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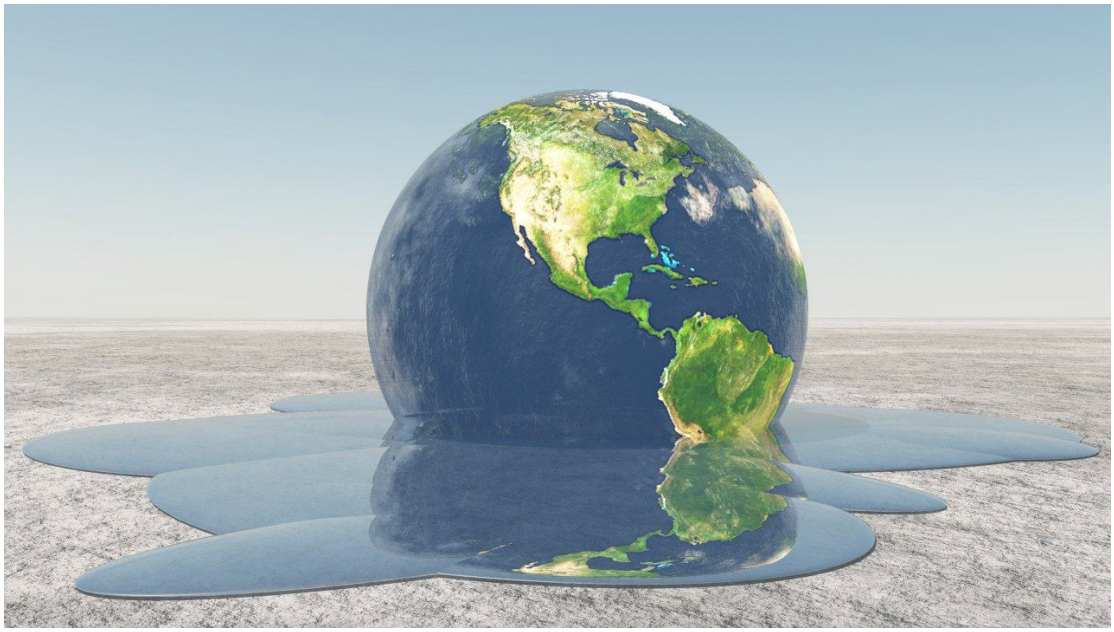

IENE Briefing Note No5

The Real Impact of Carbon Emissions Reduction

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IENE Briefing Note No 5: The Real Impact of Carbon Emissions Reduction

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The Real Impact of Carbon Emissions Reduction

1.0 Introduction

With coal and lignite being the mainstay for power generation in most SE European countries- Turkey, Greece, Bulgaria, Serbia, Croatia, Bosnia-Herzegovina, Montenegro, Kosovo- CO_2 the upcoming emissions regime is becoming increasingly important as the world is moving away from coal and towards a cleaner environment. The move (and pressure) to shift away from coal, especially for power generation, is more than evident in the EU, to which SE Europe is aligned, as the European Commission through a host of policies and self imposed targets is exerting significant pressure to member (and associated) countries to diversify their energy mix. So far most countries in SE Europe, and elsewhere (read Poland) for purely economic and social reasons, (i.e. job losses) are opposing such a move but the question remains as to how long they will be able to do so when forced with an avalanche of legislation, heavy fines and a carefully cultivated social trend against coal use. Therefore, understanding the issue of CO_2 emission reductions and their impact to the economic and social fabric of various countries is of paramount importance, and relevant to the economic policies pursued by SE European countries, as it will help them realize what lies in store. With this background in mind IENE has prepared the present Briefing Note which is divided in two parts. The first part deals with the overall Climate Change debate and the latest findings by the IEA. The second one is based on a timely analysis by "Stratfor" on how carbon emissions reductions will alter the supply chain.

2.0 A ray of hope in the debate about Climate Change

For years, it seemed like carbon-dioxide emissions rose relentlessly, whatever the world's level of economic activity and however much countries spent on no- or low-carbon energy. Now, though, that depressing fact may be changing, notes "The Economist" in a recent analysis (March 21, 2015).

The Paris based International Energy Agency (IEA), estimates that worldwide emissions of carbon dioxide in 2014 were the same as in 2013. The only occasions CO_2 emissions have actually fallen were in the early 1980s and 2008, both periods of economic contraction, but this is the first time for many years, notes the IEA, that the world economy has grown (up by 3.3% according to the IMF) and emissions have not risen too. In the European Union, GDP went up by 1.4% last year but CO_2 emissions from energy use fell by 6%. Over the past five years GDP among all rich countries has risen by 7% but CO2emissions from energy have fallen by 4%, offsetting a rise in developing countries.

The IEA's finding suggests the regulations put in place to rein in pollution are starting to have an impact. In the EU, for instance, the number of household appliances has risen by a quarter in the past ten years, but household electricity use has been flat—testimony (probably) to the many efficiency requirements brought in under European law. The IEA reckons three-quarters of the cars sold around the world in 2014 met some kind of vehicle-emission or other efficiency standard, and that the fuel-efficiency of new cars in the EU last year was 28% higher than it had been in 2000 (the global improvement was less—16%—but still significant). The IEA reckons that, in America, where emissions ticked up slightly in 2014, strict vehicle-emission standards have prevented more CO_2 entering the atmosphere than switching from coal-fired to gas-fired power stations. The strong opposition to such a switch by several states and industry groups should be noted.

The other big contributor to the emissions slowdown is a shift in the pattern of economic activity, especially in China, the world's largest polluter. As manufacturing and heavy industry decline as a share of GDP (and services increase) demand for coal is dwindling. According to China's national bureau of statistics, coal consumption fell by almost 3% in 2014—pushing CO_2 emissions down slightly.

The flattening of global emissions will not of itself make much difference to the climate according to climatologists. Though the quantity did not increase, people still threw a lot of carbon dioxide into the atmosphere last year. The standard measurement of atmospheric CO_2 concentration, taken at the Mauna Loa observatory in Hawaii, has therefore barely flickered in its upward rise. Though it ebbs and flows on an annual cycle which matches the growth and dormancy of the great forests of the northern hemisphere, it passed 400 parts per million this January, the earliest in the year it has exceeded this benchmark. Even if emissions stay flat, the world remains on course towards an average temperature rise of around 3°C by 2100, compared with pre-industrial levels. To keep the rise to 2°C (which most climate scientists think is needed) would require emissions to fall substantially.

All the same, the IEA's finding is remarkable. It happened without either a climate-change treaty or a global carbon price. And, by providing evidence emissions can actually be reined in, it might make the successful negotiation of a new climate treaty in Paris at the end of this year a bit more likely. As Fatih Birol, the IEA's chief economist says, "these numbers make me hopeful for Paris, full stop. But if nothing comes of those talks, the targets scientists set for us [a 2°C rise] may well be out of reach."

3.0 How Carbon Emissions Reductions Will Alter Supply Chains

(Abstracted from Stratfor, April 13, 2015)

Summary

Although the world is moving closer to an international agreement on climate policy, any deal will likely run into the same problems previous iterations have: enforcing binding legislation. Although the signatories have not set their final emissions goals yet, many countries, especially those that are relatively underdeveloped and those that are coping with major economic slowdowns, will eventually fall short of whatever targets they decide on.

But the effort to curb emissions and address concerns over climate change will continue. Instead of fixating on another upcoming summit with limited potential for success, the important areas to watch for long-term impacts are the instances in which adopting different technologies to reduce emissions will have geopolitical consequences. Increased use of lower emission technologies will cause a shift in supply chains because they require different raw materials. These include rare earth elements and other less common metals and minerals. Securing these raw material imports poses a new set of challenges, and in the

future, many researchers will focus on using cheaper, more readily available inputs when developing new and alternative technologies.

Analysis

The U.N. Climate Change Conference will take place in Paris at the end of the year — a forum for continued negotiations on international emissions policy. Several nations have already submitted their preliminary goals in the form of documents called "intended nationally determined contributions," which include goals for emissions reductions by 2025 or 2030.

These outlines are designed to aid the Paris negotiations, but they also illustrate some of the hurdles that will slow the international community's efforts. The debate over which countries should shoulder the responsibility of reducing emissions has historically been a major sticking point, and key carbon dioxide producers China and India have yet to submit their intended nationally determined contributions. (Notably, Beijing announced some of its climate goals in a joint announcement with the United States last November.) Although submissions from Russia and Switzerland emphasize the importance of holding all nations accountable, countries with developing economies feel that the requirement to utilize low-emission technologies could restrict their growth.

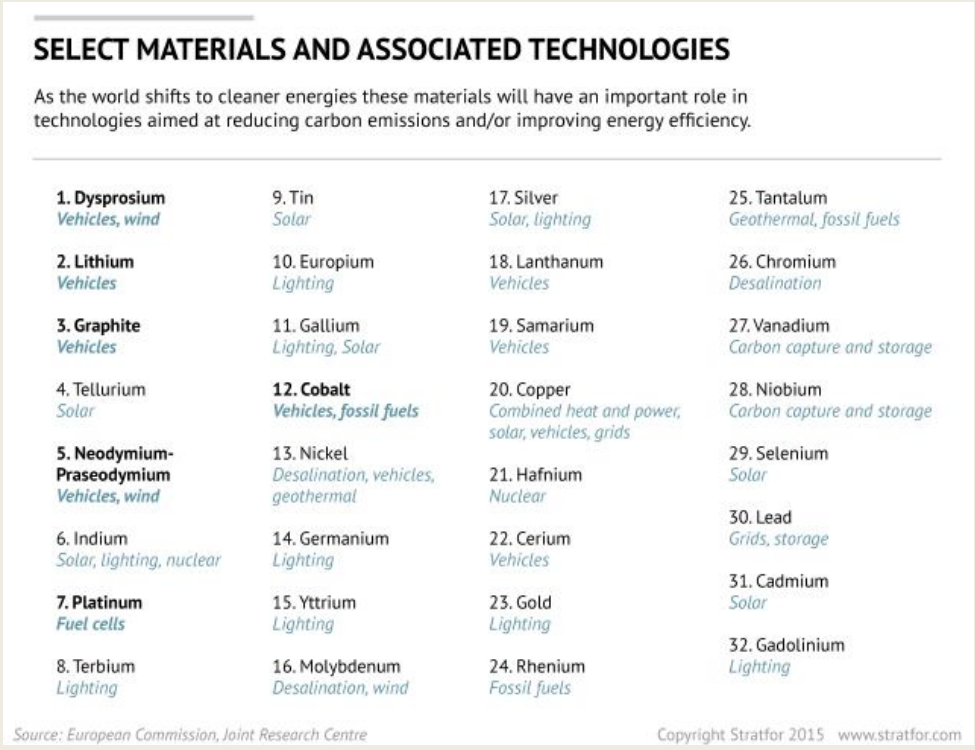
These fundamental differences mean the Paris negotiations are unlikely to result in outcomes with much geopolitical impact. In fact, even if the participants reach a binding international agreement, enforcing it and holding its signatories accountable on a global scale will remain extremely difficult — if not impossible.

However, governments will attempt, in some fashion, to reduce carbon emissions. Timelines will inevitably differ from country to country, but states will have to pursue alternate energy sources as a result of good-faith efforts to meet emission reduction goals. Though the deadlines for these targets are still more than a decade away, governments could begin taking action over the next five years. Many countries will implement or keep policies that reduce carbon emissions by encouraging the use of technologies that reduce emissions or are more efficient with energy use. For example, Germany will probably rely more on wind and solar energy sources — in addition to corresponding energy storage technology — as it decommissions its nuclear plants over the next decade. Similarly, Japan is unlikely to completely restore its nuclear power plants, so it will need to rely on additional sources of renewable power production in the future, too. Though China will continue to rely on coal for a significant portion of its power production, the country has become a world leader in carbon capture and storage technology for its coal power plants, a much cleaner variation on thermal power plants, and has collaborated with the United States on efforts to improve the technology.

Yet, cleaner power production is only one way to reduce emissions. Some, including the European Union, the United States and China, are implementing measures to decrease emissions from the transportation sector. These measures include financial incentives, fuel economy standards and lower emissions targets. As technologies continue to improve and costs decrease, more drivers will likely embrace battery-powered vehicles. With improvements, fuel cell-powered vehicles could become competitive in the transportation sector.

Raw Material Inputs

The technological adaptations and shifts in response to the policies outlined and implemented to reach climate goals will have concrete implications for supply chains. Obtaining energy resources and securing supply lines are geopolitical imperatives that no country can ignore. Indeed, Japan's decision to attack Pearl Harbor as Tokyo's own supply lines came under threat and the U.S. Navy's mandate to ensure transit through the energy-critical Strait of Hormuz are just two examples of how the need to secure delivery of fuel supplies can drive state behavior. Oil, natural gas and coal may be the most obvious commodities to track right now, but as the world shifts to cleaner energy sources and other related technologies to meet new emissions standards, different inputs will be needed in growing quantities.



Wind power, for example, requires heavy rare earth elements such as dysprosium and praseodymium, while solar power relies on gallium and tellurium. Energy-efficient lighting that uses light emitting diodes, or LEDs, could increase the demand for germanium. Current fuel cell technologies rely heavily on expensive platinum catalysts, while lithium and graphite are crucial to battery-powered vehicles. These less talked about metals will become increasingly essential. In fact, dozens of metals are vital inputs for technologies that could become fixtures of daily life over the course of the coming decades.

Production Centers

Just as the Middle East is crucial to the global supply of oil, other regions are similarly critical to the supply chains of some of the metals mentioned above. Many know that China controls the majority of the world's supply of rare earth elements, but it is less well known that China is also the world's largest producer of natural graphite. Also, Beijing's drive to increase high-end manufacturing has resulted in Chinese factories' producing a significant portion of the technologies that require rare earth elements. China's grip on the rare earth

market, however, is loosening. Beijing removed export quotas earlier this year after the World Trade Organization ruled the country had failed to show justification for them.

Nonetheless, rare earth elements are not the only necessary inputs of future technologies. The demand for many different metals and minerals will increase, and the physical security of their supply centers will become a key concern for some. The Democratic Republic of the Congo is the largest producer of cobalt, a vital input for battery technology. Kinshasa's weak and unstable government has tenuous control over its territory. The increased demand for the mineral resources produced there has the potential to aggravate centuries-old hostilities among the local population. Given the problems facing much of the developing world, the potential for corruption, smuggling and conflict dramatically increases the risk to global supply centers.

China and the Democratic Republic of the Congo are just two examples. As the world becomes more dependent on advanced technologies, security environments and the political behavior of a new set of producers will become more important to the global economy.

Research into Alternatives

Risks to the supply of inputs and the high cost of some metals will influence the focus and direction of future research. Platinum currently plays a vital role as a catalyst in fuel cell technology, but it is an expensive metal with roughly three quarters of its production occurring in South Africa. This lack of diversity in supply, combined with the instability in South Africa's mining sector, puts it at higher risk for disruption and increases its cost. Because of this, some researchers have opted to use a catalyst made of a nickel and titanium alloy, both of which are available in much higher volumes — production rates in 2014 total 161 metric tons of platinum compared to 2.4 million metric tons for nickel — and from more sources. While other consumers of nickel, primarily stainless steel producers, will compete for inventory, reserves are sufficiently high, and the prices for both these materials are expected to remain comparatively low. The recently developed nickel and titanium catalyst is not at the point of commercialization yet, but it represents the direction of future research.

Regardless of whether the Paris talks result in a binding agreement, much of the developed world will increase its use of energy efficient technologies to reduce carbon emissions. Supply chains for oil, natural gas and coal will remain vital, but as a large number of comparatively minor materials become increasingly important, pressure on their suppliers will become greater as a result. Geopolitical factors in countries that were previously considered marginal or unimportant, such as the Democratic Republic of the Congo, Chile, Peru and South Africa, will become increasingly important to the global energy supply. Likewise, the importance of countries such as China will change, but for different reasons. Over the long term, researchers will likely focus on using cheaper, more abundant materials in developing new technologies, a move that will cause a second, structural, shift in energy supply chains.