011. The Asia-Pacific has been the biggest demand driver in recent times. For example, China alone accounted for over 45% of global incremental oil demand for the decade 2001-2011.

Looking ahead, the Asia-Pacific region is expected to drive continued strong growth. Global primary energy demand could reach 19.6 Btoe by 2040, an increase of a further 50%, according to Japan's Institute of Energy Economics, with China and India alone accounting for 45% of the world's energy demand growth. Fossil fuels will continue to dominate consumption. In many Asian economies, import dependence will rise, and resource competition could intensify.

Growing energy demand over the past decade led to rising world prices with some variations. The more recent shale gas revolution in the US saw lower gas and coal prices in that economy. But the closure of nuclear power plants in Japan following the Fukushima nuclear incident led to fossil fuel purchases at increasing costs.

There is an energy price gap, especially for natural gas, between the international market and the Asian market known as the "Asian Premium". This is due to contract and market inflexibilities which mean that economies in Northeast Asia are forced to pay the most expensive prices in the world for LNG.

In the coming years, demand and supply conditions will likely tighten in world markets, thereby pushing up energy prices even further, following the increases of the past decade. The likely trends in regional energy trade in this setting are discussed in more detail below.

The boom in energy and other extractive industries offers tremendous potential for economic growth and improvements in material welfare for countries that possess large reserves of natural resources such as Myanmar, Cambodia, Vietnam and Papua New Guinea.

TRENDS IN MINERAL MARKETS

Trends in non-energy mineral demand followed a similar path to energy prices during the first decade of the 2000s, with the booming prices often referred to as the "super-commodity cycle". This period also saw very rapid growth in commodity trade, especially for iron and steel, coal, iron ore, and other industrial metals, as well as oil.

Infrastructure demands from Asia's fast growing economies drove non-energy mineral markets. For example, during the 2000s decade, China's steel demand increased fivefold. And China's demand for industrial metals now accounts or 45% of global demand. It is now also the world's largest consumer of bauxite, iron ore, coal, copper and nickel. The Asia-Pacific will likely continue to be a large market for mineral resources for next two or three decades.

Rising mineral demand resulted in dramatic price increases. Security of supply risks were highlighted by the extent of global market dependence on China as a supplier of rare earths, which are increasingly in demand for their use for high-efficiency technologies, highlight in 2011 when China reduced supplies to global markets in part to satisfy domestic demand at that time.

DOMESTIC POLICY CHALLENGES AND CAPACITY BUILDING

In domestic terms, these developments lead to policy challenges related to the Dutch Disease and to a package (or 'trilemma') of questions around i) supply security, ii) efficiency in use and iii) environment protection. In these areas the main contribution of regional cooperation is support for institutional design and the sharing of experience in the use of different policy options.

A) DUTCH DISEASE

A resource boom draws labour and capital to support the booming sector and contracts the non-booming sectors of the economy (such as manufacturing and agriculture) which compete in world markets. The term "Dutch Disease" was coined to refer to the negative effects on Dutch manufacturing brought on by rapid appreciation of the economy's exchange rate caused by the huge offshore natural gas discoveries in the North Sea.

There are arguments to support, on inter-temporal grounds, the non-booming sectors which need to compete in international markets if the natural resource boom is expected to be temporary or if reserves of natural resources are limited. The structural change caused by natural resource booms may be reversible only at great cost in the post-boom period. In practice, for most developing economies undergoing resource booms, the windfalls accruing domestically primarily flow into government coffers via taxes and royalties, as the extractive industry sector typically is capital intensive and based on foreign direct investments, and local wages constitute a small fraction of the value added in the sector. The effects of the Dutch Disease thus are strongly influenced by how governments, as the major domestic recipients of resource rents, spend their windfalls.

The resource rents provide an opportunity for governments to derive political benefits of an expanded public sector without having to bear the political costs of increasing tax rates. The existence of these natural resource rents become a motivating source of corruption and misappropriation of public resources. They can engender weak institutions that undermine sustainable and inclusive development, leading to a concentration of benefits to a narrow beneficiary group.

Since government consumption expenditures are inherently skewed towards non-tradables, such as construction and some services sectors, the spending effect of an influx of resource rents would be magnified if such rents are predominantly used to expand the public sector. Of course governments can "sterilize" the impact of foreign exchange receipts by deferring consumption or investment in the domestic economy, in favour of holding foreign assets instead. Governments can set up oil trusts and sovereign wealth funds, tasked with the objective of achieving the highest (risk-adjusted) returns for the nation's surplus of natural resource rents.

B) THE "POLICY TRILEMMA"

A successful extractive industry future will require managing the "policy trilemma", namely, security of supply, economic efficiency and environment protection. Responding to the trilemma requires enhanced energy conservation, cleaner use of fossil fuels, lower-cost alternative energy, and diversification of supplies and investing in energy efficient technology.

There may be a policy case for well-designed subsidies for these purposes. But in many Asian economies like India, China and Indonesia subsidies actually boost fossil-fuel consumption. These subsidies are invariably designed to help poor people have access to energy at relatively low prices but they have many adverse effects. They discourage adoption of energy-saving technologies, reduce the incentive to switch to renewable energies, impose a growing burden on government budgets, and increase carbon emissions. And despite their honourable objectives, all too often these fossil-fuel subsidies benefit middle and upper class citizens, more than they do the poor. It is imperative for Asian countries to tackle the energy subsidy problem as quickly and decisively as possible.

Studies indicate that there is great potential to improve energy efficiency potential, notably in China and India whose energy intensities are still much higher than in advanced countries. They also have large potential for CO2 reductions because of their high coal use rate and carbon intensity of their economies. The CO2 reduction potential of developed countries is lower than half that of developing countries. Overall, the deployment of the best available technology is the most important way to cut future carbon emissions, with there being great potential in buildings and power generation, and somewhat lower potential in the transport and industry sectors.

Asian national oil companies (NOCs) from China, Japan, Korea, India and elsewhere have been seeking to improve their security of supply through investments for equity participation in upstream energy projects in Africa, Middle East, Central Asia, Latin America and Southeast Asia/Australasia. In the past decade, the Asian NOCs have become increasingly internationalized in their asset portfolios. More recently, with the boom in unconventional oil and gas resource development in the US and Canada, the leading foreign investors in the sector have been the large Asian NOCs.

Mineral markets face similar challenges to the "energy trilemma". Policies of 'reduce, reuse and recycle' (3R) offer the potential for more efficient mineral use. The minerals sector including processing is a large energy consumer and greater efficiency of energy use would also cut carbon emissions. More efficient product design notably in automobiles can also make a contribution. Asian resources companies have also been seeking to improve their security of supply through investments in Africa, Latin America and Southeast Asia/Australasia.

POLICY CHALLENGES AND REGIONAL COOPERATION

The previous sections have canvassed a range of issues of concern in the extractive industries but in this report there are two that stand out with implications for regional cooperation – the commitment to policy regimes for investment in these sectors and the issues in and the responses to the likely reorientation of regional energy trades.

1. INVESTMENT IMPEDIMENTS

With the phenomenal commodity price boom of the past decade, the temptation to nationalize or impose higher or new taxes and royalties as a means of increasing the revenue of host economies (HCs) at the expense of multinational companies (MNCs) has once again taken centre stage in a number of economies.

Foreign direct investments in the extractive industries are vulnerable to government seizure due to the nature and timing of investments and payoffs; typically, revenues flow much later after initial investments are made. Large investments, specific to each field or mine, cannot be relocated or easily dismantled, and are essential kept "hostage" to host economy governments. It should be noted that the "hostage" issue cuts both ways. In some cases, very large MNCs with dominating roles in the primary commodities sector can hold sovereign economies "hostage", especially if they are relatively small economies. Credible threats of "walking out" and shutting down EI operations in bargaining strategies with host governments are part of the repertoire of large MNCs.

As primary commodities are subject to extreme price volatility, in up-cycles, when prices are rapidly rising, host economy governments are under domestic pressures to expropriate a larger share of the EI revenue stream, at variance to what was agreed upon ex ante at contract signing and the final investment decision. Long lived investments in mining contracts face "time inconsistency" problems: as market and other conditions evolve, interests of parties to the contract change, and what may have seemed reasonable contractual terms at the signing may seem to unduly favour one party. This leads to the "natural resource trap". As MNCs are experienced and aware of the history and comparative experience of EI investments around the world, they already anticipate a risk of expropriation of their sunk investments, and hence implicitly require a contract that compensates them for this risk.

While governments can nationalize and achieve short term gains at the expense of foreign investors, the national interests of the host economy can be adversely affected in the long run, as the lower returns reduce future foreign investments in the EI sector which ultimately reduces the present value of the economy's resource endowment. As a consequence, the global production possibility frontier for particular minerals moves inwards, making primary commodity supply more expensive. The primary policy challenge for host economy governments in the EI sector is to extract the maximum sustainable fiscal revenue to the state while allowing foreign investors to earn a risked-adjusted rate of return commensurate to their investment costs and the exploration and development risks they bear.

An understanding of these issues and the common interest in resolving them is a valuable topic for further regional cooperation.

2. NEW DIRECTIONS OF PACIFIC ENERGY TRADE

Even though North America is a large producer of oil and natural gas, and Asia is a large importer, there is virtually no energy trade across the Pacific. Most North American energy production has stayed in that region, and the US currently applies restrictions on the export of oil and natural gas. For their part, the major energy importing economies of Northeast Asia therefore source their oil and gas largely from the Middle East, Southeast Asia and Australia.

Even taking into account the higher cost of shale gas production, the substantial investments required to build pipelines and liquefaction plants, and the transportation cost of shipping LNG across the Pacific, North American gas could be competitive in Asia against existing suppliers, or at the very least serve as an secondary source of supply for Northeast Asian economies. Likewise, the prospect of North American crude oil exports to Asia is increasingly attractive given the gas glut in the United States and a widening price differential between benchmark West Texas Intermediate and Brent crude oil prices.

The Shale gas revolution in which the US became a larger exporter could ease current tight supply-demand of natural gas in the Asian LNG market, although there is an impact on the natural gas exporting economies such as Russia, Qatar and Australia. US exports will drive prices down in regions where the US supplies are competitive so that even export prices will come down. Questions remain though of whether the Asian Premium will disappear.

Lower natural gas price will encourage investing more in natural gas power plants in replacement of coal power plants in the United States. It will cause decrease of domestic coal price in the United States. It may also affect the coal price in the Pacific region.

Favorable economics, however, do not guarantee that transpacific energy trade will become a reality, since there are political, regulatory, and environmental risks to be overcome, as well as a need for substantial capital investment. Nevertheless, the prospect of transpacific energy trade would be good news for Asia-Pacific regional integration, since it would lead to a more competitive energy market and more transparent pricing of energy products, likely resulting in a reduction in price differentials between Asia and North America. In addition, transpacific energy trade would allow both exporters and importers in the region to diversify their markets, and hence support energy security objectives.

The best regional cooperation agreements are thus the ones that allow the widest diversity of buyers and sellers. The emergence and expansion of global commodity markets – and here, the potential role for North America as a major exporter of unconventional oil and natural gas is an excellent example – widens the potential diversity of import sources, and enhances the supply security for all participants in the international economy. A focus on the efficient development of new forms of energy trade in the region would be a valuable contribution of regional cooperation.

Supply Side Perspectives: Cooperation and Competition in the Extractive Industries (EI) Sector

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The globalization of extractive industries (EI) since the beginning of the 20th century was a key outcome of the revolution in sea transportation and the growth of international trade. Between the 1870s and 1990s, transport costs of bulk commodities fell by some 90%.[2] By virtue of their early industrialization, Europe and North America dominated global trade in these commodities in the 19th and 20th centuries. In contrast however, incremental demand for industrial minerals (including energy) and metals in the past two decades or so has overwhelmingly come from the rapidly growing developing economies especially in the Asia-Pacific region. From roughly 2001 till the onset of the Global Financial Crisis, commodity prices boomed largely as a result of the rapid increase in demand associated with robust developing economy GDP growth. In the medium and long runs, with the intensification of urbanization and industrial development across the "emerging markets" of Asia, Africa and South America, the demand for primary commodities, from mineral fuels to industrial metals, is expected to grow robustly.

The key policy challenges remain on supply-side governance that constrain the full potential for resource- rich economies to develop their natural wealth into sustainable economic development trajectories. This paper addresses the current literature on these policy challenges. The emergence of global markets widens the potential diversity of import sources, and enhances supply security for all participants in the international economy. The unprecedented commodity boom of the past decade has the potential to deepen markets and facilitate more transparent price discovery mechanisms than currently exist. The best regional cooperation agreements are thus the ones that allow the widest diversity of buyers and sellers in the extractive industries.

[1] The author would like to thank Oliver Yuen and Lin Fangjun, Research Analysts at ESI Economics Division for assistance in data collation.

[2] Lundgren, N.G., "Bulk trade and maritime transport costs: the evolution of global markets", Resources Policy, Vol. 22, No. 1-2, 1996.

1. THE COMMODITY "SUPERCYCLE"

Table 1 below shows the production and export volumes of key primary commodities based on UN data for the most recent year. Among the most "international" of these minerals and industrial metals industries are copper and zinc (where exports constitute over 80% of production), followed by petroleum and iron-ore (68% and 60% respectively). At the other end of the spectrum, only 6% of iron and steel in primary shapes and 14% of tin produced was exported, reflecting the fact that downstream integration into processing industries within the country of origin was typical for these industrial metals. It should also be noted that 85% of hard coal is consumed within producing economies, making it the least traded among the fossil fuels.

Table 1: World production and exports of selected primary commodities, 2011

Commodity	Production (000 tons)	Export (000 tons)	Exports in % of production
Copper	16,100	14,170	88%
Zinc	12,800	10,240	80%
Petroleum	3,995,621	2,718,072	68%
Iron ore	1,922,000	1,155,000	60%
Aluminium	44,400	22,510	51%
Natural gas	2,424,400	758,816	31%
Hard coal	7,695,441	1,129,088	15%
Tin	244	35	14%
Iron and steel in primary shapes	2,610,000	150,528	6%

Source: UN Comtrade Data

The first decade of the 21st century has been an economic boom period for much of the world, at least until the US financial crisis of 2008 and its aftermath in the EU. Indeed, it can be argued that with certain notable exceptions – the EU and Japan come to mind—the period since 2000 has constituted the greatest period of economic dynamism the world has seen in the modern era. The rise in recent decades of China and India has been well noted, but fewer studies have followed the trajectories of other booming parts of Asia, not to mention Africa and Latin America, and the more peaceful parts of the Middle East.

The decade of 2000s also witnessed a commodity demand boom unprecedented in recent history. While nominal global GDP grew by 8% annually between 1964 and 2011, total commodity trade for the major minerals and metals listed in Table 1 grew significantly faster, at an annual 11%. In the more recent period 2004 to 2011, commodity trade grew even faster relative to global GDP. The trade value for primary commodities (listed in Table 2) grew by 18% while nominal global GDP grew by 7%, slightly slower than the long run 1964-2011 average of 8%.[3]

[3] This period includes the impact of the recession on global GDP in 2008, and hence understates the boom that occurred from 2001/02 up to the 2008 recession.

Oil exports dominate as the single most valued traded primary commodity, accounting for 61% of the total value of minerals and metals in 2011. The demand for petroleum grew 20% during 2004 – 2011, significantly faster relative to the long run average of 13% over 1964 – 2011. The next highest valued commodity export, iron and steel, account for 13% of total primary commodity exports. The annual demand for coal grew twice as fast during 2004-2011 at 22% relative to the long run average of 11% during 1964- 2011. Perhaps given the more intensive infrastructure requirements for natural gas exports, exports of gas grew slower than the long run average, at 14% per annum during 2004-2011 relative to the 17% annual growth rate during 1964-2011. Other industrial metals have also shown fast annual rates of export growth, with iron-ore exports growing at a remarkable three times as fast (34%) during 2004-2011 compared to the long run 1964 – 2011 average of 11%. Other industrial metal exports such as copper, aluminium and tin also have significantly faster growth rates during the past 7 years (23%, 22% and 20% respectively) relative to the 47 year period since 1964 (11%, 11% and 5% respectively).

Table 2: Global annual export value for individual primary commodities and compound annual growth rates, current billion dollars

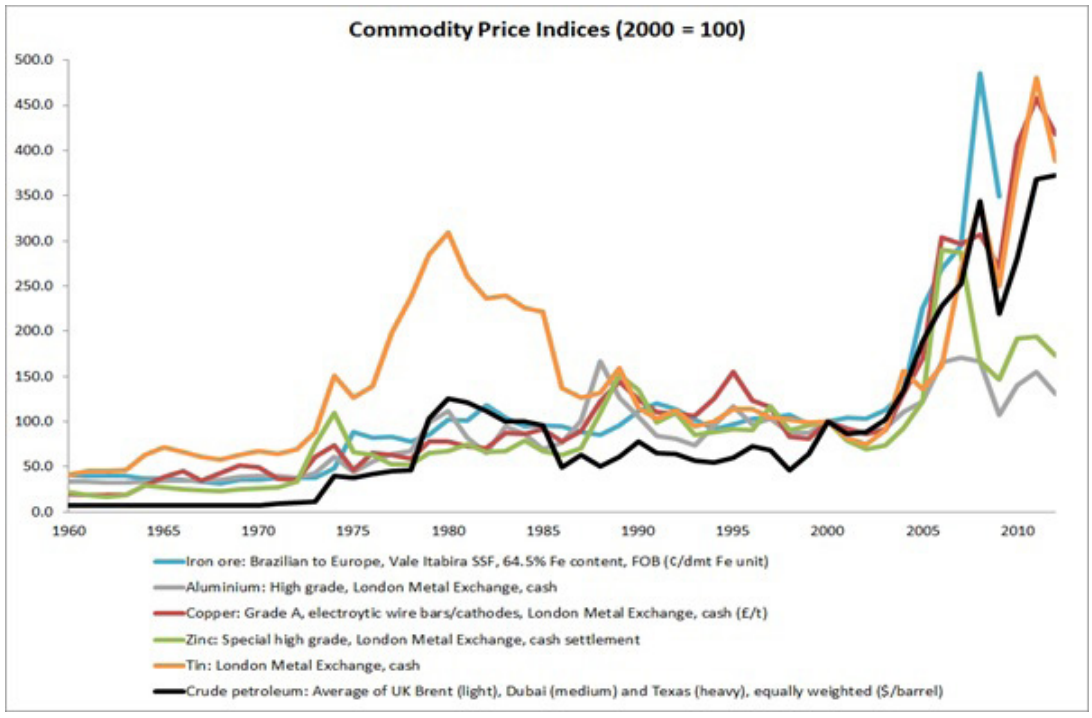
Commodity	1963-5	1983-5	2003-5	2011	2011/1964	2011/2004
Petroleum	9.1	212.7	699.7	2,446.3	13%	20%
Iron and steel	8.6	59.9	249.3	517.6	9%	11%
Natural gas	0.2	27.2	121.3	308.4	17%	14%
Precious stones	1.0	11.8	73.9	166.1	11%	12%
Copper	1.2	5.7	34.9	149.2	11%	23%
Hard coal	1.1	13.1	32.8	134.8	11%	22%
Aluminium	0.8	7.2	29.6	117.7	11%	22%
Iron ore	1.3	5.1	18.7	144.7	11%	34%
Zinc	0.4	2.8	7.7	13.4	8%	8%
Tin	0.7	2.2	2.2	7.9	5%	20%
Memo						
Energy*	10.4	253	853.8	2889.4	13%	19%
Industrial Metals**	13.0	82.9	342.4	950.5	10%	16%
Total	24.4	347.7	1270.1	4006.2	11%	18%
Global GDP ($ tn)	1.76		42.3	70.0	8%	7%

Source: UN Comtrade data, World Bank

**Petroleum, natural gas and hard coal.*

*** Iron and Steel, iron-ore, copper, aluminium, zinc and tin.*

Chart 1: Commodity Price Indices (1960 – 2012)



Note: Quotes for iron-ore prices based on Brazilian sales to Europe was discontinued in 2009.

Source: Bloomberg

As can be seen in Chart 1 above, prices for oil and industrial metals show price booms from 2002 onwards. The average index value of the equally-weighted three key crude oil streams in global trade (Brent, WTI and Dubai) grew more than 6-fold from 1998 to 2008 when Brent crude oil hit a historical peak of $140 per barrel. The oil index value fell by over a third in 2009 from the previous year, then climbed back up by 70% in 2012. According to LME data, tin prices increased from US$ 4,250/tonne in 2002 to US$16,282 in 2007, a 4-fold increase, prior to falling to US$ 10,905 in 2008 before climbing back up to US$23,380 in 2012. The iron-ore price index, based on Brazilian sales prices to Europe, increased a little less than 5-fold from 2000 to 2008 when it hit its peak at $134.40/ton, falling to $96.50/ton in 2009 before price quotes were discontinued. Australian sales of iron-ore to China which have become the leading indicator of iron-ore prices globally from 2009, climbed from $79.90/ton in 2009 to $146.90 in 2010 and $167.80 in 2011, an increase of 83% and 210% respectively. In 2012, the price fell by 23%, to $128.60.[4]

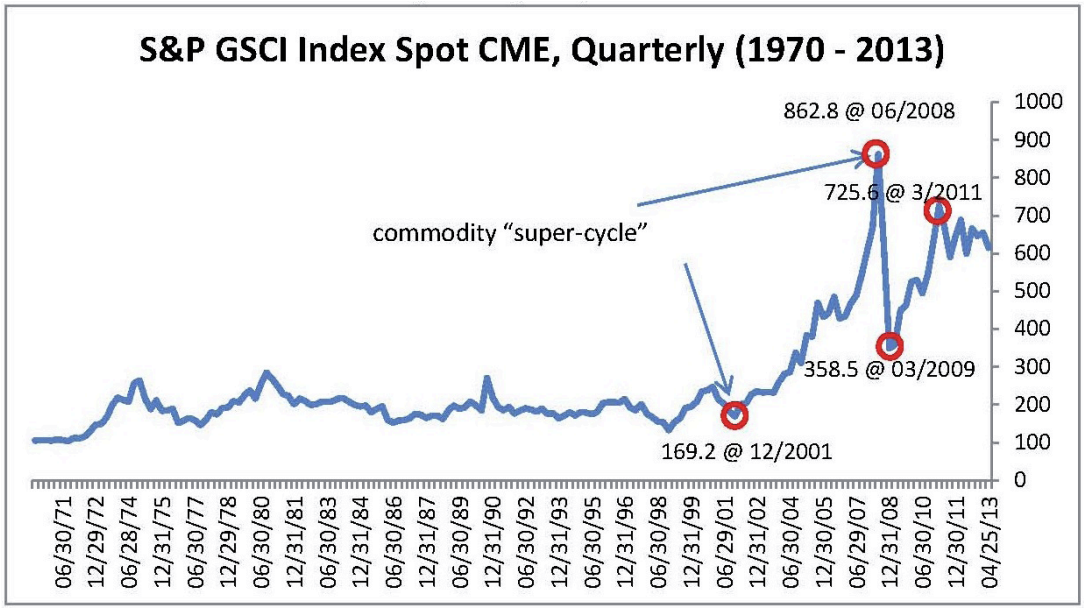
The Standard & Poor's GSCI index is as striking an indicator of the commodity boom of the 2000s as any of the individual mineral and metals price series, all of which show dramatic upturns from around 2001-2002 (Chart 2). The GSCI is a world production-weighted commodity index composed of 24 liquid, exchange- traded futures contracts. The index includes energy, industrial metals, precious metals, agricultural and livestock futures contracts, with 6 energy contracts constituting 67.5% , 5 industrial metals accounting for just over 8% , precious metals (gold and silver) for 3.2% and agricultural and livestock products for the rest.[5]

[4] Annual iron-ore price averages from UNCTAD Comtrade Data (accessed at http://unctadstat.unctad.org/TableViewer/tableView.aspx?ReportId=30727)

[5] The components and dollar weights (in % terms) for the S&P GSCI for 2012 (announced on November 3rd, 2011) are reported in "S&P Indices Announces 2012 Weights for the S&P GSCI", accessed

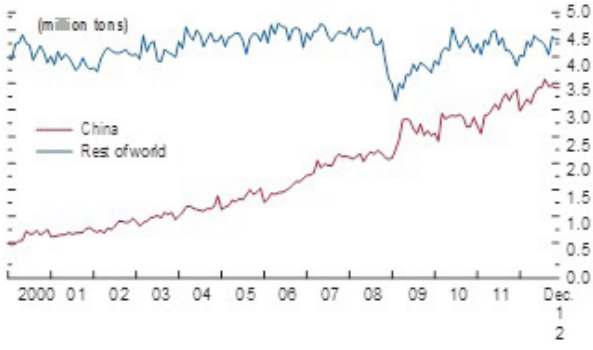
The index grew more than 5 fold from its low point at 169.2 in the third quarter of 2001 to 862.8 in the second quarter of 2008. With the on-set of the recession in 2008, the index plunged to 358.5 in 1st quarter 2009, a fall of almost 60%, then rebounded again to 725.6 in first quarter 2011. The price rally for commodities beginning in the second half of 2009 stalled in the second quarter of 2011.

Chart 2: Goldman Sachs Commodity Index (GSCI) 1970 - 2013



Source: Bloomberg

Chart 3: Global Industrial Metal Demand*



*aluminium, copper, lead, nickel, tin, zinc.
Source: IMF World Economic Outlook April 2013.

The consumption of most industrial commodities in the industrialized OECD countries has plateaued over the past 2 decades as their economies became increasingly service-oriented and less dependent on infrastructure and heavy industry development. The predominant part of incremental demand driving the commodity price boom of the 2000s has been from developing economies. For example, in 2001 OECD members accounted for almost two thirds (63%) of global demand for petroleum but by 2011 they accounted for just over a half (52%).[6] Non-OECD economies accounted for an incremental 13 million barrels per day of demand for petroleum in the decade 2001-2011, while global demand grew by some 10.8 million barrels per day (since OECD consumption actually fell over the period). China alone accounted for over 45% of global incremental oil demand for the decade.[7]

China's industrialization drive of the past few decades, and its attendant demand for minerals and metals has been a key characteristic of the commodity demand and price boom of the 2000s. By 2009, China's demand for industrial metals exceeded total OECD demand, and it now accounts for almost 45% of global demand (see Chart 3). China's primary energy demand surpassed that for the US in 2009,[8] and it is the world's largest consumer of bauxite, iron-ore, coal, copper and nickel.[9] For several major minerals, China has also become a primary producer and processor, including aluminium (41% of world production in 2010), iron-ore (38%) and zinc (29%).[10]

In the long term, as China and other rapidly growing non-OECD economies themselves make the transition from essentially a manufactured exports-led development model towards a more services-based, domestic consumption-oriented one, their demand for industrial minerals and metals will accordingly be less intensively tied to economic growth. With economic development, there occurs a process termed by Radetzki as "de-materialization", as increasingly less primary material inputs are required per $ GDP.[11] This is a result of both technological progress as well as the changing structure of the economy which evolves to higher productivity and larger services sectors relative to the manufacturing, primary commodity and agriculture sectors. But for the next two or three decades, China and other large developing economies will still play a dominating role in global incremental demand for primary commodities.

2. EXTRACTIVE INDUSTRIES: ECONOMIC POTENTIAL AND POLICY CHALLENGES

Rapid, unexpected and often very large price movements are an inherent feature of primary commodity trade. Short run price elasticities of demand for raw materials are typically low: demand responses to price shifts are not large as they usually account for a small percentage of the finished product price. Short-run price elasticities of supply are also low when supply capacities are relatively tight, which is the usual condition in competitive markets where the maintenance of spare production capacity is expensive. While both demand and supply short run price elasticities are low and hence lead to large price swings as equilibrating responses to demand or supply shocks, long run price elasticities are higher, allowing more substantive adjustments in demand and supply capacity with capital investments and technological progress. Commodity price booms are usually triggered by demand shocks preceded and accompanied by fast global economic growth, unless they are caused by supply side disruptions due to political or other crisis in key commodity producing regions - such as the 1970s oil price shocks emanating from the Middle East. Commodity price booms are followed by price collapses if sharp slowdowns in economic growth occur, as in 1974 and 1980.

[6] See BP Review of World Energy Statistics 2012.

[7] Ibid.

[8] Ibid

[9] World Bank Group in Extractive Industries, 2011 Annual Review. 10 Ibid.

[11] See Radetzki, op. cit., p. 10.

With the commodity boom of the past decade, the EI sector presents a tremendous potential for economic growth and improvements in material welfare for many developing economies many of which possess large reserves of natural resources. The revenues from the export of these resources account for a large share of the gross domestic product (GDP). In some cases export earnings account for as much as 90% of government revenues.[12] According to one estimate, between 25 – 30% of total wealth comes from natural resources in the low and middle income economies, as opposed to 2% in the high income OECD economies.[13]

The massive increase in size and volatility of EI revenues also pose critical policy challenges that will determine how the global economy's mounting needs for minerals and metals will be met. In the medium and long runs, with the intensification of urbanization and industrial development across the "emerging markets" of Asia, Africa and Latin America, the demand for primary commodities, from mineral fuels to industrial metals, is expected to grow robustly. Key policy challenges remain on supply-side governance that constrain the full potential for resource-rich economies to develop their natural wealth into sustainable economic development trajectories. These policy challenges are not unique to developing economies. Australia is a prominent example of a developed OECD economy facing fundamental policy choices in responding to large and volatile foreign exchange proceeds in a context of an appreciating exchange rate and cost pressures that have reduced the competitiveness of its exporting and import-competing industries.[14]

The key policy challenges for the supply side in extractive industries (EI) may be loosely grouped under the following broad areas:

- The macroeconomic effects of resource booms in host economies
- Environmental and social impacts of EI in host economies
- The division of rents between host economies and foreign investors
- State Owned Enterprises in the EI sector
- Cooperation and competition in regional and global markets

3. THE MACRO-ECONOMIC EFFECTS OF RESOURCE BOOMS IN HOST ECONOMIES

The basic economic effects of a resource boom on an economy are clear enough.[15] An increase in the profitability of an extractive industry, brought about by either a resource discovery or by an upward increase in the price of the extracted resource, bids up prices of factors of production (labour and capital) as it draws on these factors to support the booming sector. Since the price of exports and imports are fixed exogenously by the world price, movement of factors of production into the booming sector contracts the non-booming sectors of the economy (such as manufacturing and agriculture) which compete in world markets. And, to the extent that some of the increased booming sector revenues is spent domestically on non-tradables (such as construction or local retail services), the price of non-tradables moves higher relative to the tradables sector, further contracting the non-booming tradables sector. These effects of a resource boom are hence the natural outcomes of market forces, as economies specialize in their comparative advantage.

[12] See for instance, "Appendix 1 Resource-Dependent Countries: Descriptive Statistics" in T. Baunsgaard, M. Villafuerte, M. Poplawski-Ribeiro, C. Richmond (2012). Fiscal Frameworks for Resource Rich Developing Countries, IMF Staff Discussion Note, May 16, 2012, SDN/12/04

[13] World Bank, "Changing Wealth of Nations" Database (accessed at http://data.worldbank.org/data-catalog/wealth-of- nations)

[14] See, for instance, W. Max Corden, "The Dutch Disease in Australia: Policy Options for a Three Speed Economy", May 2012, Working Paper No 2012/10, Department of Economics, University of Melbourne.

[15] See Corden, W and Neary, J., "Booming sector and de-industrialization in a small open economy", Economic Journal, 92, pp. 825-48, 1982.

The term "Dutch Disease" was coined to refer to the negative effects on Dutch manufacturing brought on by rapid appreciation of the economy's exchange rate caused by the huge offshore natural gas discoveries in the North Sea. Why is the phenomenon considered a "disease", hence implicitly a policy issue, in the first place? Any case for government intervention needs to demonstrate a divergence between private and social valuations of the Dutch Disease outcome (a contraction of the non-booming tradable goods sector which produces exports or import substitutes). It may be optimal on inter-temporal grounds to protect the non-booming sectors which need to compete in international markets if the natural resource boom is expected to be temporary or if reserves of natural resources are limited.[16] The structural change caused by natural resource booms may be reversible only at great cost in the post-boom period. Hence the key policy challenge for governments of economies undergoing a natural resource boom is to maintain and develop a viable base of industries producing traded goods into the post-boom period while minimizing the transition costs of moving from the boom to the post-boom periods.

In practice, for most developing economies undergoing resource booms, the windfalls accruing domestically primarily flow into government coffers via taxes and royalties, as the EI sector typically is capital intensive and based on foreign direct investments, and local wages constitute a small fraction of the value added in the sector.[17] The effects of the Dutch Disease thus are strongly influenced by how governments, as the major domestic recipients of resource rents, spend their EI windfalls. Max Corden, a long-time and keen analyst of Dutch Disease economics puts it as follows:

> "...the government policy reaction issues and, in particular, the way governments spend their extra revenues resulting from the booms has been somewhat underplayed, or at least not sufficiently highlighted in the literature and yet this has been the major concern in many developing countries."[18]

The EI sector is often characterized by the existence of high economic rents, i.e. the difference between the world price of a scarce primary commodity (the future supply of which cannot be quickly adjusted upwards in the short run) and the cost of extraction and processing of the commodity from particular mining or drilling sites.[19] For instance, the typical marginal costs for the large producing fields of the major Middle East crude oil producers are widely estimated to be around $2.50 - $5.00 per barrel while current global oil prices, set by marginal costs of international oil companies operating in ultra-deepwater Gulf of Mexico or the Canadian tar-sands deposits, are estimated to be in the $90 - $100 per barrel range.[20]

[16] See Wijnbergen, V., "The Dutch Disease: A disease after all?", Economic Journal, Vol 94, pp. 41-55,1984.

[17] The EI in developing economies are typically "enclaves" where inputs of skilled abour, intermediate goods and capital are all imported. Hence, the "resource transfer effect" of EI booms are often attenuated and of much less importance relative to the spending effects of government receipts from the EI sector.

[18] See Max Corden, "Booming Sector and Dutch Disease Economics: Survey and Consolidation", Oxford Economic Papers, 36, pp. 359-380, 1984.

[19] R. M. Solow (1974). "The Economics of Resources or the Resources of Economics, The American Economic Review, Vol. 64, No. 2, Papers and Proceedings of the Eighty-sixth Annual Meeting of the American Economic Association, pp. 1-14.

[20] Kate McKenzie, "Marginal oil production costs are heading towards $100/barrel" Financial Times May 2, 2012 (Blog News and Commentary).

EI rents provide an opportunity for governments to derive political benefits of an expanded public sector without having to bear the political costs of increasing tax rates. The existence of these natural resource rents become a motivating source of corruption and misappropriation of public resources.[21] The existence of EI in a economy can engender weak institutions that undermine sustainable and inclusive development, leading to a concentration of benefits to a narrow beneficiary group.[22] Thus, resource wealth can lead to the entrenchment of autocratic regimes, the onset and persistence of civil conflict and the undermining of legal and constitutional norms.[23] But even in the more developed economies with well-established governance and legal institutions, such as Holland or Australia, government policy responses to large windfall gains from EI have often tended towards supporting unsustainably high social welfare transfers which then cannot be easily dismantled in the post-resource boom period.[24]

The Dutch Disease literature yields important policy implications for "frontier economies" such as Myanmar, Cambodia, Vietnam and Papua New Guinea in the Asia-Pacific region or Uganda, Tanzania and Mozambique in East Africa as relatively recent entrants into the EI sector. Since government consumption expenditures are inherently skewed towards non-tradables such as construction and services sectors, the spending effect of an influx of EI sector rents would be magnified if such rents are predominantly used to expand the public sector. The extent to which these economies use the windfall gains to reduce the deficit on the external account and otherwise limit the rate of domestic absorption of such windfall gains, the appreciation of the exchange rate associated with the Dutch Disease would be muted.[25] Thus, for instance, Indonesia's unusually good economic performance since the mid-1970s has been explained as a result of the low proportion of windfall revenues consumed in favour of investments, and the use of foreign exchange receipts to reduce the deficit on the balance of payments account.[26]

Of course governments can "sterilize" the impact of foreign exchange receipts by deferring consumption or investment in the domestic economy, in favour of holding foreign assets instead. Governments can set up oil trusts and sovereign wealth funds, tasked with the objective of achieving the highest (risk-adjusted) returns for the nation's surplus of natural resource rents by creating and managing a portfolio of foreign investments, in order to avoid excessive domestic investment or consumption expenditure programs which would lead to exchange rate appreciation and the attendant effects of the Dutch Disease.[27] Primary commodity markets have matured greatly in the past two decades, and now allow even major producers and consumers to hedge their price exposure risks (to export revenues or import costs respectively). However, few large primary commodity producing governments have used hedging instruments that markets provide as "the potential political costs of hedging outweigh the benefits even if the economic case is clear".[28] Few governments can withstand the great pressures they typically face to fulfil their constituents' expectations of higher standards of living by increasing direct and immediate government consumption expenditures in the domestic economy

[21] F. van der Ploeg (2011). Natural Resources: Curse or Blessing? Journal of Economic Literature, American Economic Association, vol. 49(2), pages 366-420, June; D. Acemoglu, T. Verdier (2000). The Choice between Market Failures and Corruption, The American Economic Review, Vol. 90, No. 1 (Mar., 2000), pp. 194-211.

[22] A. Bebbington, L. Hinojosa, D. H. Bebbington, M. L. Burneo, X.Warnaars (2008). Contention and Ambiguity: Mining and the Possibilities of Development, Development and Change 39(6): 965–992, Institute of Social Studies 2008. Auty, R. and S. Gelb (2001). Political Economy of Resource-Abundant States, in R. Auty (ed.) Resource Abundance and Economic Development, pp. 126–44. Oxford: Oxford University Press.

[23] P. Le Billon (2001). The political ecology of war: natural resources and armed conflicts, Political Geography 20(5):561 – 584.

[24] See, for the Dutch case, Ebrahimzadeh, C., "Dutch Disease: Wealth Managed Unwisely", Finance and Development, IMF, 28 March 2012, accessed at http://www.imf.org/external/pubs/ft/fandd/basics/dutch.htm

[25] For the Indonesia example, see Warr, P., "Exchange Rate Protection in Indonesia", Bulletin of Indonesian Economic Studies, 20, pp. 53-89, 1984.

[26] Gelb, A., Oil Windfalls: Blessing or Curse?, (John Hopkins Press, Baltimore, 1988). It should be noted that the positive overall economic performance of Indonesia refers to the period after Pertamina, the Indonesian national oil company, defaulted on loans in 1975-76 (see footnote 45).

[27] See, for instance, Scheer, S., "Israel cabinet OKs wealth fund to prevent "Dutch Disease"", Reuters, April 14, 2013.

[28] Daniel, J. A., "Hedging government oil price risk", IMF Working Paper, November 2001.

4. ENVIRONMENTAL AND SOCIAL IMPACTS OF EXTRACTIVE INDUSTRIES IN HOST ECONOMIES

By their very nature, extractive industries have environmental impacts, and hence, can have adverse consequences for those communities living in or depending on the resources of the affected areas. In turn, this can lead to further unintended consequences, with sometimes violent responses from local communities. The lessons from the Niger delta, where armed groups threaten installations and personnel in the oil and gas sector show the importance of effective community engagement by both governments and companies in resource extraction areas. While militancy on the scale witnessed in Nigeria is relatively rare, there can be no room for complacency in new areas of extractive industry development such as Southeast Asia (Myanmar, Laos, Cambodia, and Papua New Guinea) or East Africa (Tanzania, Mozambique and Uganda). The recent mass protests against Chinese resource investments in Myanmar, for example, are an example of failed community relations.[29]

Governments in developing economies with increasingly important EI sectors typically have weak institutions and poor capacity to monitor and enforce mining contracts to ensure compliance with social and environmental regulations.[30] Licenses and permits for mineral resource developments are often granted in the absence of adequate legal frameworks or environmental safeguards. Environmental impact assessments are often a matter of formality with local and regional governments lacking adequate capacity to ensure compliance with agreed environmental standards. Systematic assessments of potential environmental and social impacts of both new and continued extraction of raw materials and fuels are either lacking or subverted by powerful stakeholders and vested interests.

In the past decade or so, the negative effects of exploiting natural resource wealth have been given more attention in international development institutions, mainly framed as issues of governance. An example of this is the World Bank's Extractive Industries Review[31] – an assessment of the Bank's role and operations across the mining, oil, and gas sectors. In one early external assessment of the Bank's efforts to address policy and institutional failures which have had adverse effects on the environment and the poor, the patterns of EI development in Peru, Tanzania and Indonesia during 1990 – 2002 were examined.[32] The study found weaknesses in the capacity of governments to ensure full implementation of World Bank advice. It also found a "lack of leverage" that the World Bank had over governments. The Bank generally recognized that the extractive industries in these three economies were associated with negative environmental and social impacts. According to the study, the Bank's structural reform strategy had significant 'imbalances' between allowing market forces to support EI development and the mitigating responses that require long term institutional development on the part of national, regional and local authorities. Among the institutional failures that are common to the governance of EI sector development is the privatization of state-owned enterprises (SOEs) that occur without adequate building of state capacity to regulate the private sector, the absence or lack of government authority to address social and environmental compliance issues independent of agencies in charge of promoting investments in the EI sector, and the lack of adequate management, accountability and transparency of EI sector revenue flows.

Civil action against the development of extractive industries and downstream processing of raw materials has emerged as a new area of concern for policy planners in rapidly developing economies such as China and India. A burgeoning middle class is increasingly active in its opposition to hazardous pollution in Asia's many polluted cities. Mass protests in China, many of which have been effective in halting large project developments against oil refining and petrochemical projects in Xiamen (2007), Dalian (2011), Ningbo (2012) and Kunming (2013), have been reported in the press.[33] Increasingly, businesses and government in the more advanced developing economies are having to adjust to the potential for opposition by civil society and non-governmental organizations against adverse environmental outcomes of extractive industry developments in the midst of the demands of intensive urbanization and infrastructural developments.

[29] For instance, see Perlez, J and Feng, B., "China Tries to Improve Image in a Changing Myanmar", New York Times, 18 May 2013.

[30] For instance, see World Bank, "Extractive Industry Technical Advisory Report", 5 October 2010.

[31] "The World Bank Extractive Industries Advisory Group was formed to help the Bank identify and promote good practices in oil, gas, and mining extractive industries and to follow up on implementation of the agreed recommendations of the Extractive Industries Review." See World Bank Oil, Gas and Mining Unit website at http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTOGMC/

[32] Heike Mainhardt-Gibbs, "The World Bank Extractive Industries Review: The Role of Structural Reform Programs towards Sustainable Development Outcomes", November 2003 accessed at http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTOGMC/

[33] See, for instance, Spegele, B., "Protests build with dismay at pollution", The Wall Street Journal, 20 May 2013.

5. DISTRIBUTION OF RESOURCE RENTS BETWEEN THE HOST ECONOMY AND FOREIGN DIRECT INVESTMENT

With the end of colonial rule, newly independent governments found it imperative to gain control over the natural resource sector in minerals and energy where ownership had traditionally been established by colonial interests. In the 1960s and 1970s, there occurred a massive wave of nationalization of foreign owned mines, often without or with little compensation. It is estimated that between 1956 and 1974, 25% of total foreign direct investments (FDI) in developing economies was nationalized, about 60% of which was without compensation.[34] Natural resources, especially fossil fuels, were a large proportion of FDI which were nationalized. Nevertheless, with the fall in commodity prices and increasing evidence of waste and low productivity in SOEs and public investments around the world during the 1980s, there was a sharp fall-off in cases of expropriation of EI investments and a partial roll-back of government intervention in the EI sector.[35] With the phenomenal commodity price boom of the past decade, the temptation to nationalize or impose higher or new taxes and royalties as a means of increasing the revenue of host economies (HCs) at the expense of multinational companies (MNCs) has once again taken centre stage in a number of economies. Expansion of state ownership in the natural resource sectors of Bolivia, Venezuela and Russia in the mid- 2000s are among the more prominent examples. It is not possible to predict whether they are harbingers of a new wave of nationalization or the transient results of a commodity price boom.

Foreign direct investments in the extractive industries are vulnerable to government seizure due to the nature and timing of investments and payoffs; typically, revenues flow much later after initial investments are made. Large investments, specific to each field or mine, cannot be relocated or easily dismantled, and are essential kept "hostage" to host economy governments.[36] It should be noted that the "hostage" issue cuts both ways. In some cases, very large MNCs with dominating roles in the primary commodities sector can hold sovereign countries "hostage", especially if they are relatively small economies.Credible threats of "walking out" and shutting down EI operations in bargaining strategies with host governments are part of the repertoire of large MNCs.[37]

As primary commodities are subject to extreme price volatility, in up-cycles, when prices are rapidly rising, host economy governments are under domestic pressures to expropriate a larger share of the EI revenue stream, at variance to what was agreed upon ex ante at contract signing and the final investment decision. Long lived investments in mining contracts face what economists call "time inconsistency" problems: as market and other conditions evolve, interests of parties to the contract change, and what may have seemed reasonable contractual terms at the signing may seem to unduly favour one party. This leads to what has been termed the "natural resource trap".[38] As MNCs are experienced and aware of the history and comparative experience of EI investments around the world, they already anticipate a risk of expropriation of their sunk investments, and hence implicitly require a contract that compensates them for this risk. In a vicious spiral, this provides further motivation to the host economy to expropriate or change the rules of the game ex post. Host economy governments, even those that value good investment risk rankings by investment banks and rating agencies, may face intolerable pressures of "resource nationalism" to expropriate the windfall gains that would otherwise accrue to MNCs.

[34] Williams, M. L., "The extent and significance of the nationalization of foreign-owned assets in the developing countries", Oxford Economic Papers, Vol 27, 1975 (cited in Radeztski, op. cit. p. 172.)

[35] Yergin, D. and Stanislaw, J., The commanding heights: the battle of the world economy, Simon and Schuster, 1998.

[36] Specific capital investments in long term bilateral contracts are hostage to ex post opportunism, after initial contracts are signed for such long-lived investments. See Paul L. Joskow, "Contract Duration and Relationship-Specific Investments: Empirical Evidence from Coal Markets," American Economic Review, Vol. 77, No 1, March 1987, pp. 168 – 185.

[37] A recent example is the international mining giant Rio Tinto's implicit threat to close New Zealand's Bluff's Tiwai Point aluminium smelter if it can't negotiate cheaper power for it to continue operating. See, Bennett, A., "Tiwai Pt threat could delay Mighty River sale", The New Zealand Herald, August 23, 2012.

[38] See Hogan, W. and Sturzenegger, F., The Natural Resources Trap: Private Investment without Public Commitment, The MIT Press, 2010.

Nationalization or expropriation of foreign investments can be one-off extreme events but, more often, they tend to be indirect or "creeping". In the latter, increasing tax and royalty rates, increasing government equity without compensation or imposing new legislation which change the rules governing the mining contracts after they have been signed, are among the means to reduce the payoff to the foreign investors in favour of the host economy government. It is important to note that "creeping nationalizations" have occurred not only in developing economies. For example, unilateral changes in tax rates, royalties and other contractual rules have occurred in the UK, Canada, and the US (at Prudhoe Bay).[39]

While governments can nationalize and achieve short term gains at the expense of foreign investors, the national interests of the host economy can be adversely affected in the long run, as the lower returns reduce future foreign investments in the EI sector which ultimately reduces the present value of the economy's resource endowment. As a consequence, the production possibility frontier for particular minerals at a global level moves inwards, making primary commodity supply more expensive. The primary policy challenge for host economy governments in the EI sector is to extract the maximum sustainable fiscal revenue to the state while allowing foreign investors to earn a risked-adjusted rate of return commensurate to their investment costs and the exploration and development risks they bear.

6. STATE-OWNED ENTERPRISES IN THE EI SECTOR

Along with nationalization, large public investments and the establishment of state-owned enterprises (SOEs) in the EI sector became the norm especially in developing economies.40 With natural resource wealth being seen as the nation's patrimony, often yielding high rents, public ownership was often seen as the preferred route to prevent EI rents flowing to private sector enterprises, often foreign-owned. The immobility of mineral deposits allowed governments to intervene without the risk that the mines or the drilling sites could escape their jurisdiction. The immobility of fixed investments, however, does not stop MNCs from being able to use transfer pricing and other accounting techniques to reduce host economy tax obligations based on profits or revenue flows. Transfer pricing remains one of the major ways in which cross-border tax evasion is practiced, and has been one of the major issues discussed in various forums regarding transparency of tax payments by MNCs in the EI sector on an economy-by-economy basis.[41]

There is a vast gulf between the best and the worst performers among the SOEs in the EI sector. At one end are examples of organizations that are mere instruments of plunder for favoured or powerful constituencies. These SOEs get rapidly de-capitalized as their revenue streams are appropriated for social or political objectives while inadequate funding is provided for re-investments and maintenance expenditures in the EI sector. The EI sector then shrinks and loses production capacity even as it fails to maintain adequate reserve- production ratios for future capacity growth. Examples of slumping production and shrinkage of future production prospects include the copper industry in the Congo, and the oil industry in Peru and Mexico[42] In the 1970s, many OPEC countries used the oil price windfalls to fund welfare and political initiatives while failing to re-invest in their oil and gas sectors, leading to falling reserve-production ratios and stagnation or shrinkage of production capacity over time; among the examples cited are Venezuela, Indonesia, Nigeria and Peru.[43] At the other end of the performance spectrum, SOEs such as Statoil, the Norwegian state oil company, are indistinguishable from their private sector counterparts. These companies are typically mandated to maximize the net present value of their respective economy's natural resource endowments. While governments are the sole shareholders, the SOEs retain full operational and managerial autonomy and have access to necessary re-investment funds to ensure that the EI sector develops to its full potential.

[39] Ibid, p. 4. See also, Howell, N. M. and Dahlawi K, "Will the UK Government's Recent Increase in Tax on Oil Profits Deter Investment in the UK North Sea?", Energy Newsletter (King & Spalding), June 2011.

[40] See, for instance, Radetzski, pp. 16 – 18.

[41] See for instance Kabajwara, C., "Multinational companies and tax transparency: what is changing?", Daily Monitor (Uganda), January 22 2013. Tax transparency of MNCs has become a major issue within OECD countries more recently, as the UK, the US and other countries look to domestic legislation to curb the practice with such global companies such as Starbucks and Apple. See, BBC Business News, "Tax paid by some global firms in UK 'an insult'", 3 December 2012

[42] Radetzski, op. cit., p. 178.

[43] International Energy Agency (IEA), "Medium Term Oil Market Report", Paris, 2006.

Typically, most SOEs in the EI sector lie somewhere between these extremes. They are often poorly capitalized, burdened by social and political objectives imposed by government directives, with their surpluses used to fund social or political objectives. The management may be recruited on the basis of political or social affiliation, rather than on technical or managerial competence. For SOEs which derive large rents, governmental oversight and control is often compromised by severe "principal-agent" problems, i.e. where that the principal cannot directly ensure that the agent is always acting in its (the principal's) best interests since the agent's actions are not unobservable or costly for the principal to observe.[44] Indeed, some SOEs evolved into behemoths unrestrained by accountability except to the highest political authorities, with CEOs having equal rank with other Cabinet Ministers and with ostensible oversight ministries becoming mere appendages of the SOE rather than exercising overall control as independent regulators.[45]

The large literature on the performance of SOEs in the EI sector in the developing economies suggests a generally negative picture. More often, nationalization and the takeover of EI by SOEs led to short run payoffs but also to long term declines in both production as well as in the future potential of natural resource recovery. The host economy's desire to extract the entire rent of EI projects in many cases led instead to the dissipation of rents via mismanagement, gross inefficiencies and corruption, ultimately reducing the present value of the economy's endowment of natural resources in absolute terms.

7. COOPERATION AND COMPETITION IN REGIONAL AND GLOBAL MARKETS

Among the key themes that affect the landscape for cooperation and competition in regional and global commodity markets for minerals and metals are barriers to trade, trading and pricing norms in markets for key commodities, and policy concerns about supply security.

A) BARRIERS TO TRADE

Trade-distorting protectionism is far less prevalent in minerals and mining than in the agricultural and food commodities.[46] Two thirds of the distortion in global trade arise from agricultural protectionism, and half of global agricultural protectionism can be attributed to the OECD economies.[47] In the extractive industries, perhaps the most common trade barrier is the tendency for net exporters and importers of industrial commodities to apply tariff escalation along the commodity processing chain, in order to encourage the location of downstream processing industries within their respective economies. Importers often allow crude or raw primary materials with zero or low import tariffs but with higher "cascading" import tariffs for processed commodities, while exporters typically impose higher export taxes on exports of ores and other raw minerals than on processed primary commodity exports. China for instance, has a 17% value added tax on refined copper imports but none on imports of copper concentrate; the economy is now a major global smelter of the metal, while Chile, a major copper producer, lost its previous pre-eminent position in copper smelting.[48] Indonesia, a major exporter of hardwoods, has progressively lower export taxes along the downstream processing chain: crude logs, sawn logs, processed wood products, in that order. [49]

[44] Sanford J. Grossman and Oliver D. Hart, "An analysis of the principal-agent problem", Econometrica Vol. 51, No. 1 (Jan., 1983), pp. 7-45

[45] For instance, the oil price shocks of 1973-74 which led to massive surges of cash flow to Pertamina, the Indonesian national oil company, was followed by the use of oil funds for large new "nationalist" projects amid endemic corruption in the oil sector, the defaulting on foreign denominated debt by Pertamina and the assumption of such debts by the government in 1975-76. See Hertzmark, D., "Pertamina: Indonesia's State-Owned Oil Company", James A. Baker Institute, 2007.

[46] Radetzki, M. "A Handbook of Primary Commodities in the Global Economy", Cambridge University Press, Cambridge, UK: 2008.

[47] Anderson, K., "Subsidies and trade barriers", in Lomborg, B. (editor) Global Crises, Global Solutions, Cambridge University Press, 2004; cited in Radetzki, op. cit., p. 48.

[48] Ibid., p. 56.

[49] Ibid.

Factors which determine the geographical location of natural resource processing industries include transport costs, economies of scale and local business conditions such as the cost of intermediate inputs such as electricity (which is critical for some energy intensive processing industries such as aluminium smelting). Taking the cost of transporting copper for example, the weight of refined copper is two thirds lower than the equivalent in its ore state, making it far more favourable for the exporting economy to smelt locally, preferably in the vicinity of the mine-mouth or at a convenient rail-head. In the case of petroleum however, transport of crude oil in very large crude carriers (VLCCs) is much cheaper than that for smaller quantities of refined oil products which require smaller and more specialized oil tankers. Economies of scale in many of the mineral processing industries favour the location of processing facilities in economies that import or export large volumes of the ores. Nevertheless, the geographical location of processing industries is not uncommonly the result of various trade barriers. Clearly, the world economy would benefit if commodity processing is located on cost-efficiency grounds rather than as a consequence of trade-distorting barriers that compete in a zero-sum manner to influence the location of commodity processing industries.

Perhaps the most remarkable recent example of trade barriers is the continued policy debates and associated partisan political rhetoric taking place in the United States regarding the 20 or so current applications to export LNG being considered by the US Department of Energy.[50] New extraction technologies such as horizontal drilling and hydraulic fracturing of oil and gas-bearing shale rock have helped increase the supply of fossil fuels in the United States, reduce prices, encouraging downstream processing industries, and potentially reversing the economy's status as a large net energy importer to a significant exporter. Federal regulations—including discretionary export licensing systems for natural gas and crude oil—restrict exports, and hence distort domestic energy prices and signal wrong investment choices. Furthermore, such restrictions are possibly in contravention of WTO membership obligations.[51] What may seem most remarkable of the policy debates occurring in the US is the discretionary authority granted to administrative appointments of the government in deciding "the national interest".[52] Despite a number of authoritative studies having concluded that the US would gain net overall benefits of allowing LNG exports,[53] opposition to exporting natural gas has been organized by domestic consuming industries and environmental groups, causing the government to inordinately delay approvals on pending export-license applications.

B) TRADING NORMS AND PRICE DISCOVERY

Most primary commodity trade occurs in bilateral contracts which determine commodity quality specifications, time and place of delivery, and price. At one end of the spectrum, these contracts can be private and confidential ('P&C') between buyer and seller, and may be based on opaque arrangements, for instance when buyers have equity stakes in, or make long term loans to, commodity suppliers in return for a long term commodity supply contract at "preferential" prices. At the other end, trade may be mediated by electronic commodity exchanges which allow trade of highly standardized commodity contracts with strictly specified volumes, qualities, delivery schedules, modes of allowed delivery (ex-ship or ex-storage facility, etc.), payment terms, and so on.[54] In exchange-traded commodity contracts, the counter-party to every buyer and seller is the exchange's Clearing House.

[50] Daly, M. "Moniz: LNG exports on hold until data reviewed", Associated Press, 21 May 2013.

[51] Lincicome, S., "License to Drill: The Case for Modernizing America's Crude Oil and Natural Gas Export Licensing Systems", Free Trade Bulletin No. 50, Cato Institute, 21 February 2013.

[52] Just days after the US DOE announced the granting of a 2nd license to export natural gas to non-FTA economies, the newly appointed Energy Secretary Ernest Moniz announced that no other projects will be approved until he "personally was satisfied" with data reports and analytical studies in favour of exports that have been with the DOE for considerable time. See Daly, op. cit.

[53] The most authoritative study of the economy-wide impacts of potential US exports of natural gas to date is by NERA, a consulting company commissioned by the US DOE. See NERA, "Report on the macroeconomic impacts of LNG exports from the United States", 3 December 2012.

[54] It should be noted that in most exchange traded commodity contracts, physical delivery plays a secondary role, as the majority of futures contracts are liquidated via 'cash settlement', i.e. the purchase of an equal and opposite position on the contract before its physical delivery is due.

The group of commodities traded on modern electronic exchanges[55] has expanded since the earliest ones were founded in the late 19th century in the US and the UK, and the GSCI basket now includes six energy contracts,[56] seven industrial and precious metals contracts,[57] and eleven agriculture and livestock contracts. However, much of the physical trade still occurs outside of the commodity exchanges for reasons ranging from difficulty in grade standardization and the role of dominant producers or buyers in preferring direct bilateral negotiations to government price or supply regulations. In highly concentrated industries such as iron ore, a few dominant sellers and buyers set market "guideline" prices which are then used as a reference price for trading by numerous smaller buyers and sellers around the world.[58]

Relatively few commodity prices are directly discovered by the commodity exchanges. Instead, there are a large class of commodities which are priced off assessments published by price reporting agencies (PRAs). Indeed, the largest (by value) international traded commodity categories -- crude oil and refined petroleum products – are overwhelmingly traded on the basis of price assessments published by private agencies such as Platts, ICIS and Argus.[59] The influence of such PRAs extends across the commodities universe, including petrochemicals, coal, liquified natural gas (LNG, whose supply contract prices are indexed to crude oil or refined product prices) and some metals, as well as other goods or services outside of the traded commodities space, such as shipping rates and wholesale power.

The high degree of reliance on PRAs in price discovery, and more particularly, in the potential for price manipulation by market actors interacting with PRAs, has recently gained attention from anti-trust regulatory authorities in Europe.[60] PRAs do not have any legal authority over the reporting of prices. They merely report, with no warranties for their accuracy, assessments based on voluntary "self-reporting" of bids, offers and deals done by market actors (which naturally have an interest in participating in the setting of prices). The current Platts system of reporting prices at "market on close" ('MOC'), where assessment is based on deals done, bids and offers during a short time window under strict reporting rules, replaced the previous system of reporting daily volume-weighted averages on reported trades executed throughout the day. The current system evolved out of the obvious disadvantages of the previous.[61] Highly volatile oil prices, reflecting fast-moving political or weather-related events affecting prices and, as importantly, expectations of future prices, makes any calculated weighted-average daily price purely notional. The MOC system provides an exact time stamp for publishing the daily settlement price of any particular market place (e.g. Singapore 4.30 pm or London 4.30 pm for business days). By following stricter reporting procedures for setting daily settlement prices within a short time frame, the MOC assessments also reduces the dependence on reporters' judgement calls in assessing information provided by self-interested market actors.

The advent and rapid growth of derivative futures and options contracts ('paper barrels' in the oil industry), which now dwarf the size of the physical trading markets ('wet barrels'), make it possible for small moves in relatively small physical markets to have an impact on large paper positions. A trader could under certain market conditions take a small 'hit' on his ownership of physical oil while being better off overall due to his larger offsetting paper positions. The role of speculators on commodity exchanges has been an area of much government scrutiny and academic research.

[55] Prior to electronic trading systems becoming ubiquitous, commodity contracts were traded in "open-outcry" trading pits with trading floor broker members executing buy or sell offers for their clients.

[56] Brent crude oil, West Texas Intermediate crude oil, US gasoline, US heating oil (gasoil) and US natural gas.

[57] Aluminium, copper, lead, nickel, zinc, gold and silver.

[58] Over most of the past five decades, iron-ore prices have been decided in annual private negotiations between the large iron-ore producers such as Sweden and Brazil with German and Japanese steelmakers. With the emergence of China's demand in recent years, negotiations between the newly dominant large Australian exporters (such as BHP Billiton and Rio Tinto) and Chinese buyers now set global iron-ore prices.

[59] According to one large oil and gas MNC's report, 80% of all crude oil and refined products trading, including almost all of the Middle East sales of crude oil to its largest markets East of Suez, is linked to Platts published reference prices. See Kwiatkowski, A., and Zhu, W., "EU oil manipulation probes shines light on Platts pricing", Bloomberg, 15 May 2013.

[60] Campbell, R., "How to manipulate oil price assessments", Reuters 15 May 2013.

[61] For an authoritative, even if somewhat dated, account of the myriad pricing norms and methodologies for crude oil and refined petroleum products trade in the East of Suez markets, see Horsnell, P., Oil in Asia: Markets, Trading, Refining, and Deregulation, Oxford University Press, 1997.

Investment in commodities has become a common part of the portfolio of large investors. This coincides with a large increase of assets under management of commodity exchange-traded funds (i.e. 'ETFs' which track commodity indexes). From less than $10 billion around the end of the last century, commodity assets under management reached a record high of $450 billion in April 2011.[62] Consequently, the volumes of exchange-traded derivatives on commodity markets are now an estimated 20 to 30 times larger than physical production. Financial investors, which accounted for less than 25% of all market participants in the 1990s, now represent more than 85%, in some cases, of all commodity futures market participants.[63] The rise of commodity futures contracts as an asset class for many institutional investors and their clients have heightened concerns that derivative prices set physical commodity prices, allowing the vagaries of investor confidence to set prices rather than demand and supply 'fundamentals'. There is much debate on the assertion that speculators determine commodity prices and their volatility. However, the findings of at least two key studies suggest that the role of speculators in price volatility is not entirely evident in the data. An IMF study found no relationship between the size of net long non-commercial positions (a measure of participation by speculators) and prices during the commodity price boom of 2003 – 5.[64] Indeed, in the copper market, net long positions fell while prices increased to record highs in 2005. Another study by the Commodity Futures Trading Commission (CFTC) of the US found, counter-intuitively, that speculators shift their long or short positions less frequently than hedgers; instead it was the change in positions by industry hedgers, presumably responding to perceptions of fundamental demand and supply factors, that led to a change in speculative positions.[65]

C) SUPPLY SECURITY

Supply-side security concerns for internationally traded commodities are not new.[66] Many economies pursued policy initiatives to counter the perceived problem of commodity import insecurity, but the major impetus rose amid the crisis environment of the oil price shocks of the 1970s. They stimulated major policy initiatives to reduce dependence on energy imports and to boost energy efficiency in several OECD economies. While concerns with oil geopolitics quietened somewhat with low oil prices particularly since 1985, energy security has once again become a prominent global security issue, driven by political and market events: the aftermath of the US military intervention in Iraq and the ratcheting up of political instability with the Arab Spring, and the price increases and amplified price volatility for oil over the past decade. Concerns of supply security of critical industrial commodities can be broadly grouped under two separate issues. The first is the perceived depletion of natural resources as known reserves of minerals and metals get exhausted and their real prices increase. The second concerns the means whereby economies attempt to mitigate import dependence for vital industrial commodities.

[62] Institute of International Finance, "IIF Commodities Task Force Submission to the G20: Financial Investment in Commodity Markets: Potential Impact on Commodity Prices & Volatility", September 2011

[63] Masters, M W(2008), "Testimony of Michael W. Masters before the Committee on Homeland Security and Governmental Affairs", United States Senate, 20 May 2008

[64] International Monetary Fund, World Economic Outlook, 2006.

[65] Haig, M.S., Hranoiva, J., and Overdahl, J. A., "Price dynamics, price discovery, and large futures trader interaction in the energy complex", US CFTC Working Paper, Washington DC., 2005. (cited in Radetzki, op. cit., p. 110).

[66] For instance, this was of concern to Lord Keynes who believed that the industrial economies were too reliant on distant sources of raw materials. See Radetzki, op. cit. p. 126.

I. PERCEPTIONS OF INCREASING SCARCITY: PRICE TRENDS FOR PRIMARY COMMODITIES

In the late 1940s, Raul Prebisch, commissioned by the Economic Commission of Latin America and the Caribbean (ECLA), examined long run data series not with a view to studying resource scarcity but rather to examine the movements in the terms of trade between developing economies with mainly extractive industry exports and the industrialized OECD economies which exported primarily manufactures.[67] He suggested that the terms of trade for primary commodity exporters had a tendency for secular decline, relative to manufactures, in the long run. A common explanation for the phenomenon is the observation that the income elasticity of demand for manufactured goods is greater than that for primary products. Therefore, as incomes rise, the demand for manufactured goods increases more rapidly than demand for primary products. Another argument is that continuous quality improvements -- an inherent characteristic in manufacturing, in contrast to primary commodities -- support long run secular increase in prices for manufactures. Yet another factor in support for the secular decline in primary commodity prices is associated with the dramatic fall in transport prices since the rise of maritime shipping in the early 20th century, as transport prices constitute a larger fraction of the final price for primary commodities than manufactured goods.

A World Bank study for the period 1900-1986 for 24 major commodities show a price decline of 0.59% annually; if the data is disaggregated, the fall in the price of metals is steeper, at 0.84% annually. [68] Another study, covering the more extensive period of 140 year (over 1862 – 1999) for metals, minerals and agricultural commodities but excluding food and fuels, found a decline of 1.3% per annum.[69] A more recent analysis, based on 24 commodity price series and seven indices which were originally developed for the World Bank study mentioned above but which have been updated to the year 2000 in order to cover the entire century, also found "a significant deterioration in their [i.e. primary commodities] barter terms of trade over the course of the twentieth century". [70] This decline was neither continuous, nor was it distributed evenly among individual products, however. The data show "that the far-reaching changes that the world economy underwent around 1920 and again around 1980 led to a stepwise deterioration which, over the long term, was reflected in a decline of nearly 1% per year in aggregate real prices for raw materials".[71]

During the 2000s commodities boom, the terms of trade of most developing economies improved while East Asia (with much of its exports being manufactured goods) has deteriorated in its terms of trade.[72] In practice, it is difficult to disentangle real long run price trends which can signal resource depletion from price booms which reflect unexpected demand or supply shocks or oligopolistic cartel behaviour, not the underlying marginal cost conditions. It is clear that the long run historical evidence is not very supportive of those who perceive increasing scarcity for minerals and metals. Yet, it is also clear that the history of commodity prices is no guide to their future trajectory.

[67] Prebisch, R.,, The Economic Development of Latin America and Its Principal Problems (New York: United Nations, 1950)

[68] Grilli, E. R. and Yang, M.C., "Primary commodity prices, manufactured goods prices and the terms of trade of developing countries: what the long run shows", World Bank Economic Review, January 1988.

[69] Cashing, P and MacDermott, C.J., "The Long Run Behaviour of Commodity Prices: Small Trends and Big Variability", IMF Staff Papers, Vol 4, No 2, 2002.

[70] José Antonio Ocampo, J. A and Parra, M. A., "The Terms of Trade for Commodities in the Twentieth Century", Econ Working Papers, 17 February 2004.

[71] Ibid.

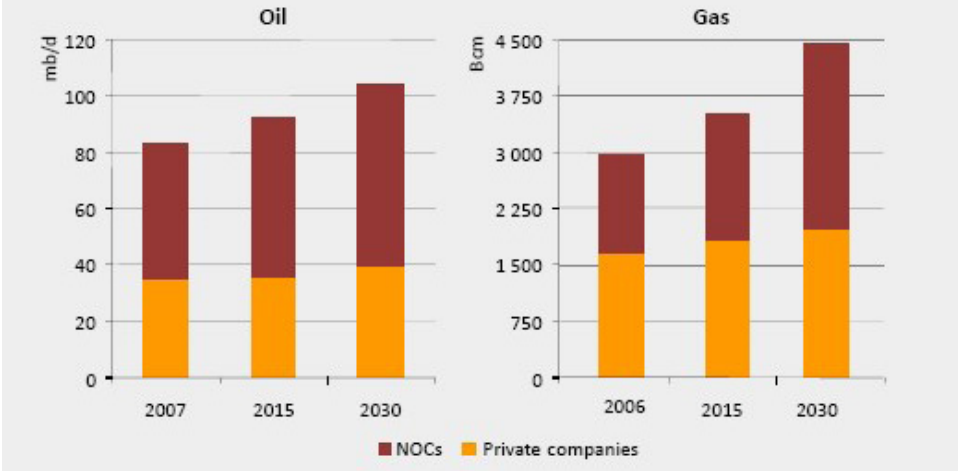
[72] United Nations Conference and Trade and Development, Trade and Development Report 2008, UNCTAD/TDR/2008

Reflecting the steep climb in crude oil prices in the past decade (which reached a peak of $140 per barrel in 2008), a vociferous debate has taken place between "Peak Oil" proponents who claim that increasing oil scarcity and the ultimate depletion of global oil reserves are already apparent and those who hold less pessimistic views.[73] Most industry experts agree that a large portion of the easily accessed, conventional oil reserves have already been discovered, and that increased production outside of OPEC will take place in more difficult or hostile environments at higher cost and risk, such as the deep-water prospects in the Arctic.[74] But the 'oil question' (as for all natural resources) for most economists is about price, available technology and marginal costs of production, rather than some ultimate physical 'availability' in the sense of a certain amount of supply in the ground consumed at a certain rate. To many practitioners in the industry, the real limitations to the supply of natural resources are seen not as "below ground" issues (reservoir characteristics, production engineering, etc.) but rather "above ground" matters which include regulatory and policy uncertainty, quality of local personnel and sub-contractors, security risks to personnel, lack of available infrastructure and environmental activism by non-governmental organizations.

II. THE 'SCRAMBLE' FOR NATURAL RESOURCES: THE ASIAN NATIONAL OIL COMPANIES

Perhaps the theme of supply security is nowhere more apparent than in the oil and gas industries. Resource nationalism and the first oil crisis of 1973 gave rise to the modern national oil company (NOC), a model that has become widespread in both the oil and gas sectors in the non-OECD economies. While Deng Xiaoping's opening up of China and the collapse of the Soviet Union led to reform, privatization and deregulation in many of the developing economies, the role of NOCs has remained dominant (see Chart 4 below). Governments, not private shareholders, already own the world's largest oil companies and about 83% of global oil reserves and production are controlled by national oil companies; privately owned multinationals now produce just 10% of the world's oil and own just 3% of global reserves.[75] According to the IEA, almost 80% of future conventional oil and gas output to 2030 will come from NOCs.[76]

Chart 4: Oil and Gas Production by NOCs and Private Companies



Source: IEA World Energy Outlook 2008

[73] Simmons Matthew R (2005). Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy. Hoboken, N.J.: Wiley & Sons. ISBN 0-471-73876-X.; For an early view opposed to the idea of resource depletion, Simon Julian L (1998). The Ultimate Resource. Princeton University Press.

[74] The relatively recent emergence of East Africa as a major new region for oil and gas exports, for example, illustrates the fact that there are still many areas around the world that have had little exploration activity, and the assessment of "ultimately recoverable reserves" is a constantly moving target.

[75] IEA World Energy Outlook 2008.

[76] Ibid

While the first national oil companies (NOCs) were established in the early years of independence from the ex-colonial powers, primarily representing the large exporting oil exporting economies of OPEC, the NOCs of the large Asian net oil-importers are relative late-comers. More recently, however, Asian NOCs from China, Japan, Korea, India and elsewhere have led a wave of investments for equity participation in upstream energy projects in Africa, Middle East, Central Asia, Latin America and Southeast Asia/Australasia. In the past decade, the Asian NOCs have become increasingly internationalized in their asset portfolios. They compete as well as form joint ventures with the international oil companies for access to oil and gas deposits around the world. More recently, with the boom in unconventional oil and gas resource development in the US and Canada, the leading foreign investors in the sector have been the large Asian NOCs.[77]

The Chinese oil companies in particular have gained increasing attention from the industry in recent years by the scale of their investments in upstream oil and gas assets.[78] According to the IEA, China spent $47.6 billion to acquire oil and gas assets worldwide, accounting for 61% of total acquisition value by all NOCs; over the same period, it spent an estimated $77 billion in loan-for-oil deals.[79] From 2009 to 2011, the worldwide net investment by the top 50 oil companies ranked by the Petroleum Intelligence Weekly was $107 billion; of the total, the Chinese NOCs alone represented more than half of the total ($54.1 billion).[80] The Chinese continued with a spate of large investments in oil sands and unconventional gas in North America during 2012.

What are the key determinants of this drive to acquire equity stakes in the oil and gas sector? In the context of constrained domestic production and increased demand for hydrocarbons in the NOC's home economy, the perceived need to gain 'control' of larger levels of oil and gas reserves across the globe would seem high in many policymaker's strategies to enhance energy security.[81] Large cash surpluses on the NOC books, on the one hand, and managerial strategies to exploit economies of scale and vertical integration in the oil and gas operations and downstream processing and distribution, on the other, provide straightforward commercial imperatives. The need to acquire new technology, especially for "frontier areas" such as ultra- deepwater drilling and using hydraulic fracturing and horizontal drilling techniques for unconventional oil and gas deposits, is another determinant that is often cited by industry observers.

[77] For a recent listing of the major investments by Asian NOCs in North America, see Doshi, T. and Zahur, N. "Prospects for Transpacific energy Trade", a supplement to the State of the Region 2011-2012 Report by the Pacific Economic Cooperation Council (PECC) accessed at http://www.pecc.org/resources/doc_view/1747-prospects-for-transpacific-energy-trade

[78] See for instance Xu, C., "Chinese NOC's expansion", Oil and Gas Journal, 22 April 2013.

[79] IEA, "Overseas Investments by Chinese National Oil Companies", Information Paper, February 2011.

[80] Petroleum Intelligence Weekly (PIW), Special Supplement, "PIW Ranks the World's Top 50 Oil Companies", December 12, 2011.

[81] China's "White Paper on Energy" states that that Chinese policies "will, step by step, change the current situation of relying too heavily on spot trading of crude oil, encourage the signing of long-term supply contracts, and promote the diversification of trading channels." China's Energy Conditions and Policies ("White Paper on Energy"). Beijing: China State Council Information Office. December 2007.

More controversially, the Asian NOCs have sometimes been perceived in industry and government circles of the host economies as opaque and adept at using oil and gas acquisitions as a tool to advance their government's strategic and political initiatives across the globe.[82] It is no surprise that with the steep increase in energy prices over the past decade, and with continued unrest and political instability in the Middle East, a deep sense of insecurity about the reliability of future fuel supplies has made energy security part of core national security concerns for governments across Asia. As a consequence, the NOCs have higher risk tolerances than their private sector counterparts, investing in economies such as Myanmar, Chad, Sudan, Afghanistan and Venezuela. It is not clear, though, how state-directed purchases of equity in opaque companies, typically in economies where the rule of law is not well established, can enhance energy security. While the NOCs might have found it initially to their strategic advantage to operate in regions which had troubled relations with the Western economies, they also found that, not surprisingly, they were not protected from political and fiscal risks either.[83] More recently, the Asian NOCs have shown a preference for more stable and mature areas with less risk, as seen with the major unconventional oil and gas investments in North America over the past few years.

The key supply side policy question revolves around whether oil and gas acquisitions and loan-for-oil deals by the Asian NOCs "lock-up" fuel supplies and distort the competitive landscape with "preferential" access to such resources. If the NOC, by acquiring a company, invests in the expansion of the acquired company's production capacity, then there is no necessary adverse impact on other buyers and consumers of oil and gas. Instead, such investments lead to a larger and more diversified competitive global hydrocarbon supply, beneficial to all users of oil and gas fuels. According to one careful study of Chinese SOEs' acquisition, loan and long-term procurement deals, the distinction drawn is between those deals that work towards "consolidating an existing structure of production for a given resource base, as opposed to multiplying and diversifying sources of supply while adding new output at the margin faster than the growth in world demand". [84] The study concludes that the largest Chinese natural resource procurement arrangements show "a few instances in which Chinese natural resource companies take an equity stake to create a "special relationship" with a major producer. But the predominant pattern is to take equity stakes and/or write long- term procurement contracts with the competitive fringe."[85] This finding is consistent with a recent International Energy Agency (IEA) study of Chinese NOC investments, which suggests that the NOCs have a great deal of autonomy from the government to act in ways that meet commercial criteria, citing "the high ranks of NOC top management within the Communist Party of China and the sheer size of their organizations and capacities compared to the government agencies that oversee them".[86]

[82] It is instructive to examine the national security debates in Washington DC and the accompanying media reports that accompanied the attempt by CNOOC to acquire Unocal, a US oil company.

[83] Xu (op cit) refers to a 2010 report by the China University of Petroleum that found many foreign investments by the Chinese NOCs were found to be loss-making or abandoned, due to poor assessment of risks.

[84] Moran, T. "Chinese Strategy to Secure Natural Resources: Risks, Dangers, Opportunities", February 26, 2010 draft (Peterson Institute of International Affairs)

[85] Ibid. p. 4.

[86] IEA, 2011, op. cit.

8. EI: IMPLICATIONS FOR REGIONAL COOPERATION

A major implication for regional cooperation in EI sector issues lies in the importance of keeping markets for primary commodities as free from protectionist practices as possible. The practice of imposing cascading tariffs according to stage of production, to promote the domestic location of downstream processing facilities, has been a common policy posture among many economies. The costs of 'forced' but uneconomic downstream integration of extractive industries, by punitive tariffs or bans on the exports of ores or raw materials, are often borne by the host economies to their own detriment.

In the context of Dutch Disease outcomes, where over-valued exchange rates caused by resource booms negatively affect export and import-competing sectors, governments might find tariff protection as a possible policy instrument to be used if necessary. However, this is a losing proposition. Tariff protection of the export and import-competing sectors outside of the booming EI sector is likely to be counter-productive as the burden of adjustment would then fall on a narrower range of unprotected export sectors, worsening the Dutch Disease effects. The general conclusions of the economics literature for economies undergoing an EI boom are as follows: adopt a conservative fiscal posture, support a liberal trade regime, curtail the size of the public sector and maintain prudent external account balances while ensuring a sustainable, non-inflationary rate of investment within the absorption capacity of the domestic economy. This sustains a competitive real exchange rate which in turn supports a viable base of export and import substituting industries and avoids an over-dependence on non-renewable primary commodity exports. Economies suffering from Dutch Disease symptoms can stabilize revenue streams by setting up Sovereign Wealth Funds or hedge their EI export revenues via the use of derivatives, although perceived political costs mean that these are options not often utilized.

The environmental and social impacts of the EI sector have had decades of attention of both practitioners and academia, and the literature – across the social sciences – is vast. The fundamental principles guiding EI sector developments in a way which is both environmentally sustainable and benign in its impacts on the poorer sections of the population are well understood but bear repeating. Among the recommendations of the EI Report, commissioned by the World Bank and led by Dr. Emil Salim, a former Minister of Population and Environment in Indonesia, were the following: observance of human rights and the protection of immediately impacted local communities; effective and equitable sharing of revenues among local, regional and national administrations; active participation by wide range of stakeholders including the affected communities.[87] Regional cooperation in upholding these principles is imperative, in that the interests of both EI-host economies and international operators and investors converge on an efficient EI sector with stable industrial and community relations.

The fundamental building blocks to best practice regulations for ensuring desirable environmental and social impacts are transparency and accountability. They need to work across the whole value chain: awarding contracts and licenses; regulation and monitoring of EI operations; collection of taxes and royalties; revenue management and allocation; implementation of publicly-financed projects for economic development. These are the principles on which the Extractive Industries Transparency Initiative (EITI) is founded. It was launched by the then British Prime Minister, Tony Blair, at the World Summit on Sustainable Development in Johannesburg, in September 2002. The EITI is a coalition of governments, companies, civil society groups, investors, and international organizations. It attempts to promote accountability by requiring transparency of financial flows and the validation of both data and processes. By June 2011, there were 35 EITI-implementing economies, of which eleven have completed their first EITI cycle and have been declared EITI-compliant.[88]

[87] The Final Consultation Report closing the EIR process was presented by Dr. Emil Salim (the Eminent Person heading the process) to the President of the World Bank at the end of December 2003.

[88] The World Bank Group in Extractive Industries, 2011 Annual Review. World Bank.

For international operators and investors, subject to home economy legislation such as the US Foreign Corrupt Practices Act (FCPA) and the UK Bribery Act, the over-lap of business and political elites in many EI-host economies presents challenges to staff and corporate integrity. The moves towards transparency have been bolstered by the passing of the Dodd-Frank Act in 2010 which requires US-listed resources companies to report material payments to foreign governments; there is also a current EU proposal that would require European companies to publicly disclose payments for individual oil, gas, mining and logging projects.[89]

In the contentious area of division of rents between host-economy governments and foreign investors in large EI projects, in a context where parties cannot credibly commit to sanctity of contract under changing conditions, it may be helpful if more flexible contracts were used which allow for a change in the distribution of rents such that neither party gets an "undue" share of unexpected or windfall gains. In industrial organization theory, there is a significant literature on "incentive-compatible" and "self-enforcing" long run contracts.[90] More concretely, at a multi-lateral level, institutions such as the World Bank offer third party advisory services for EI contract negotiations, licensing rounds and tender or auction processes for EI exploration and production (E&P) projects, capacity building for national negotiation teams, and relevant institutional, fiscal, legal and regulatory frameworks which support good governance principles for the EI sector. [91]

Mitigating actions outside of the contract itself can be taken by both parties (host economy governments and foreign investors) with a view to providing durability to the EI sector contracts. Investors are often provided risk insurance by their national governments or home economy development banks. Regional financial institutions and national development banks can offer risk mitigation, insurance cover and project finance which adhere to host economy environmental and employment standards. Foreign investors in the EI sector also seek joint venture agreements with prominent local partners in the host economies in order to alleviate domestic political pressures host economy governments might otherwise face.

Physical supply disruptions of global commodities may best be countered by regional or international coordination measures for stock-piling and emergency supply protocols along the lines of the IEA for instance.[92] In this context, the research and institutional supporting role that the IEA plays in crude oil and refined product storage protocols for developing economies such as Thailand is constructive. Regional dialogue on coordinated oil stock-piling arrangements might also make prudent sense, although the existing track record for collective action in oil stockpiling outside the IEA group of economies is not impressive.

To enhance the efficacy of trading norms and price discovery, it is critical for policy-makers and legislators to exercise utmost caution and prudence in the regulation of industry practices. Current industry practices, after all, are an outcome of previous systems and modes of conducting trade and discovering prices, an evolutionary process that policy makers would do well to appreciate.[93] History is replete with examples of heavy handed attempts at regulating markets, with severe unintended consequences to be reaped later. Where there are clear cases of fraud or price manipulation, regional agreements as well as national legislations can invoke the full weight of prosecution. Simple bans on "speculators" or "profiteers" in commodity markets which are prone to price swings and volatility are, however, more likely to backfire. In this context, the over- reaching aspects of some recent legislation such as the Dodd-Frank Wall Street and Consumer Protection Act (2010) have given rise to legitimate concerns as to how it might impact commodity exchanges and over-the- counter (OTC) markets.[94] The extra-territorial reach of the Dodd-Frank Act has also been a source of concern among finance, commerce and trade ministries in several economies, including London, Singapore and Hong Kong which serve as large commodity trading hubs across the minerals and metals spectrum.[95]

[89] Ibid, p. 12.

[90] Tirole, J. "The Theory of Industrial Organization", MIT Press, 1988.

[91] See "The World Bank Group in Extractive Industries", 2011 Annual Review

[92] International Energy Agency (IEA) 1995. Oil Supply Security: The Emergency Response Potential of IEA Countries, IEA, Paris 1995

[93] See Hayek, F., The Constitution of Liberty, University of Chicago Press, 1960.

[94] A US federal judge recently struck down a key rule within the Dodd-Frank Act, the Commodity Futures Trading Commission's so-called position limits rule, which the CFTC supported as a means of placing new restrictions on speculative trading, capping the number of derivatives contracts a trader can hold on certain commodities. See Protess, B., "Judge strikes down a Dodd-Frank trading rule", New York Times, 28 September 2012.

[95] See for instance, Bannon, E., "The Extraterritorial Reach of Derivative Regulation Under Dodd-Frank", Holland & Knight Newsletter, April 12, 2013.

9. CONCLUDING REMARKS

The need for regional cooperation and agreed cross-border trading and investment rules is evident, if only to alleviate the tendency for economies to move unilaterally in tit-for-tat moves for perceived national interests in the EI sector. Ultimately, the correct policy lessons are the conventional ones. Supply security and the efficient exploitation of natural resources, from both host economy and foreign investor points of view, are best served by free markets and policies which ensure that investments and technologies cross borders freely, and diverse primary commodities trade unhindered. This is well illustrated by the Singapore example. Without a drop of oil of its own, its status as one of the world's great oil refining, trading and storage centers, with "FOB Singapore" price quotes guiding the flows of over 12 million barrels per day of crude oil and refined products in East of Suez markets is a testimony of robust international markets for crude oil and refined products.

With respect to heightened concerns with 'supply security', it is clear that the very concept of security has fundamentally changed with the emergence of global markets for natural resource. As Radetzki puts it, "One can claim that the emergence of global markets, offering a wider potential diversity of imported sources may well make imports more secure than domestic supplies." The best regional cooperation agreements are thus the ones that allow the widest diversity of buyers and sellers in the EI universe. The emergence and expansion of global commodity markets – and here, the potential role for North America as a major exporter of unconventional oil and natural gas is an excellent example – widens the potential diversity of import sources, and enhances the supply security for all participants in the international economy.

Demand Side Perspectives: Cooperation and Competition in the Extractive Industries (EI) Sector

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SURGING DEMAND, ASSURANCE OF STABLE SUPPLY, RESPONSE TO GLOBAL WARMING AND IMPACT ON ECONOMY

Global energy demand continued to expand quickly over the past several decades, for example, primary energy demand increased from 5 billion tons of oil equivalent (Btoe) in 1971 to 13.1 Btoe in 2011, more than doubling in 42 years. This increase in energy demand will continue along with economic growth. As the Asia-Pacific is expected to be a driver of global economic growth for the next few decades, it will also drive energy demand growth. The International Energy Agency (IEA) and US Energy Information Administration (EIA) highlight the significance of the Asia-Pacific in their energy outlooks.[1, 2] The Institute of Energy Economics, Japan (IEEJ)[3] also pointed out the emerging "energy trilemma": energy security; economic efficiency and environment protection.[4] Under the reference scenario of IEEJ's outlook, the world's primary energy consumption is projected to expand from 13.1 Btoe in 2011 to 19.6 Btoe in 2040 (an increase of 50%). Fossil fuels will account for 79% of primary energy consumption growth during the period, continuing to serve as the major energy source. Asia will lead the growth in the world's primary energy demand, with demand in China and India growing sharply. The demand growth in China and India will total 2.9 Btoe, accounting for 45% of the world's demand growth. Many energy-consuming economies will become more dependent on imports for their energy supply, and this may intensify the competition to secure energy resources.

[1] IEA, World Energy Outlook 2013 (WEO 2013)

[2] EIA, International Energy Outlook 2013 (IEO 2013)

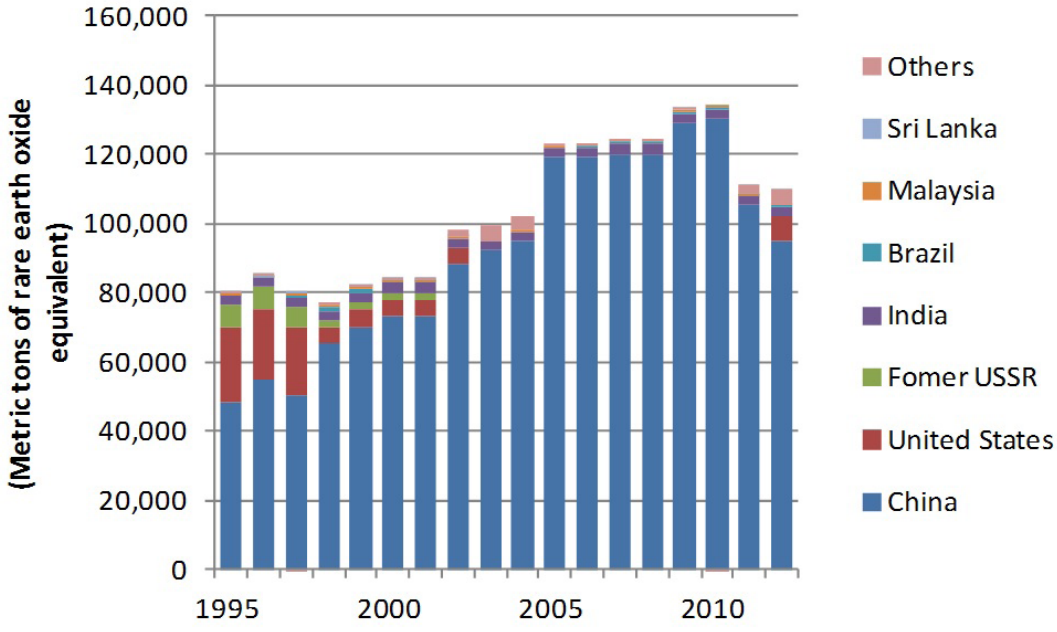
[3] IEEJ, Asia/World Energy Outlook 2013

[4] World Energy Council, "2013 World Energy Trilemma – Time to get real – the case for sustainable energy investment," 2013

Given the expectations of growth in demand for fossil fuels, ensuring stable energy supplies will become an increasingly important challenge for all major economies. At the same time, global warming is an important worldwide problem that may affect sustainable global growth. Therefore, it is important to enhance long-term, comprehensive efforts to overcome the "trilemma" challenges. As there is no panacea, it is essential to take all available measures, including promotion of "enhanced energy conservation", "cleaner use of fossil fuels" and "lower-cost alternative energy".

The minerals and energy sector more broadly face similar challenges as the energy trilemma - especially for rare earths[5]. The demand for rare earths is increasing because the so-called high-efficiency technologies use many rare earths[6]. China was the dominant rare earths producer. The Chinese government has gradually reduced export of rare earths to satisfy the domestic demand. Many rare earths consumer nations heavily depended on Chinese production at that time. The price of rare earths suddenly hiked due to the tight supply-demand situation in 2011.[7] Consumer nations learned big lessons from hard experiences. Policies pertaining to natural resources should take into consideration three basic principles: "diversification of supply," "more efficient use of resources," and "development of alternatives" (e.g. The Japanese government has promoted those three approaches as part of its national energy strategy.)

Figure 1: Rare Earth production



Source: US Geological Survey, Rare Earths Statistics and Information

[5] As defined by IUPAC, a rare earth element (REE) or rare earth metal is one of a set of seventeen chemical elements in the periodic table. It comprises the 15 lanthanides, scandium and yttrium.

[6] Neodymium and dysprosium are used in magnets in PC, hybrid cars and so on.

[7] Japan Oil, Gas and Metals National Corporation (JOGMEC), Rare Metal Handbook, 2012

MEASURES TO OVERCOME THE TRILEMMA CHALLENGES

The following three measures are particularly important for the trilemma challenges:

- **SAVING ENERGY AND MINERALS**

Energy conservation potential (improvement in energy use efficiency on both supply and demand sides) is expected to be very large for developing economies. The ratio of saving energy and reducing minerals potential are particularly high in regions where steep demand growth is expected, such as Asia and the Middle East, and hopes pinned on energy conservation and reducing wasteful use of minerals are all higher in those regions. Thus, waste reduction is the most effective means to reduce carbon dioxide emissions and expenditure on energy and minerals. Progress in these actions will have a significant impact on global security of supply, global warming and economy as well as the "noble use" of energy and minerals.

- **EFFECTIVE USE OF FOSSIL FUELS AND MINERALS**

The ratio of fossil fuel demand to the world's primary energy consumption will drop from 82% in 2011 to 79% in 2040 under the reference scenario and to 70% under the technologically advanced scenario[8] (Tech. Adv. Scenario) in IEEJ's outlook. Thus, fossil fuels will continue to account for most of the world's primary energy consumption. Therefore, making clean and highly efficient use of and ensuring stable supply of fossil fuels will continue to be critical challenges in the long term. In terms of mineral resources, the effective use of minerals is essential to sustainable development. For instance, the adoption of a recycling system of mineral resources helps to develop a sound material cycle society and save energy in the life cycle of materials.

- **EXPANSION AND DEVELOPMENT OF ALTERNATIVE RESOURCES**

Likewise, in light of the need for security of supply and measures to deal with global warming, the importance of alternative resources including renewable energy is certain to grow. In the case of mineral resources, many advanced and efficient technologies need rare materials.[9] Surging rare materials demand sometimes causes a spike in prices. It is important to reduce the use of rare materials and develop alternative materials in the development of more efficient technologies. Therefore, it is an urgent challenge to strengthen policy, research and development and infrastructure development activities, including the reduction of the cost so as to promote the dissemination of alternative resources.

[8] In this scenario, energy conservation and low-carbon technology promotion will make the maximum progress as each economy implements powerful policies to secure stable energy supply and address climate change.

[9] Bloomberg, "Neodymium, Dysprosium Rare Earths May Grow Fastest on Hybrid Cars, Hi-Tech," Bloomberg News - Nov 10, 2010

1. GROWING DEMAND AND THE TRILEMMA CHALLENGES

1.1. SECURITY

(1) ENERGY

A breakdown of world primary energy demand by source indicates that oil will continue to account for the largest share until 2040 in both the Reference and Tech. Adv. Scenario in IEEJ's outlook. In the Reference Scenario, coal and natural gas demand will expand and by 2040, oil, coal and natural gas will have almost similar shares. Fossil fuels (coal, oil and natural gas) will remain the major energy sources, accounting for about 80% of a primary energy demand increase between 2011 and 2040. In the Tech. Adv. Scenario of IEEJ's outlook, oil demand will peak out in 2030. Through fossil fuel switching, natural gas demand will expand its share of the total energy demand and continue increasing instead of leveling off. A comparison of the world energy demand breakdown by source between the two scenarios indicates no major gap in shares for oil and natural gas.

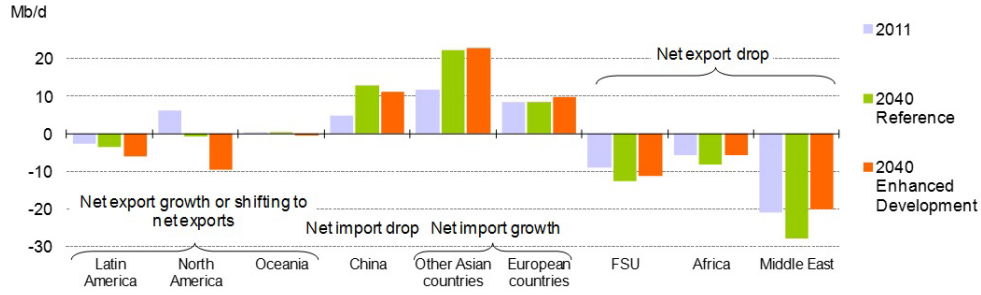
It is still fresh in memory that China and Indonesia, which had been oil-exporting economies within the past quarter century, became net importers of oil because of increases in domestic demand. Domestic demand growth in resource-supplying economies is an important issue when economies consider measures to stabilize the international energy market. Those economies must improve their energy intensity continuously. The acceleration of investment in upstream development is also essential in order to ensure export revenues for resource-supplying economies. IEEJ shows the net oil imports balance in the two scenarios[10] (Figure 2) and natural gas flows (Figure 3). IEA also shows the future energy net trade balance in South East Asia economies in the special report.[11] They indicate a common message. "The Pacific region will be a big energy consumer and a key player of the energy trade market."[12]

[10] Enhanced development scenario combines the Reference Scenario with the maximum progress in the development of unconventional fossil fuel resources including shale gas and oil, which will have a great impact on global energy supply and demand in IEEJ's outlook. Global natural gas output will increase from 3,384 Bcm (Billion cubic meters) at present to 5,411 Bcm in the Reference Scenario. In the Enhanced Development Scenario, natural gas output will expand to 6,180 Bcm in line with progress in unconventional resources development in various regions. Unconventional gas production will account for 36% of total natural gas output. Oil output will increase from 85 Mb/d (Million barrels per day) at present to 115 Mb/d in the Reference Scenario. In the Enhanced Development Scenario, total output will remain almost unchanged at 114 Mb/d. But unconventional oil production mainly in North America, Latin America and China will account for 29 Mb/d of the total.

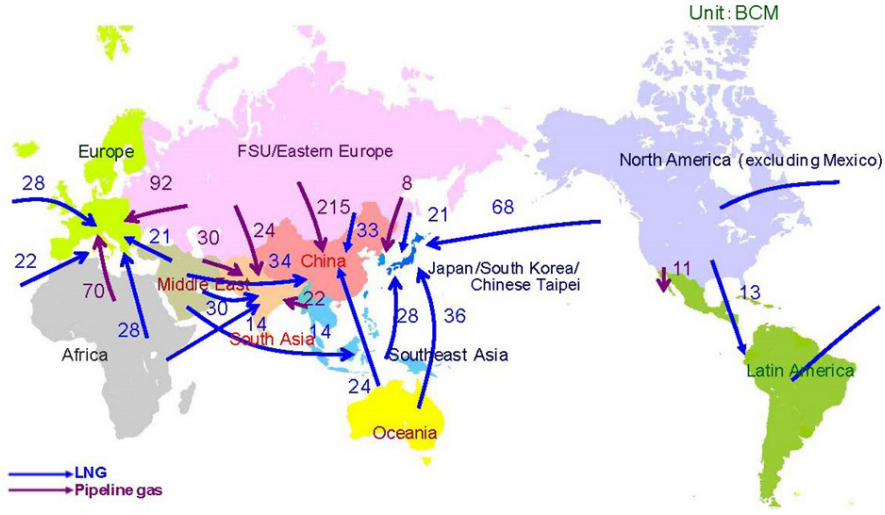
[11] IEA, "World Energy Outlook Special Report 2013: Southeast Asia Energy Outlook," 2013

[12] Shale gas revolution will stimulate the LNG market in the Pacific region.

Figure 2: Change in Net Oil Imports



Source: IEEJ, Asia/World Energy Outlook 2013



Source: IEEJ, Asia/World Energy Outlook 2013

(2) MINERALS

Economic growth pushed demand for materials as well as energy. In the 2000s, China increased steel demand by about 5-fold[13] in a decade. Steinberger et al. (2010) shows that the relation between economic activity and resource use is robust in their statistical analysis (Figure 4). [14,15] Most Asia- Pacific economies are plotted at the lower left on the Figure 4. It implies that many Asia-Pacific economies will use resources as much as developed economies in the future. Asia-Pacific are expected to be large markets of mineral resources.

Figure 4: The global interrelation between resource use and income (175 economies in the year 2000)

Source: UNEP, Decoupling Natural Resource Use and Environmental Impacts from Economic Growth, 2011

A well-developed infrastructure is essential for stable economic activity and further growth. However, there should be no surplus capacity. No economy on the planet can increase their capacity of infrastructure beyond its physical limit. J Randers (2012)[16] says that "Currently the human demand on the biosphere exceeds the global bio-capacity by some 40%." Steinberger describes the measure of resources demand as a metabolic rate in her paper. Developed economies are expected not to be fat economies but well-muscled and highly-efficient economies through technological development and change structure of the economy. Developing economies should follow successful experiences to be slim economies. Otherwise, future economic growth will not be sustainable.

[13] World Steel Association, Annual crude steel production archive

[14] Steinberger, J.K., Krausmann, F. and Eisenmenger, N. (2010) Global patterns of material use: a socio-economic and geophysical analysis. Ecological Economics, 69(5): 1148-1158.

[15] UNEP report says, "The loglinear correlation was R2 = 0.60 (weighted by country size), the scatterplot demonstrates a large number of outliers. This suggests that it is possible for some countries to achieve relatively high incomes per capita while consuming fewer resources per capita, while other countries display very high resource consumption levels per capita without a corresponding rise in incomes per capita."

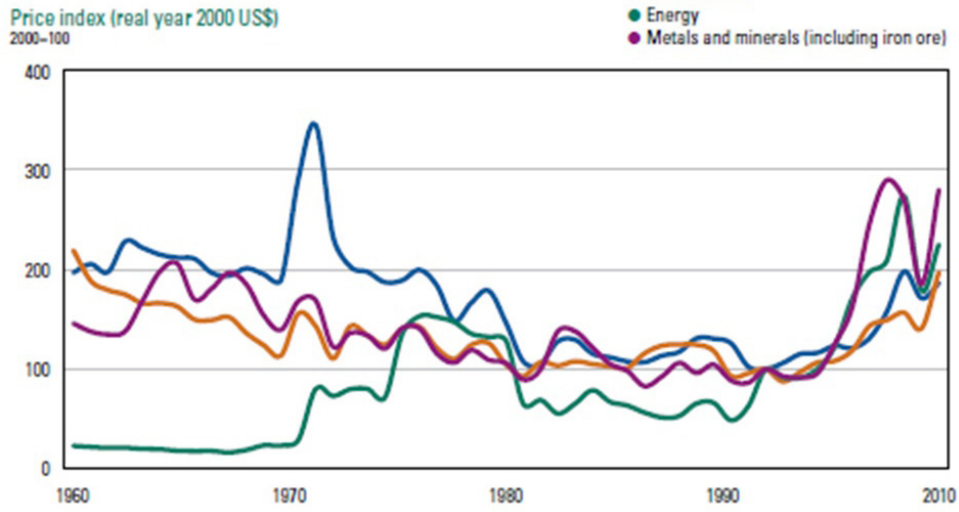
[16] Jorgen Randers, "2052: A Global Forecast for the Next Forty Years," 2012

1.2. ECONOMY

1.2.1. IMPORT BILL

According to the World Bank database, resource prices declined in the middle of the 20th century. After the first oil crisis, commodity price levels were on a downward trend. In the 2000s, the Chinese economy led the demand of energy and minerals and there were some speculative activities in the commodity market. Commodity prices were pushed strongly. The Lehman shock affected the commodity market but commodity prices recovered pre-crisis levels immediately. The higher prices encouraged investment on unconventional resources including shale gas, rare earths and so on. However, IEA and EIA pointed out that mining cost was increasing gradually. They anticipate that the future commodity prices would be increasing.

Figure 5: Commodity price indices



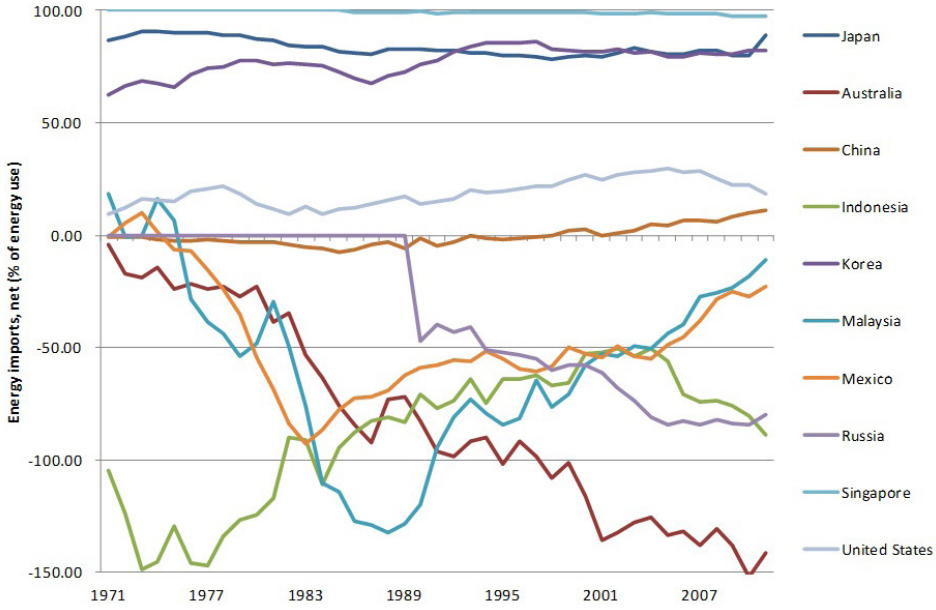
Source: UNEP, Decoupling Natural Resource Use and Environmental Impacts from Economic Growth, 2011

(1) ENERGY

Surging energy demand will tighten the situation of supply and demand and push up energy prices. IEA mentioned the effect of a combination of increasing reliance on energy imports and relatively high energy prices.[17] This combination resulted in energy import bills weighing more heavily on many national accounts in recent years. Some energy exporting economies such as Malaysia are likely to become energy importers the near future. Exporting energy has been an important source of foreign exchange for many of these economies, in the future they will have to control their domestic energy demand and develop other sources of foreign exchange.

[17] IEA, World Energy Outlook 2011

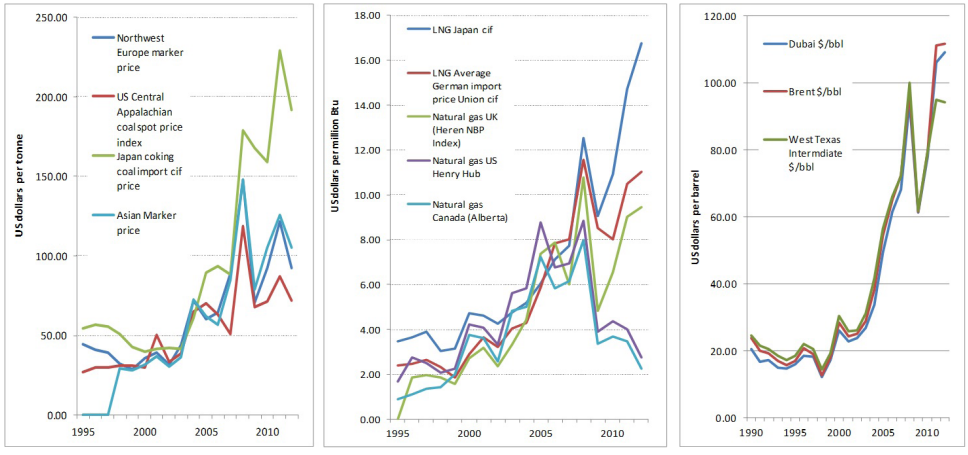
Figure 6: Energy net imports (% of energy use)



Source: World Bank, World Development Indicators

After the Lehman shock, energy prices were slightly lower. On the other hand, the energy price gap between the United States and other energy markets increased due to several reasons including shale gas revolution, nuclear accident in Japan, amongst others.. Fracking technology made it possible to access an unconventional resource called "Shale Gas" in the United States. Massive production of shale gas decreased the price of natural gas in United States. The shale gas revolution had a great impact on the energy market. The cheap shale gas replaced coal from the power generation sector and reduced the domestic coal price in the United States. In Japan, nuclear power plants stopped one by one after the Fukushima nuclear incident. Japanese electric utilities bought additional fossil fuels at higher prices to supply electricity without nuclear power (Figure 7).

Figure 7: Historical Energy Prices (Left: Coal price, Center: Gas price, Right: Oil price)



Source: BP, statistical review of world energy 2013

The energy price gap between the international market and Asian market is called the "Asian

Premium". At the LNG Producer-Consumer Conference, many specialists and stakeholders expressed concerns about the gap in the LNG market as follows[18]

- The Asia-Pacific market is more often than not bound by the irrational high price known as the "Asian premium" as well as contracts than contain inflexible conditions, such as the destination clause.
- However, there are concerns over the lack of flexibility in the global LNG market, which should rightfully guarantee active and free trade. In other words, economies in Northeast Asia are cut off from the pricing system that is applied to other regions of the world and are forced to pay the most expensive prices for their LNG suppliers. In response to this, Asian consumer economies should increase their collaborative efforts to eliminate the destination clause and oppose inflexible pricing structures, by trying to secure Henry Hub-linked pricing for example.
- We hope the inter-regional gap in prices that has emerged in the world's LNG market will narrow due to further expansion of inter-regional trade and an increase in new supply sources (global convergence).

Consumers' united actions and continuous dialogues between producer and consumers are expected to solve market distortions for the energy and minerals importing economies.

IEA also referred to the benefits of introducing advanced technologies.[19] More advanced technology will be able to reduce the increase of energy demand. The 450 Scenario (most advanced scenario) gives rise to a number of other benefits, notably in terms of import bills, local pollutants and health impacts.[20, 21] In the 450 Scenario, crude oil, steam coal and natural gas import prices are much lower than in the other scenarios, reflecting lower demand. Lower demand for oil and gas are also likely to reduce uncertainty in upstream investment and diminish the volatility in oil and gas markets, while energy security is also enhanced by diversification of the energy mix which reduces import dependence.

More efficient technologies help governments to cut the expenditure on net imports of fossil fuels and decrease the risk of energy security. They also help to save the energy subsidies in some economies.

[18] Ministry of Economy, Trade and Industry, Japan and Asia Pacific Energy Research Centre(APERC), "Summary Statement of the LNG Producer-Consumer Conference", 2013

[19] IEA says that "By early October 2012, prices for benchmark Brent and West Texas Intermediate futures were trading at around $115/barrel and $93/barrel, respectively. In the New Policies Scenario, the average IEA crude oil import price – a proxy for international oil prices – rises to $120/barrel (in year-2011 dollars) in 2020 and $125/barrel in 2035. This rising trend reflects the mounting cost of producing oil from new sources, as existing fields are depleted, in order to satisfy increasing demand. In the 450 Scenario, lower oil demand means there is less need to develop oil from costly fields higher up the supply curve in non-OPEC countries. As a result, the oil price is assumed to level off at about $115/barrel by 2015 and then decline gradually to about $100/barrel by 2035."

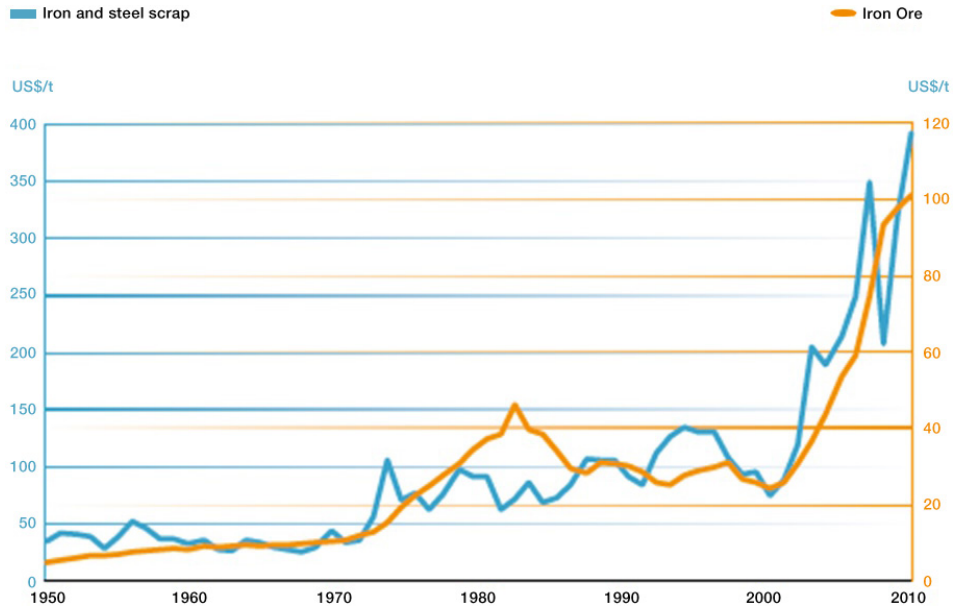
[20] The New Policies Scenario – IEA's central scenario – takes into account broad policy commitments and plans that have already been implemented to address energy-related challenges as well as those that have been announced, even where the specific measures to implement these commitments have yet to be introduced.

[21] The 450 Scenario sets out an energy pathway that is consistent with a 50% chance of meeting the goal of limiting the increase in average global temperature to 2 °C compared with pre-industrial levels.

(2) MINERALS

Even after the Lehman shock commodity prices still continued to increase which poses a heavy burden for for economic growth in each economy. The 3R[22] policy (Reduce, Reuse and Recycle) is expected to be a fundamental way to reduce such burden. The scrap material price is also increasing along with ore price. However, the higher recycled metal price should encourage the promotion of more recycling activities because if the value of the recycled metal is too low due to low metal prices, recycling cannot come to its full fruition. UNEP says that recent high prices of various metals – possibly indicating a paradigm shift towards higher metal prices – would generally have a positive effect on recycling. It is also expected to stimulate metal recycling in in the developed economies. Most of the developed economies have a huge amount of resource stock of metals as "urban mining".[23] They should develop recycle technologies further and make the best use of their own domestic resources.

Figure 8: Steel scrap prices following iron ore prices (US Geological Survey, 2011)



Source: UNEP, Metal Recycling Opportunities, Limits, Infrastructure, 2013

1.2.2. INVESTMENT

If the commodity prices continue to increase they will be a huge financial burden for economies. On the other hand, economies have to invest to promote their efficiency and reduce such financial burdens. The initial investment cost is one of the biggest issues in developing economies. While China and India have great potential for energy saving because their energy intensities are still higher than developed economies, the problem is how to promote their investment on efficiency. It is essential to identify what is the most crucial barrier in the economy. J. Sweeney (2012) points out challenges of investment in energy efficiency technologies as follows.[24]

[22] UNEP, "Strategic Elements in Implementing the 3R Platform," 2006

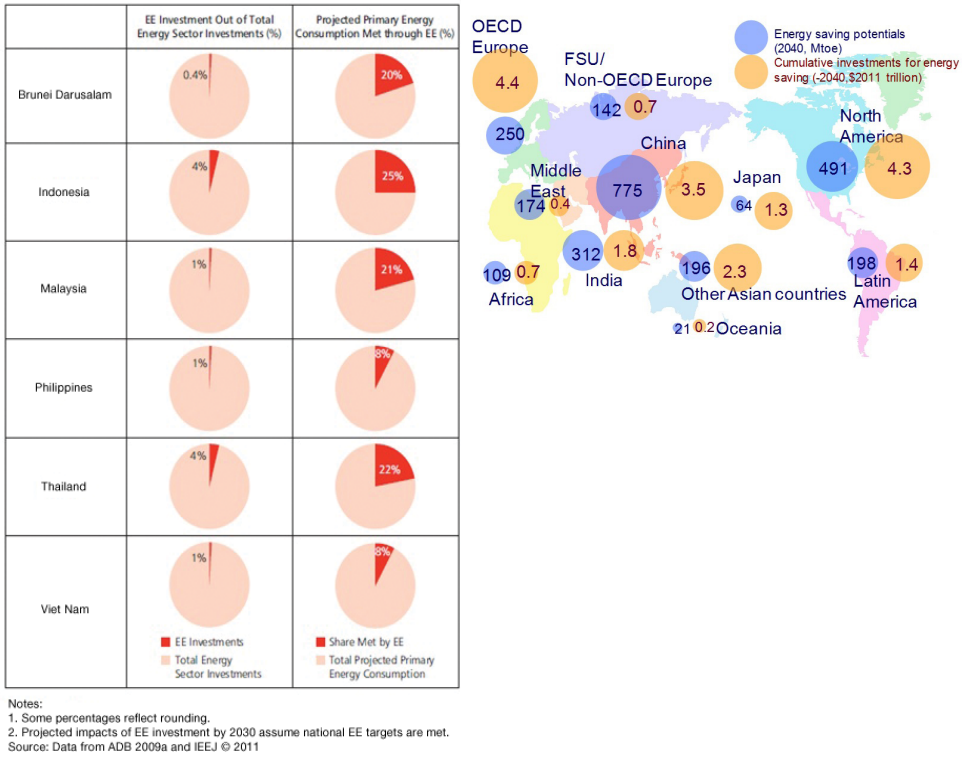
[23] UNEP, "Metal Stocks in Society: Scientific synthesis," 2010

[24] Kenneth Gillingnam and James Sweeney (2012), Climate Change Economics, 3

- For some investments in energy efficiency, the primary barrier is again the high cost of the technology.
- We classify possible barriers to the implementation of energy efficient technologies into three categories: institutional barriers, market failures, and behavioral issues.
- Institutional barriers are based on the institutional structure of our society. Market failures are based on incentives embedded in the existing structure of market interactions. Behavioral issues are based consumer or firm decision processes.

ADB shows the impact of investment in EE[25] on meeting energy demand by 2030, assuming that national EE targets are met in the Asian region (Figure 9, left).[26] In Brunei Darussalam, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, an EE investment share of just 1% to 4% of overall energy investment serves to meet at least 8% to as much as 25% of the projected increase in primary energy consumption. This dynamics reinforces EE's relevance as a least-cost solution to meeting Southeast Asia's growing energy demand. It pointed out the initial investment action reap big rewards for the economy. IEEJ shows that investment on energy efficiency should be one of the expected big markets for the investors. (Figure 9, right)

Figure 9: Energy Efficiency in Projected Energy Investments and Primary Energy Consumption in Southeast Asia (left), Energy saving potentials and accumulated investments through 2040 (right) [27]



Source: ADB, Same Energy, More Power: Accelerating Energy Efficiency in Asia, 2013 (left), IEEJ, Asia/World Energy Outlook 2013 (right)

[25] EE: energy efficiency

[26] ADB, "Same Energy, More Power: Accelerating Energy Efficiency in Asia", 2013

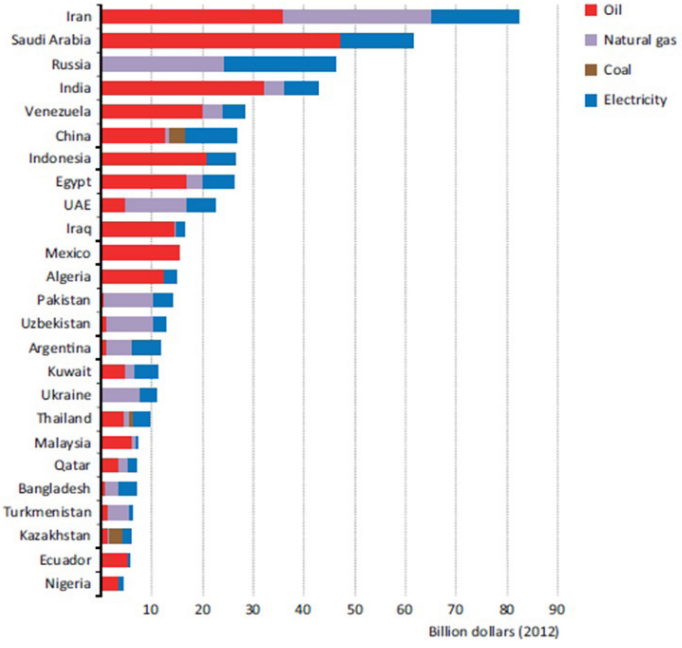
[27] It shows the difference between the Reference and Advanced Technology Scenarios.

1.2.3. SUBSIDY

It is important to improve energy efficiency throughout the world. However, many developing economies are facing barriers to promote energy efficiency policies. If the economy wants to encourage investment on energy efficiency, the market should reflect its true cost. But customers may face price distortions for energy in many developing economies. Energy tariffs in developing economies may not reflect the costs of resource capture and delivery, or pollution and climate change. The governments in the developing economies help poor people to access adequate energy at a relatively low price. They have energy subsidies for political, economic, social and environmental goals. Yet there can be undesirable outcomes, because subsidies may work to discourage adoption of more energy-efficient technologies. It may imply that lower price distortions may result from incomplete prior knowledge of the full range of costs associated with energy production and consumption, or from poorly designed policy or regulatory interventions, as in the case of many energy subsidies.

Subsidies distort energy market. The subsidies are also pushing the surging demand in those economies and creating problems in the way that the markets operate. Surging energy demand will also increase the total amount of energy subsidies. It will be an additional burden for the national finance. IEA pointed out that well-designed, subsidies to renewables and low-carbon energy technologies can bring long-term economic and environmental benefits. However, the costs of subsidies to fossil fuels generally outweigh the benefits. WEO 2013 shows that fossil-fuel consumption subsidies amounted to $544 billion and renewable subsidies increased by 11% to reach $101 billion in 2012. Persistently high oil prices have made the cost of subsidies unsustainable in many economies and prompted some governments to act. Considering future energy price and growing energy demand, energy subsidies will increase steadily. Many governments will suffer from the burden of energy subsidies and expenditure on energy import.

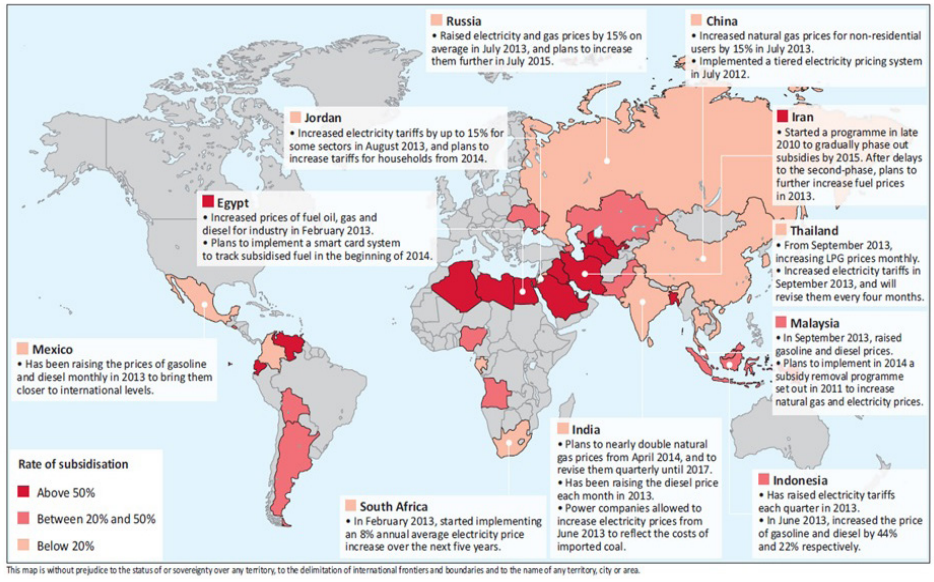
Figure 10: Economic values of fossil-fuel subsidies by fuel for top 25 economies, 2012



Source: I EA, World Energy Outlook 2013

According to WEO 2013, IEA has been measuring fossil-fuel subsidies in a systematic and regular fashion for more than a decade. Its analysis is aimed at demonstrating the impact of fossil-fuel subsidy removal for energy markets, climate change and government budgets. The increase in the global amount of subsidy in 2011 closely tracked the sharp rise in international fuel prices. The rate of subsidization was highest among oil and gas exporters in the Middle East, North Africa and parts of Central Asia, many of which set the price of domestic fuels above the cost of indigenous production but well below those that would prevail in the international market (Figure 11). If the government has excess subsidies on energy prices, energy companies and the national budget will bear the burdens of subsidies. State-owned companies, especially those in the electricity and natural gas sectors sometimes bear losses from the under-collection of bills, which occurs when consumers cannot afford even subsidized energy prices. In fact, energy companies in China suffer from negative gap between energy cost and selling price. Many economies in Asia and Middle East have energy subsidies as shown in Figure 11.

Figure 11: Rates of fossil-fuel consumption subsidies in 2012 and recent development in selected economies

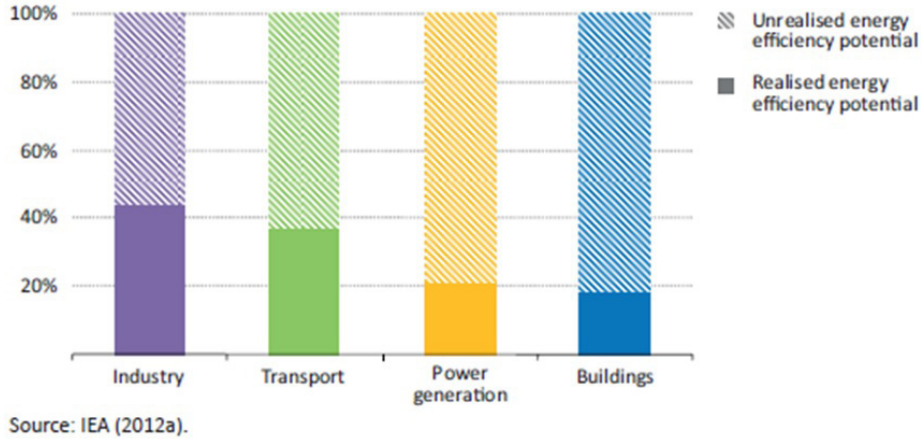


Source: IEA, World Energy Outlook 2013

1.3. ENVIRONMENT

According to the IEEJ outlook, as fossil fuel consumption will account for about 80% of global primary energy consumption until 2040, energy-related carbon dioxide emissions will increase 1.4-fold from 31.8 Gt (giga tons) in 2011 to 44.8 Gt by 2040. The share of non-OECD economies will increase from 59% in 2011 to 70% in 2040. IEEJ and IEA show that the demand side will have the biggest potential for carbon dioxide reduction in the future. End-use efficiency is expected to account for about 40% of total carbon dioxide reduction potential in their outlooks. IEA estimated the full economic potential of energy efficiency by sector and pointed out that it is important to encourage and support the increasing attention in order to raise the visibility of energy efficiency (Figure 12).

Figure 12: Proportion of long-term economic energy efficiency potential achieved, 2012-2035



Source: IEA, World Energy Outlook 2013

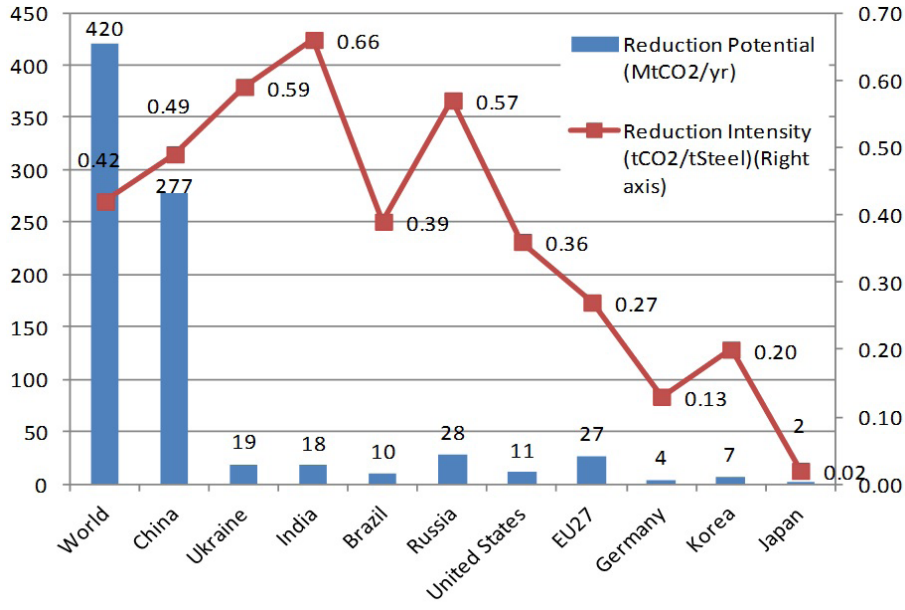
In the power generation sector, Ecofys has conducted a detailed analysis of emission reduction potential.[28] The gap of energy efficiency between state-of-art coal power plants and old existing coal power plants are more than 10% points. Ecofys shows the specific (g/kWh) and absolute (Mtonne) emission reduction potential per economy by improving energy-efficiency of fossil-fired power generation. It shows the impact of applying the best available technologies (BAT) for power generation. Research Institute of Innovative Technology for the Earth (RITE) published the report about CO2 reduction potential in the Iron and Steel sector (Figure 13).[29] According to the RITE, China and India have large potential of CO2 reduction, because their coal use rate and carbon intensity of electricity are higher than other economies. The reduction intensity of developed economies is lower than half of that of developing economies.

Those two reports indicate deployment of the best available technology is one of the most important ways to cut carbon dioxide emission in the future (Figure 13).

[28] Ecofys, "International Comparison of Fossil Power Efficiency and CO2 Intensity," 2012

[29] RITE, "CO2 Reduction Potential in Iron and Steel Sector," 2012

Figure 13: CO2 reduction potential estimated by RITE (2010)



Source: RITE, CO2 Reduction Potential in Iron and Steel Sector, 2012

The environmental impact of the mineral sector is often measured by Life Cycle Analysis (LCA). Ore refining needs a lot of energy. A huge amount of carbon dioxide is emitted during the process of refining. It is important to reduce and make the best use of energy and minerals as RITE mentioned. 'Reuse' and 'recycle' are essential keywords to cut emissions as well.

In addition, efficient product design should be considered from the viewpoint of LCA. For example, the US Department of Energy (DOE) published a technology roadmap regarding energy reduction in automotive manufacturing sector.[30] Likewise, EU promoted the SuperLight Car project as Design for Sustainability approach. This approach requires product designers to assess which material promises the best sustainability performance, with regard to energy efficiency combined with other factors like recyclability, durability, etc., by taking a life-cycle perspective. However, any changes to a product generally lead to tradeoffs. A lower cost or environmental impact in one area may lead to an increase in cost in another. Goede et al (2008)[31] and Krinke et al (2009)[32] show the concept of SuperLigtht Car. They calculate the environmental footprint of the SuperLight Car design and the materials used in the concept body-in-white (BIW)[33]. The LCA modelling showed the SuperLight Car to have a substantially lower carbon footprint than a reference vehicle, although materials production requires more energy. As it is also recyclable, it also brings a higher CO2 credit with it. A sophisticated product design is one of the important technological ways to sustainable development.

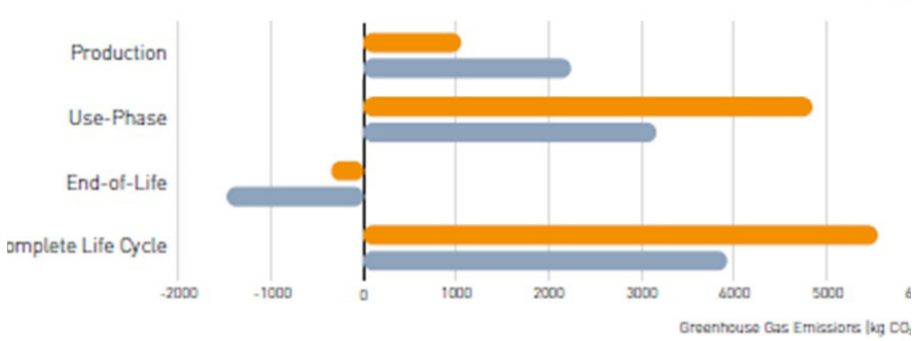
[30] US Department of Energy and US Council for Automotive Research, "Technology Road map for Energy Reduction in Automotive Manufacturing," 2008

[31] Goede, M. et al, "Super Light Car lightweight construction thanks to a multi-material design and function integration." European Transport Research Review, vol. 1, pp. 5 – 10 (2008).

[32] Krinke, S. et al, "Recycling and DfR of multimaterial vehicles" (as part of 'Life cycle assessment and Recycling of innovative multimaterial applications') in proceedings of the international conference, 'Innovative Developments for Lightweight Vehicle Structures.' May 26 – 27, 2009, Wolfsburg, Germany

[33] Body in White (BIW) refers to the stage in automotive manufacturing in which the vehicle body sheet metal (doors, hoods, and deck lids) has been assembled but before components (chassis, motor) and trim (windshields, seats, upholstery, electronics, etc.) have been added.

Figure 14: LCA visualization of the SuperLight Car concept



Source: UNEP, Metal Recycling Opportunities, Limits, Infrastructure, 2013

2. REGIONAL COOPERATION

In the Asia-Pacific strong economic growth is expected and energy demand and mineral demand will be increasing steadily as well. At the same time, it will face many challenges. The region must get ready for chances, risks and uncertainties.

The Shale gas revolution will ease current tight supply-demand of natural gas in the Asian LNG market. Shale gas and tight oil[34] will be expected to improve stability of supply and decrease energy price. Shale gas revolution may have an impact on the natural gas exporting economies such as Russia and Qatar. NERA shows that the US exports will drive prices down in regions where the US supplies are competitive so that even export prices will come down and the largest change in international natural gas prices in 2015 and 2025 will be about $0.33/MMBtu[35] and $1/MMBtu, respectively.[36] Lower natural gas price will encourage investing more in natural gas power plants in replacement of coal power plants in the United States. It will cause decrease of domestic coal price in the United States. It may also affect the coal price in the Pacific region. Shale gas revolution is one of the key issues that is likely to change the situation of energy market in the world. However, the Pacific region still faces the market distortion such as the "Asian Premium." When an economy without a Free Trade Agreement with the US tries to import shale gas, the US Department of Energy (DOE) requires the economy to get permission. In addition, the DOE prohibits crude oil export. From the demand perspective, energy importing economies have to promote cooperation to tackle the barriers which distort the market and make the best use of cheap energy. The LNG Producer-Consumer Conference may be a one of the platforms to develop regional cooperation.

[34] Tight oil is petroleum that consists of light crude oil contained in petroleum-bearing formations of low permeability, often shale or tight sandstone.

[35] MMBtu: Million British Thermal Unit

[36] NERA Economic Consulting, "Macroeconomic Impacts of LNG Exports from the United States," 2012

Cheap coal is expected to expand steadily on any energy outlooks. But the environment surrounding coal is changing. Many regulations for coal are considered from the viewpoint of environment protection in the world. For example, Chinese government tries to reduce air pollutants from old coal-fired power plants. The United States Environment Protection Agency (EPA) classified carbon dioxide as air pollutants. EPA also announced strong regulation for coal-fired power plants. The US Department of Treasury published the Guidance for development assistance for developing economies in accordance with the EPA policy.[37] NY Times commented about it as follows. "In an aggressive move to impose President Obama's environmental policies overseas, the Treasury Department on Tuesday declared an end to United States support for new coal-fired power plants around the world. The decision means that Mr. Obama's administration will no longer contribute to coal projects financed by the World Bank and other international development banks." [38] The limitation of financial assistance for coal-fired power plants will be a burden for developing economies. However, the Guidance and EPA's regulation imply that the best available technology could be considered within the process. If so, technological cooperation and technology transfer would be more important to promote future development in the developing economies.

Technology transfer and regional cooperation should be key words. In the Pacific region, Asia-Pacific Partnership on Clean Development and Climate (APP) was launched as a multilateral cooperation framework to tackle surging energy demand in 2005. Global Superior Energy Performance Partnership (GSEP) took over APP in 2010.[39] GSEP has seven Task Forces and focuses on the critical issue to accelerate energy efficiency improvements throughout industrial facilities and large buildings and to significantly cut global energy use.[40] Some TFs under GSEP published the papers and identified the potential of energy demand reduction. A bottom up approach such as GSEP is expected to be one of the candidates of alternative ways to top-down approach like the Kyoto protocol. Institutional design is essential to consider the future energy demand. Well-designed Bilateral or Multilateral frameworks are expected to encourage those bottom-up efforts in accordance with the discussions at UNFCCC.[41] With respect to technology transfer, IPCC[42] shows that "technology transfer" is defined as a broad set of processes covering the flows of know-how, experience and equipment and is the result of many day-to-day decisions of the different stakeholders involved.[43] According to the IPCC's definition, technology transfer has many issues comprehensively. In the 1970s, the key issue regarding technology transfer was "dependence theory" which that technological independence from developed economies was essential for economic development of developing economies. Since 1990s, structural dependence of technology transfer was changing in the context of trends of the globalization. Some developing economies succeeded in the technology transfer in a win-win situation. Sauter, et al (2008)[44] points out the "Technology Leapfrogging[45]" in the developing economies. Ueno (2009)[46] follows the trend of discussion of technology issues and points out that the technology transfer in China should be considered mainly from two viewpoints: "technology diffusion" and "nationalization." Ueno conducted a case study of technology transfer to China and concluded as follows:

[37] US Department of the Treasury, Guidance for US Positions on MDBs Engaging with Developing Countries on Coal-Fired Power Generation, 2013

[38] Michael D. Shear,, "US Says It Won't Back New International Coal-Fired Power Plants," The New York Times, 2013

[39] Clean Energy Ministerial, http://www.cleanenergyministerial.org/OurWork/Initiatives/BuildingsandIndustry.aspx

[40] Seven Taskforces are: Energy Management Working Group, Power Working Group, Steel Working Group, Cement Working Group, Cool Roofs and Pavements Working Group and Combined Heat and Power (CHP) and Efficient District Heating and Cooling (DHC) Working Group

[41] UNFCCC: United Nations Framework Convention on Climate Change

[42] IPCC: Intergovernmental Panel on Climate Change

[43] IPCC special report (2000), "Methodological and Technological Issues in Technology Transfer"

[44] Sauter Raphael and Jim Watson (2008), "Technology Leapfrogging: A Review of the Evidence," A report for DFID, Falmer, Bringhton: University of Sussex

[45] Sauter describes the definition of leapfrogging as follows: "the general definition of 'environmental leapfrogging' used in the report is the possibility that developing countries might be able to skip some of the dirty stages of development experienced by industrialised countries."

[46] T. Ueno, et al (2009), CRIEPI research report, Socio-economic Research Center, Rep. No. Y08023

- The production of technologies has been rapidly localized through international specialization of manufacturing industries.

- The localization dramatically reduces the production cost and boosts their diffusion both in China and other emerging economies.[47]

- Even without loose IPRs[48] and large-scale funding, technology transfer, both in terms of localization of production and diffusion, occurs as a result of international specialization.

These indicate that the "international specialization" and "localization" boosted reduction cost and technology diffusion. However, he also pointed out the characteristics of the Chinese market. China has a huge domestic market. It is one of the reasons for promoting localization and mass production. In terms of market size, the Asia-Pacific has a huge market potential. Hence, regional cooperation is expected to support to realize it and promote technology transfer more smoothly in the Asia-Pacific. It will contribute to reduce energy demand and cut emissions of air pollutants.

3. CONCLUSION

In the Asia-Pacific , energy and mineral demands will be increasing steadily but it faces the trilemma challenges. To tackle the trilemma, "reduce", "noble use" and "alternatives" are keywords from the demand side perspectives. The region needs technological development, institutional framework and political decision to promote the above-referenced issues. Regional cooperation is expected to be essential for any actions in the Asia-Pacific. It must be in the interest of the world as well.

[47] Marigo (2007) points out reduction of production costs in China.

[48] IPR: intellectual property right