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Chapter 4

The Future of the Global Energy Flow Map and its Strategic Implications

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The Global Flow Map

Our contemporary world is increasingly dependent on global flows of merchandise, services, money, people and innumerable other material and immaterial 'flows.' This is particularly true of merchandise trade, which makes up the bulk of global material flows.[2] Such international merchandise trade flows -- including both high valued-added manufactured and technology goods, along with large-scale international energy and resources trade – have tripled over the past ten years and are expected to continue increasing into the future.[3]

Indeed, in recent years a 'global flow map' has taken shape both in real human-geographic terms and as a conceptual tool for calibrating the contours of the strategic horizon. For at least 200 years, the central driving force behind the coalescing emergence of today's global flow map has been the continued growth of international trade, measured as a share of global economic output.[4]

Although there is a broader 'ecological flow map' beyond the boundaries of what is strictly human geography and political economy, what can be called the 'human global flow map' finds its dynamic roots in a millenary evolutionary interplay between technology, the economic division of labor, and human politics – i.e., what could be considered the key historical

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[2] This paper considers only 'legitimate trade', and excludes 'illicit flows'. Nor does it consider immaterial (i.e., informational), biological or ecological flows.

[3] See UNCTAD, *Key Trends in International Merchandise Trade* (UN: New York and Geneva), 2013.

[4] See Hendrik Van Den Berg and Joshua J. Lewer, International Trade and Economic Growth (M.E. Sharpe, Inc.), 2007.

determinants of the depth and extension of 'the market.' However, this 'flow map' has only recently emerged into clear global consciousness as a result of the international dynamics of post-Cold War 'globalization,'' which effectively brought the 'First', 'Second' and 'Third' worlds into a single global 'market economy' at the end of the 20th century. Nevertheless, while 'globalization' brought about the wide-spread perception of the most completely globalized political economy ever experienced in history, it also generated the mirage of 'flatness' in global affairs and 'the end of history' in political thought, thus obscuring the contours of the actually emerging global flow map.[5]

After at least a decade of recurrent 'globalization crises,' however, and nearly another of tightening impasse across nearly all realms of Cold War-era global governance, the mirage has finally faded. In its place a sense of strategic unmooring now pervades the global community as most global governance structures have failed to arbitrate disputes successfully among varying international interest groups; facilitate global economic growth and sustainable development; or maintain the peace during the turn-of-the-century generation of post-Cold War 'globalization.'

A conscious mapping of the 'seascapes' of the current global flow map at least restores a physical, geographical grounding to any of our preferred strategic abstractions. The fresh framing of a such a global flow map, and an emphasis on its 'seascapes,' might also begin to challenge the 'Eurasian-focused,' 'world-island-centered' abstractions that still influence much of our strategic thinking. Dominated by seaborne flows, the global flow map actually fleshes out – due to the rising strategic significance of the oceans themselves, some three-quarters of the planet's surface and accommodating the shipping of over four-fifths of global trade -- into a new, multidimensional and dynamic 'geopolitical *flow globe*,' which is marine-centered and ocean basin-based.

Our world has long been dependent on the shifting dynamics of this multidimensional, geography-bound global flow map -- at least to some degree since the 16th century. However, the strategic value of the security of such flows has continued to accumulate with the deepening of the global market and the on-going penetration of international trade, and has never been greater than at present. The relevance and value-added of such a strategic focus on the global flows of the 'geopolitical flow globe' – both in terms of geo-economic 'volumes' and geopolitical 'physical-logistical routes' -- comes into even sharper relief when cast against a number of currently unfolding megatrends and macro-realities – both independent and interlocking -- which are reshaping the contours of 21st century geopolitics.

Such megatrends include:

- the growing share of the developing world (the "South") in both global GDP and seaborne merchandise trade (particularly in container traffic, but also in energy);[6]

[5] Thomas L. Friedman, *The World Is Flat* (New York: Farrar, Straus and Giroux, 2005); Francis Fukuyama, *The End of History and the Last Man* (New York: Free Press, 1992).

[6] UNCTAD, op cit.

- broad technological change across the global energy landscape (including the sometimes competing revolutions in 'unconventional fossil fuels' and low carbon technology);[7]
- the re-emergence of the broad Atlantic Basin (as opposed to simply the 'northern Atlantic') as an increasingly coherent and potentially influential geopolitical space;[8]
- on-going climate change, driven principally by fossil fuel use, which has taken global temperatures to around 0.9 degrees Celsius above pre-industrial levels (with a 2 degree rise virtually built-in to our current global business-as-usual trajectory, and with a 4 degree rise increasingly likely);[9]
- the incipient birth of the Arctic as a truly functioning ocean basin[10] -- paradoxically, the result of human-induced climate change stemming from our energy, agriculture and land-use practices;[11] and
- the rapidly growing significance of the oceans relative to land, in terms of economy, geopolitics and ecological balance.[12]

The intensifying centrality of the oceans, in particular, as a key variable within the equations of global geopolitics – and as an increasingly critical aspect (ie, the global 'seascape') of the global flow map -- is underpinned and strengthened by a number of other dynamic trends working simultaneously across many sectors. Perhaps the most important global macro reality in this regard – at least with respect to global material flows -- is the fact that nearly 90% of global merchandise trade (by volume, and nearly three-quarters by value) is transported by ship at sea. Total global seaborne trade has increased since 1970 at an average annual rate of 3.1% and is expected to double yet again by 2030.[13] Furthermore, just the *seaborne oil trade* in 2010 (2700 mn tons) was approximately 30% of total seaborne merchandise trade (8400 mn tons).[14] In fact, total international energy trade (including oil, but also liquefied natural gas, coal, biofuels and synthetic fuels) could account for as much as a third, or more, of all current seaborne merchandise trade.[15]

There are many other expanding flows, legitimate and illicit, private and public, economic, scientific, ecological, military-strategic, etc, which add to the growing and changing significance of both the global flow map – or 'geopolitical flow globe' -- and the primary space – the global 'seascape' of interlocking 'ocean basins' -- through which the fastest-growing volumes now

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[7] See Paul Isbell, *Energy and the Atlantic: The Shifting Energy Landscapes of the Atlantic Basin*, (GMF, Brussels and Washington, DC, 2012).
[8] See Daniel S. Hamilton, "Towards a Governance Agenda for the Emerging Atlantic Hemisphere," *Revista CIDOB d'Afers Internacionals*, n. 102-103, (CIDOB, Barcelona, September 2013), pp. 51-71.
[9] See, for example, Vergara et al, *The Climate and Development Challenge for Latin America and the Caribbean: Options for climate-resilient, low-carbon development*, (Washington, DC:ECLAC-IDB-WWF, 2013).
[10] See Daniel S. Hamilton, ed., *A New Atlantic Community: Generating Growth, Human Development and Security in the Atlantic Hemisphere*, (Washington, DC: Center for Transatlantic Relations, 2014).
[11] See G.S. Eskeland L. S. Flottorp, 2006, *Climate change in the Arctic: A discussion of the impact on economic activity*, in S. Glomsrød and I. Aslaksen, eds., *The Economy of the North* (Oslo: Statistics Norway, 2006).
[12] See, among other innumerable sources, John Richardson, et al., *The Fractured Ocean* (Brussels/Washington, DC: German Marshall Fund of the United States, 2012).
[13] UNCTAD, *World Economic Situation and Prospects* (New York: UN, 2012).
[14] *International Shipping Facts and Figures - Information Resources on Trade, Safety, Security and the Environment*, International Maritime Organization (2012).
[15] *BP Statistical Review of World Energy* (2013), IMO (2012), Ibid., and own elaboration.

pass. There are also fast-growing resource reserves within the oceans themselves (energy, minerals, fisheries[16] and aquaculture, bio-genetic resources, etc), further augmenting the weighting of the oceans as a variable within the geopolitical equations of international conflict and transnational cooperation.

Nevertheless, global energy trade – always a key geopolitical variable – remains the single most important global flow on the seas, both in terms of size and centrality to economic and geopolitical interests. Even though container traffic (mainly consumer goods) has grown faster since the 1980s than seaborne oil trade (driven mainly by rising Asian consumption), the seaborne energy trade remains the most strategic flow, from the most perspectives (economic, environmental, geopolitical, and military). In the same way, the 'global energy seascape' remains the most strategic dimension of the 'global flow map' (i.e., the 'geopolitical flow globe').

The sections to follow will examine, in turn: (1) global energy trade flows, (2) their underlying drivers and dynamics, and (3) their geopolitical and strategic significance within the context of the evolving megatrends and macro-realities outlined above.

Global Energy Flows

Globally traded energy flows include, in the main: oil, gas, coal, biofuels, synthetic fuels and electricity.[17] Such energy trade occurs in liquid, gaseous, solid, and electric form.

Liquid energies are typically transported by ship, but some also move by international pipeline. These *liquids* include: oil (both crude and derivatives, like gasoline); liquefied natural gas (LNG); biofuels; and synthetic fuels (or 'synfuels').

Gases include, mainly, natural gas -- most of which moves in gaseous form though pipelines (although about 30% is LNG, mentioned above, and moves internationally as a liquid by ship).[18]

Solids include, mainly, coal -- which is traded internationally by both sea and land (railroad and truck).

Finally, electricity – the smallest flow of the internationally traded energies – is mainly moved just domestically although, in some limited cases, it does flow internationally, and typically by transmission cable through international interconnections.

In terms of relative volumes, as we will examine further below, the largest flows of internationally traded energy come from oil (and its derivatives), then coal (most by ship, but some by land) and gas (some by LNG, a liquid, but most still by international pipeline), and finally in a minor way other liquids like biofuels and finally synthetic fuels, still in virtually residual quantities. In 2010, oil accounted for 90% of all international energy trade (measured in

[16] Global fisheries, and other 'biological flows' are actually on the decline. See Richardson et al., op. cit.
[17] Globally traded energy is a subset of total global energy flows; the other subset is domestic energy flows that do not cross international borders.
[18] BP (2013), op. cit.

terms of total exa-joules).[19] However, although oil currently dominates global energy flows as well as the global material flow map, by 2050 internationally trade in energy will nearly double (under a business-as-usual scenario) and around 80% of the total by then will be gas (much of it LNG). So while liquid energies will continue to be the single most central global material flow, the dominant globally traded energy will shift from oil to gas over the course of the coming decades.[20]

Oil Flows

In 2012, global oil production hit an all-time high of 86.15 million barrels a day (mbd). Global oil consumption was also at an all-time high of nearly 90 mbd. Of this quantity of globally produced oil (including relatives and derivatives), 64.2% is internationally traded oil (55.3 mbd). Furthermore, over 55% of global oil production – and nearly 88% of total traded oil -- is shipped by sea (some 48.5 mbd). Less than 13% of internationally traded oil (6.7 mbd) travels by land (mainly pipeline but also rail and road), although more than an additional 30mbd (or 35% of total oil production) also travels by land, but only domestically, without crossing national borders.[21]

LNG Flows

Total global gas trade reached 1 trillion cubic meters (1 tcm) in 2012, or 50% of total world gas production (2 tcm). The global LNG trade – the liquid, ship-transported portion of the gas trade – came to 328 billion cubic meters (bcm), or 5.93 mbdoe[22] (just over 30% of total global gas trade) and 16.4% of total global gas production. Global pipeline-traded gas – the portion of the international gas trade that moves by land – came to 705.5 bcm last year, some 70% of total global gas trade, and 35% of total gas production. Of course, almost all of the 1 tcm of gas that is produced – but not traded internationally – travels by pipeline domestically, without crossing national borders (50% of the global total).[23]

Moreover, far more oil, as a percentage (64%) is traded internationally than is the case with gas (50%). In addition, more oil (55% of the total) than gas (16.4%) travels by ship. Furthermore, oil still accounts for a higher share of total global energy (33%) than gas (25%).[24] All of these parameters make oil the most significant flow on the 'global energy seascape.'

Biofuels Flows

Total global production of biofuels reached 1.2 mbd of oil equivalent (oe) in 2012, or around 3% of the global transportation fuel market.[25] Of this, approximately 2 billion liters,[26] or 4.5 Mtoe[27]

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[19] IIASA GEA Model Projections Database (2013) and own elaboration.
[20] Ibid.
[21] BP (2013), op. cit., and own elaboration.
[22] For conversion from bcm of gas to million barrels a day of oil equivalent (1bcm x 6.6 divided by 365), see BP op. cit.
[23] Natural gas and LNG data from BP (2013), op. cit., and own elaboration.
[24] Ibid.
[25] Ibid.
[26] Greenfacts (http://www.greenfacts.org/en/biofuels/figtableboxes/figure-18.htm).

(around 350,000bdoe or 0.35mbdoe) is traded internationally, basically all by ship. Compared to oil and LNG, however, this liquid flow (together with that of synfuels) is still marginal. Nevertheless, over 80% of this international trade takes place within the Atlantic Basin.

Coal Flows

Coal currently accounts for 30% of the global primary energy mix. Total global coal production in 2011 came to 7 billion tons; about one-seventh of this total (1 billion tons) was internationally traded (a tripling since 1999). Some 94% of all globally traded coal (978 million tons) is transported by sea, while only 6% moves by land (mainly rail). In comparable terms with oil (measured in million barrels per day of oil equivalent, or mbdoe), the global seaborne coal trade comes to 9.35 mbdoe. Of this total global seaborne coal trade, some 75% is hard/steam coal (7.5 mbdoe), while the remaining 25% of seaborne trade is in coking coal. The seaborne hard coal trade has declined recently in the Atlantic Basin (-8% between 2008 and 2011) but expanded significantly (+30%) in Asia (or in the Pacific and Indian Basins).[28]

Electricity Flows

Total world electricity imports (596bnkWh, or *1mbdoe*) come to 3.1% of total world electricity production (19,038 billion kilowatt hours, or 32mbdoe) and 3.4% of total world electricity consumption (17,445 billion kilowatt hours, or 29mbdoe).[29] However, nearly all of this international electricity trade takes place by land-based transmission cable, while only a tiny fraction occurs through sea-based transmission cable.

‘Landscapes’ versus ‘seascapes’ on the ‘geopolitical flow globe’

The world produces some 222 mbdoe of ‘tradable energy’ (including oil, gas, biofuels, coal and electricity).[30] About 38% of this ‘tradable energy’ production is *actually traded* internationally, across borders (or about 84 mbdoe). Nearly 77% of this globally traded energy is moved by sea (or some 64 mbdoe), the equivalent of 29% of total global ‘tradable energy’ production. Less than 20 mbdoe of globally traded energy travels by land (some 23.5% of globally traded energy, or 8.9% of total global produced ‘tradable energy’). Table 1 lays out these global energy ‘land’ and ‘seascapes.’

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[27] IFP, “Panorama 2012: Biofuels Update: Growth in National and International Markets,” 2011 (www.ifpenergiesnouvelles.com).

[28] Global coal data comes from: Lars Schernikau, “Economics of the International Coal Trade: The Renaissance of Steam Coal,” (Springer), 2010; HMS, Bergbau AG (http://hms-ag.com/en/energy-coal-market/world-coal-trade.html); and Arne K. Bayer and Maggi Rademacher, “Seaborne steam coal market dynamics and future production costs,” EON, Resources Workshop “Long-Term Costs and Reserves of Coal, Oil, & Natural Gas,” March 22, 2012. Note: Divide million metric tons of coal (mn tons) by 2.1 to get ‘million tons of oil equivalent’; then divide million tons of oil equivalent (mtoe) by 49.8 to get million barrels a day of oil equivalent (mbdoe).

[29] Electricity data is from the Energy Information Agency (EIA) of the US Department of Energy. See the EIA ‘International Energy Statistics,’ (http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=2&pid=2&aid=12), 2013. For electricity to oil conversion factors (1 kilowatt hour = 3412 BTUs divided by one trillion x 0.18 for million barrel oil equivalent) see BP, op. cit.

[30] The world actually produces/consumes around 250mbdoe of energy, although a significant share of it is energy which cannot be traded internationally, like most traditional (and even some modern) biomass.

Figure 1. Global Energy Production, Trade and Seaborne Energy Trade, mbdoe, 2012[31]

Tradable Energy Source	Total Tradable Energy Production	Total Energy Traded	Seaborne Energy Trade	Seaborne Energy Trade (mbdoe)	% Seaborne Energy Trade (mbdoe)
Oil (2012)	86.15mbda	55mbd	48.5mbd	48.5	75.6%
Gas (2012)	2 trillion cm (36mbdoe)	1 trillion cm (18mbdoe)	328bcm	5.93	9.2%
Biofuels (2012)	1.2mbd	0.35mbd	0.35mbd	0.35	0.54%
Coal (2011)	7bn tons (66.6mbdoe)	1bn tons (9.5mbdoe)	978mn tons	9.35	14.6%
Electricity (2010)	19 PWh (32mbdoe)	596 TWh (1mbdoe)	--	--	--
Total mbdoe	222mbdoe	83.85mbdoe (or 38% of total tradable energy production)		64.13mbdoe (29% of total tradable energy production; 76.5% of total energy traded)	100%

The large majority of energy flowing 'globally' moves in liquid form by ship (49mbdoe). This 'liquid flow' is complemented to some degree by solids, like coal, much of it also transported by sea (another 9.35mbdoe). However, much oil, gas, biofuel and coal (59mbdoe) is not physically traded across national borders. Piped gas and electricity, in particularly, are generally still limited to regional markets; even then, the densest flows tend to be domestic. Of total 'tradable energy' produced, some 62% is consumed domestically, without crossing borders; meanwhile of this total global 'tradable energy' produced, only 38% is actually traded globally, and 29% of this total 'tradable energy production' is traded by sea.

[31] *Oil and Gas: BP Statistical Review of World Energy* (2013); Biofuels: IFP, "Panorama 2012: Biofuels Update: Growth in National and International Markets," 2011 (www.ifpenergiesnouvelles.com); Coal: Lars Schernikau, "Economics of the International Coal Trade: The Renaissance of Steam Coal" (Springer, 2010); HMS, Bergbau AG (http://hms-ag.com/en/energy-coal-market/world-coal-trade.html); and Arne K. Bayer and Maggi Rademacher, "Seaborne steam coal market dynamics and future production costs", EON, Resources Workshop "Long-Term Costs and Reserves of Coal, Oil, & Natural Gas," March 22, 2012; Electricity: Energy Information Agency (EIA) of the US Department of Energy. See the EIA 'International Energy Statistics' (http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=2&pid=2&aid=12); and own elaboration.

Figure 2. Global Energy Land and Seascapes: Total Global Tradable Energy Consumed Domestically and Traded by Land and Sea, 2012

Total Global 'Tradable Energy' Produced	Consumed Domestically	Traded Internationally by Land	Traded Internationally by Sea
222 mbdoe	137.64mbdoe	19.75mbdoe	64.13mbdoe
% of total	62%	8.9%	29%

From one angle, then, the global energy flow map reveals an international energy 'seascape' in which energy is globally traded (38% of the total tradable energy produced), and transported principally by ship via the world's sea lanes (76.5% of total traded energy, or 29% of total tradable energy produced). From another angle, however, the global energy flow map is an essentially domestic 'landscape' (62% of total tradable energy produced), with energy transport almost exclusively terrestrial (either by transmission cable, pipeline, rail or road).

This latter, more domestic and land-based version of the global energy flow map reflects the energy landscape of the interior of the Eurasian landmass, while the former expression of the global flow map – the one expanding the most rapidly -- reflects the energy 'seascapes' of the 'ocean basins' (ie, the Atlantic Basin, the Indian Basin, the Pacific Basin and, possibly someday, even the Arctic Basin), which now command nearly one-third of the global total of tradable energy produced. This means that the 'global energy seascape' constitutes nearly a third of the 'global energy flow map' – including all domestic energy flows that do not constitute international energy trade – and for three-quarters of globally traded energy. Yet the strategic significance of the 'global energy seascape' is heightened further by the fact that it provides the critical binding spaces between global loci of production and consumption, across ocean basins.

Oil, however, is by far the dominant flow, accounting for three-quarters of this 'globally traded energy seascape.' Nevertheless, by 2050 80% of globally traded energy flows will be accounted for by gas, as mentioned above, as oil is progressively squeezed out of the global energy mix, even under a business-as-usual scenario.[32] To the extent that the gas market becomes global, based on LNG, the globally-traded energy seascape will be increasingly dominated by liquid movements of gas.

Drivers and Dynamics of the Global Energy Flow Map

To begin to foresee the shape and rhythms of the future global energy flow map, one must analyze the drivers – and underlying dynamics -- of the past and present versions of this map. Historically, and perhaps systemically, the principal driver, dominating the directions of the flows, has been the interplay and relationship between the centers of global energy production and the centers of consumption.

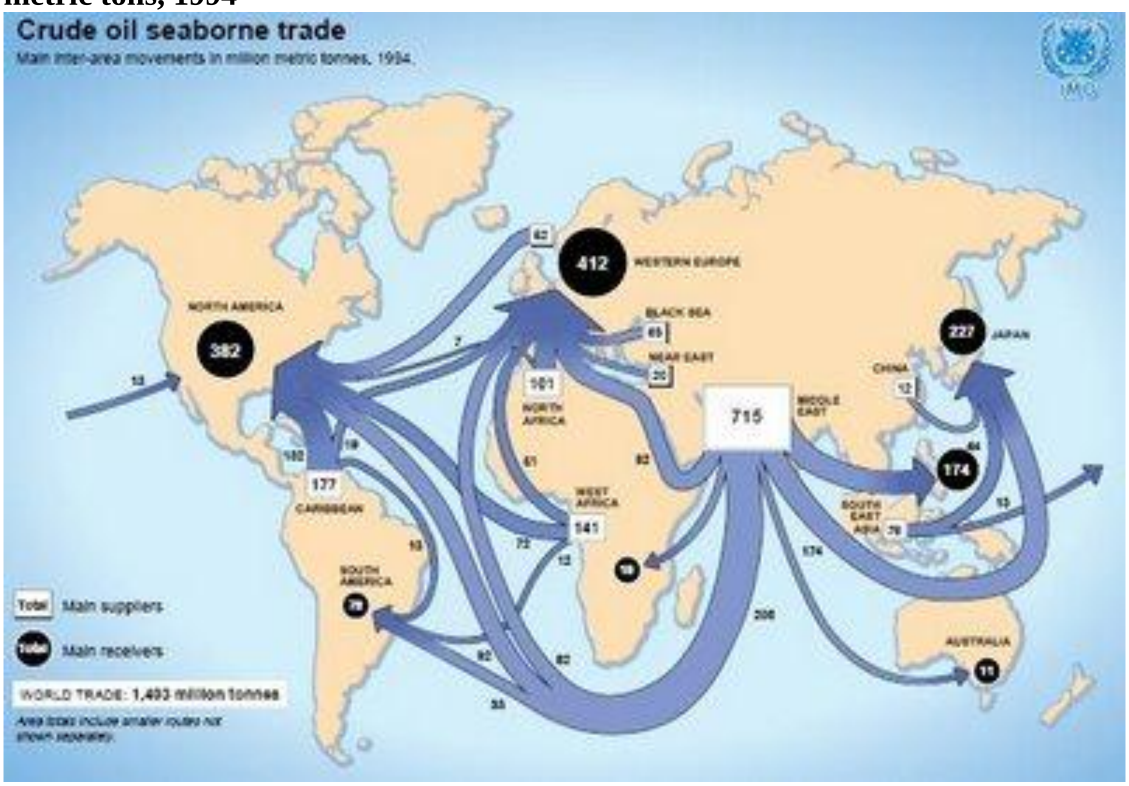
[32] IIASA GEA Model Projections Database (2013) and own elaboration.

A century of shifting oil production and consumption loci

The world's oil production locus was first located in the United States, a product of the original Pennsylvania-Texas Wildcat booms. Within decades the production locus began to be shared with the Caspian, as the old Eurasian 'heartland' -- that transfixing strategic mirage of the 19th and 20th century -- became overlaid in a thick layer of oil. By the end of the Second World War, however, both the Americas (Mexico and Venezuela were on the scene by now) and Central Asia and the Caspian were gradually being displaced by the rising Middle East. Meanwhile, the United States had surpassed Europe as the world's principal locus of consumption (which eventually balanced out during the post war years to include, more or less, all of the OECD economies).[33]

As a result of the oil price shocks of the 1970s, the Northern Atlantic (particularly Europe) began to experience a secular shift in energy demand, as efficiency rose and as certain material demands became mature or saturated. At the same time, Asia began to emerge as an increasingly central locus of consumption, as its economies began to grow -- and as consumption in OECD economies began to level or even peak.

Figure 3. Seaborne Crude Oil Trade in the late 20th Century Global Oil Flow Map, mn metric tons, 1994



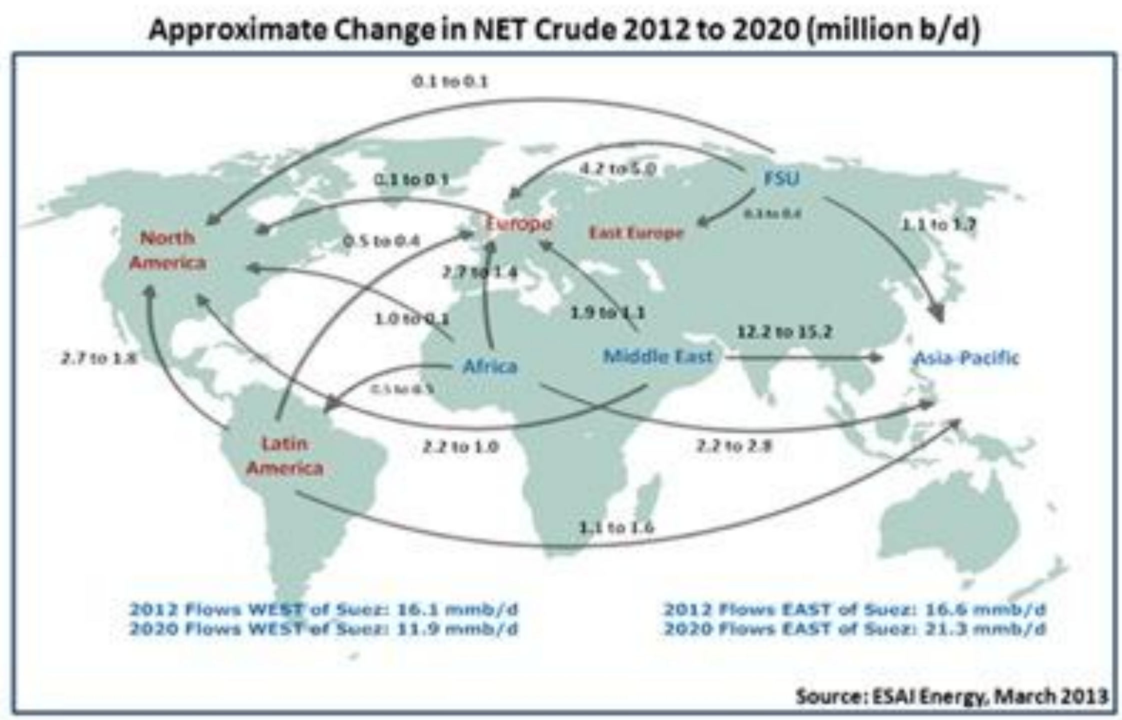
Source: International Maritime Organization.

[33] For a history of the evolution of world oil production and consumption from the mid-19th century to the end of the 20th, see Daniel Yergin, *The Prize: The Epic Quest for Oil, Money and Power* (Simon & Schuster, New York, 1991).

For several decades after the Second World War, then, global flows of oil were increasingly dominated by crude oil coming from the Middle East and then shipped by sea: first into the Atlantic Basin -- where the United States and Europe remained more or less highly dependent on imports of Mideast oil (making Suez and Hormuz crucial chokepoints) -- and then to the Indian Basin and, with time, even more so to the East Asian rim of the Pacific Basin (lending the Straits of Malacca their strategic significance). During the classic age of the Seven Sisters, the global oil market functioned smoothly with its heart beating the oil out of the Persian Gulf in increasingly voluminous flows, with a largest share shipped westward. Then, after the Sisters' loss of control and the oil shocks of the 1970s, another increasingly large flow shipped eastward, to emerging Asia (see Figure 1). The Middle East – in particular, Saudi Arabia, Iran, Iraq, Kuwait and the Emirates – was the strategic exporter of a barrel at the margin (to all ocean basins) on the previous global energy flow map.

From the late Cold War of the 1980s – when prices precipitously fell from oil shock levels -- to the time of the Great Recession, which plunged global oil prices from shock-levels again in 2008, such patterns of dependency began to unravel, and the flow map, in turn, has changed. A number of factors have contributed to this slow series of interlocking shifts in the dominant sources, destinations, and transport patterns of the global energy flow map. Figure 2 reveals the emerging land/seascape of global oil flows, with the global center of gravity of consumption (or global consumption locus) shifting eastward from the Atlantic Basin to Eurasia – and East Asia, in particular.

Figure 4. Global Oil Trade Flows Shifting Eastward, 2012-2020



Source: ESAJ Energy, March 2011.

As can be seen in Figure 4 above, global oil trade flowing west of Suez reached 16.1mbd in 2012, while global oil trade flowing east of Suez came to 16.6 mbd. By 2020, however, the westward flow will have fallen by more than 4 mbd (to 11.9), as the eastward flows are expected to rise by 4.7 mbd (to 21.3). A number of trend shifts affecting the global loci of production and consumption underlie these changes in the global energy flow map, reversing the previous East-to-West nature of the preponderant flows.

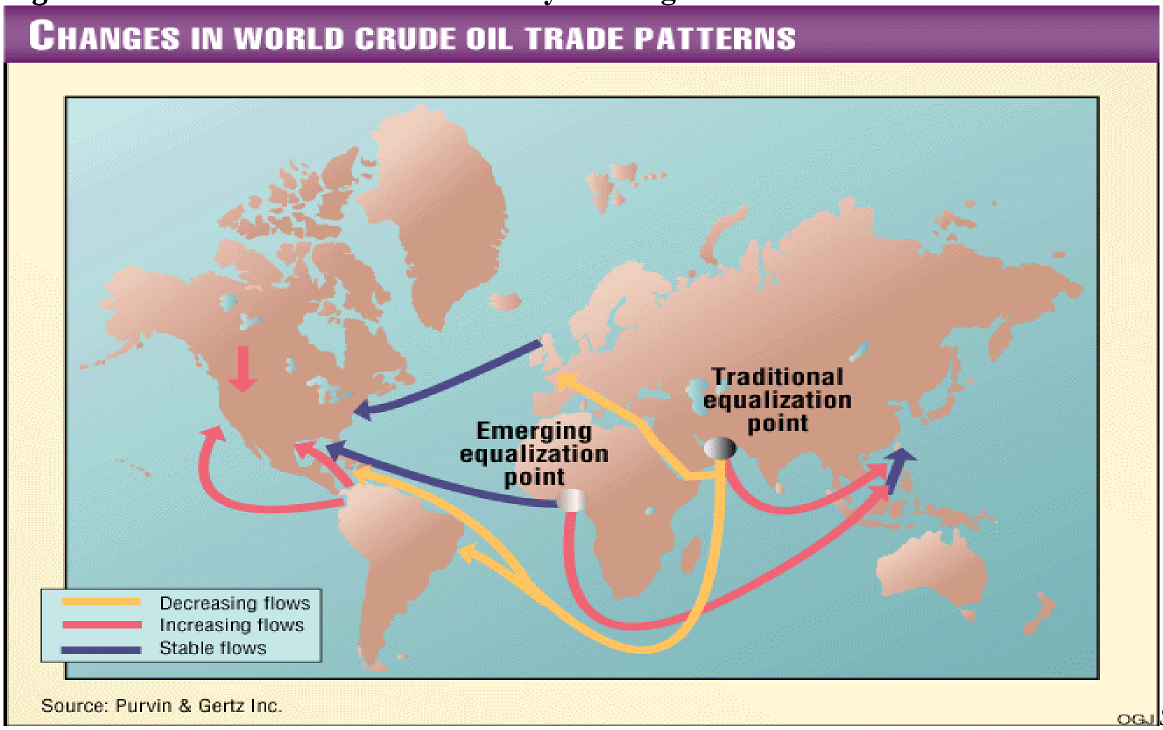
On the demand side, the shift from East-to-West to West-to-East flows has been driven by:

- slowed consumption growth in the Northern Atlantic (first in Europe, and then in the US);
- increased demand in "Eurasia," a trend set to continue: including among both the major exporters (Russia, Central Asia, the Middle East) and importers (South and East Asia) of the region.

On the supply side, the reversal in the East-to-West flow has been underpinned by:

- expanded conventional hydrocarbon reserves and increased oil and gas production from all corners of the Atlantic Basin: North America, South America, Africa and even (at least for a while) North Sea Europe;
- increased U.S. production in unconventional hydrocarbons (shale gas and 'light tight oil'), reversing a heightening dependency trend and reducing U.S. imports of oil and gas for first time in generations;
- the related 'unconventional revolutions' of the broader Atlantic Basin: including shale, LTO and tar sands in Northern Atlantic, and the deep offshore and shale resources in the Southern Atlantic.

Figure 5. Oil's Global Center of Gravity Shifting into the Atlantic Basin



Source: Oil and Gas Journal (from Purvin & Gertz Inc.)

While similar supply side developments may be occurring in other ocean basins or other terrestrial regions, on all counts they are being outstripped by their manifestations in the Atlantic Basin. Figure 3 reveals the impact of such factors shifting the global loci of production and consumption upon the global energy flow map (and in particular upon global flows of oil). As the global consumption locus shifts east to Asia, the global production locus continues to shift in a westward direction, leaving the global center of gravity (or global equalization point) in the Atlantic Basin, from where the marginal barrel of oil will be exported to the world market in the future and, increasingly, to Eurasia -- East Asia, South Asia and the 'Great Crescent' (including the Middle East, Russia and Central Asia), and in that order.

Already, nearly 80% of U.S. imports comes from the Atlantic Basin.[34] Furthermore, the IEA has recently called attention to the increased segmentation of the global oil market, noting that the "Western Hemisphere" is increasingly autonomous in terms of oil.[35] More than 60% of all new oil production to 2035 will come from the Atlantic Basin; even now, no more of the world's import quota for oil is filled by the Middle East (35%) than by the Atlantic Basin (the same).[36] Given that U.S. oil production is now rising, while consumption levels off and imports fall; and given that oil production in the Southern Atlantic (in both Africa and Latin America) is also rising, the 'Atlantic Basin,' too, is increasingly autonomous in terms of globally traded oil.

[34] Own elaboration, based on data from BP op. cit.
[35] International Energy Agency (IEA), *World Energy Outlook 2013*.
[36] See Isbell 2013; BP op. cit. and own elaboration.

This new, but still oil-dominated, global energy flow map is rounded out by an Atlantic Basin preeminence in a number of other marginal, but increasingly significant, energy flow categories. These include LNG (which is following a dynamic similar to that of oil, with increasing Atlantic gas reserves and LNG production lending the Basin a growing autonomy and much future export potential to Asia, at least at the margin), biofuels (with the Atlantic possessing 85% of the global biofuels economy and incorporating global leaders like Brazil and the United States), and synthetic fuels (where South Africa and the US have the lead). Much the same could be said about coal: increasingly European coal demand is being met by the United States and to some extent Colombia, while South African coal is more and more bound for India, and farther east. There exists a growing trend toward greater Atlantic Basin autonomy across a range of energy sectors and the global energy flows that typically came into the Atlantic Basin from the Indian Ocean Basin are now reversing their flow, moving from the West to the East, toward the Pacific. And the trend has only begun.

Chokepoints and Key Sea Lanes: East-West Limitations and 'High-Latitude' Spill-overs in the Global Energy Flow Map

The most visible, major thrusts and contours of the global energy flow map are explained by the production-consumption loci layout and its evolution. However the physical geography of the oceans' shipping chokepoints and key sea lanes also interacts with technological evolution affecting transportation to contribute some unique dynamics to the global energy flow map.

Shipping flows shift when canals are opened, shut, widened, technically disabled, potentially threatened or even actually sabotaged. Some of these factors affecting canal traffic can be planned for; others cannot and imply certain amounts of technical and political risk. The world's sea straits – similar to canals, but subtly different -- are also vulnerable to these latter forms of risk. However, while such factors can affect the energy flows of the global 'seascape', and even indirectly of the 'landscape', they do so only in dialectical relation with the dynamics of transportation, particularly shipping (ie, technology/size of shipping vessel, weather constraints, etc). Therefore, the shifting political and technical dynamics of the world's strategic straits and other chokepoints and strategic sea lanes impact upon the flows as they interact with the broader dynamics of transportation.

In fact, the world's two most important chokepoints are straits, not canals. More than 17mbd of oil pass through the Straits of Hormuz, at the mouth of the Persian Gulf – meaning 17 million barrels every day.[37] This is equivalent to 35% of all seaborne oil trade, and nearly 20% of globally produced oil.[38] More than 85% of it is going to Asia (India, China, Japan and South Korea), and by 2035 nearly all of it will be Asia-bound. Well over 75% of the oil moving through Hormuz daily also passes through Malacca in Southeast Asia, through which passes

[37] "In addition, Qatar exports about 2 trillion cubic feet per year of liquefied natural gas (LNG) through the Strait of Hormuz, accounting for almost 20 percent of global LNG trade. Furthermore, Kuwait imports LNG volumes that travel northward through the Strait of Hormuz. These flows totaled about 100 billion cubic feet per year in 2010." EIA, "World Oil Transit Chokepoints," August 22, 2012 (http://www.eia.gov/countries/regions-topics.cfm?fips=wotc&trk=p3)

[38] EIA, op. cit.

some 15mbd – including the bulk of the Hormuz oil and some flows coming from West Africa through the Cape Passage on their way to the Far East.

For as long as the new global energy flow map has been emerging (since the late 1970s) this crucial sea lane – from the Persian Gulf to East Asia – has been gaining in global importance. First, an increasing share of global oil has continued to pass through these straits. While such oil contributes to global supply and to the world oil price, increasingly the Hormuz oil, at least, is directly providing for consumption in the East, not the West, linking with Malacca in an increasingly strategic energy supply chain of fast growing Asia. Nevertheless, even as the currently emerging global energy flow map changes with time, this strategic chain of chokepoints will only increase in its significance. The shut-down of either of these straits – or both -- would take more oil off the market than is produced by Saudi Arabia. Furthermore the only potential swing producer with excess capacity to replace such lost oil from the market would be Saudi Arabia itself (if not, increasingly in the future, some countries of the Atlantic Basin). But in the case of a shutdown of Hormuz, in particular, it would be precisely Saudi Arabia which would have no way to bring its potentially heightened production to world market. The pipeline links between the Gulf countries and the Mediterranean or Red Sea are minimal, and would take years and untold billions to build new sufficient capacity capable of backing up the Strait of Hormuz. Regardless of the nature of the strategic maps preferred by the Indians or the Chinese, they have clearly captured this.

Indeed, for China and its East Asian neighbors, the Straits of Malacca (together with Lombok and Sunda) are existential. Some 80% of China's energy imports and some 40% of its consumption is dependent on oil passing through these straits. Japan and South Korea are even more dependent on this energy flow. Within the frame of obsolete geopolitical thinking, it is no wonder that there exists a strong narrative – and perhaps even a partial reality – that China is building up its 'blue water' navy to be able to protect the Hormuz-Malacca flows: an international public good that from World War II to the present has been provided by the United States.

While they are important as crucial gateways for the energy flows of the global 'seascape,' the Suez and Panama canals remain marginal to the potential overall evolution of the global energy flow map in the future. Together they account for around 4mbd of oil traffic, and will unlikely every surpass 5mbd. Even though the Panama Canal is set to inaugurate its new expansion, already the largest ships in both tanker and container shipping are too large to be accommodated by even the enlarged Panama Canal.[39]

At the margin of future shipping growth, size and technological capacity will dictate that the increasing flows at the margin will use the Cape Passage in the south linking the Atlantic Basin with the Indian Basin (or in the mapping of some, with the Indo-Pacific continuum). The other possible seaborne flow to grow (as a result of the size and technologically-induced 'spill over' flows from the ultimately restricted canal passages), is the Arctic passage, particularly the 'Northern Route', from the entrance of the Atlantic into the Arctic Basin, around the top of the Nordic countries and then all along the Russian northern coast to the Bering Strait.

[39] See "New Challenges for Panama Canal at 100," *The New York Times*, August 21, 2014.

Although it is true that notable Arctic traffic will still be long in coming, and ultimately also capped by technological and political-economic circumstances, much like the canals, it is nevertheless also true that, after the Cape Passage -- the strategic passage to gain the most traffic on the future global energy flow map -- the other potential chokepoint, or strategic passage, to see its significance rise, at least notably -- would be the Northern Russian coastal passage and in particular the Bering Strait. This is because the most likely scenario is that some Arctic oil and gas will in the end be produced, at least by Russia, even if the Arctic is left relatively unexploited, for whatever reason. However, such new energy flows, perhaps potentially notable – again, at least for Russia -- will flow east and south through the Bering Strait to East Asia. This means that the Bering Strait, already traditionally significant in military and geo-strategic terms, now also becomes so with respect to the global energy flow map for the very first time.

By contrast the canals will be increasingly saturated and, in Panama's case, handling a relatively small amount (when compared to the projected growth in future global demand) of increased energy and other flows to the Pacific Basin (particularly to East Asia) from the Atlantic Basin (like some Venezuelan oil to China). In the case of Suez (and the companion SUMED pipeline), the growing flows will increasingly be container traffic to Europe from Asia through the canal, as energy flows through this route, at least flowing East to West, dry up.

A secondary consequence of the ultimate limitations faced by the strategic canals – even while they remain vital links for certain global trade flows between the world's ocean basins -- is that such flow limitations reinforce an already notable new trend of rising energy flows *within* the Atlantic Basin. Other chokepoints, like the Danish Straits and the Turkish Straits, serve to further constrain the capacity of energy to move from East to West. As the global energy flow map continues to evolve to lend an even greater role for the Cape Passage, the crucial point is that the growing energy flows will be both intra-Atlantic and, in the longer run, moving from West to East, as they begin to serve as the oil and gas exports at the margin to Asia.

The Atlantic Basin energy 'seascape' will become much denser on the future global energy flow map. At the same time, the deepening energy links between the exporters of the 'Great Crescent' and the importers of South and East Asia will logically demand a denser network of land-based pipeline, rail and electricity connections -- a development which would correspondingly intensify the Eurasian energy 'landscape'. Nevertheless, the Eurasian energy 'seascapes,' including the Hormuz-Malacca flow and the potentially new eastward and southward flows through the Bering Strait, will remain crucial for Eurasian logistical feasibility, and therefore key flows on the future global energy flow map.

The Emergence of an Ocean-Basin World: The Ocean-Basin Thesis

Provoked by shifts in the energy land- and seascapes, changes in the global material flow map are now interacting with changes in the relative importance of – or the relationships between – the oceans and the land.

Marine technologies are opening up the sea in numerous ways, revealing its potential, its difficulties and its hazards. The new trends already embrace energy in particular – from offshore hydrocarbon and wind power production to other forms of marine energy and coastal energy interfaces for maritime uses – but economic activities are set to span from seabed mineral, fishing and aquaculture production to the exploitation of sea-based resources by the pharmaceutical and biotech industries. The role of the oceans in the maintenance in species diversity and of coastal ecosystem services, and in the absorption of carbon dioxide, is also critical, and – given the deplorable state of oceans in general and their rapid rate of deterioration -- it will demand more and more intensive transnational collaboration. Such collaboration should logically be based on new 'ocean basin communities,' much like that already forming around the Rovaniemi Process and the Arctic Council in the Arctic Basin, and like that envisioned in the proposal for a new Atlantic Basin Community developed by the Eminent Persons Group of the Atlantic Basin Initiative in the Atlantic.[40]

Oceans are increasingly significant in strategic terms if for no other reason than that they are at once (1) the next great 'economic,' 'scientific,' and 'geopolitical' frontiers, and (2) the collapsing foundation of the broader global environment. The great game over the future of global stability will be played out increasingly on and around the seas, and the four ocean basins in particular will shape its physical evolution in geopolitical space. Indeed, this shift in the realities of physical and human geographies will also demand a recasting of our land-locked, 'world-island-based,' Eurasian-centric strategic thinking to allow for our mental maps to actually see the potential of an 'ocean basin world.'

Ocean basins -- with their new and evolving interfaces between ocean and 'maritime rimlands' – are becoming the new nexus of geo-economics, geopolitics and transnational environmental collaboration. The result is a reconfiguration of the international landscape – to use what is now, for us, a less than useful metaphor, given the specificity of the increasingly important global seascape. Certainly, however, a new 'geopolitical globe' is taking shape faster than most of us can alter the structure of our mental maps to perceive, and – like the strictly physical planet – it is an 'ocean-basin world.'

On the most obvious levels, such ocean emergence trends are manifest in the currently-unfolding and multifaceted reconfiguration of the Atlantic Basin and in the climate change-induced emergence of the Arctic. Such manifestations unfold within the contexts of other existing trends: the emergence of previously 'developing' economies in Asia, which has provoked a great cleavage in the international division of labor, with the global center of gravity of manufacturing moving East, along with the center of gravity of energy demand. For the first time in modern history, the growing source of energy supply could be located beyond the Eurasian landmass (the 'world-island') and providing energy to the growing source of global energy demand on the Asian side of the Eurasian landmass. Because energy from beyond Eurasia must pass through the world's ocean basins to reach it, oceans register an increase in the strategic import while ocean basins become key governance frames for responding to any related strategic challenges.

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[40] See Daniel S. Hamilton, ed., *A New Atlantic Community*, op. cit.

Climate Change and the Opening of the Arctic

Some future global material flows could shift, if melting ice allows the Arctic basin to become more feasible for economic exploitation (mainly hydrocarbons production and mining, both on- and offshore), other forms of scientific, social, political and military engagement, and for transportation shipping.

Although there is now much economic over-hype and geopolitical hyperbole concerning the 'imminent opening' of the Arctic, it is nearly inevitable, on the other hand, that at least some more human activity will take place in the Arctic zone in the decades to mid-century (under almost any scenario). The Arctic countries have already been involved in increasing transnational collaboration, particularly through the so-called Rovaniemi Process. According to most interpretations, this process of collaboration, inspired by the famed 'Murmansk Speech' of former Soviet Premier Mikhail Gorbachev in 1987 and launched by two Arctic meetings in Rovaniemi, Finland (in 1989 and 1991), led to intensive environment monitoring and protection collaboration in the form of the Arctic Mapping and Assessment Program (or AMAP), and eventually to the creation of the Arctic Council.

Any of the potential Arctic passages could substantially cut the journey time – by as much as one-third of the distance and time -- between the Pacific and the Atlantic Basins. Economics will therefore dictate that much future Pacific-Atlantic seaborne trade will 'spillover' from the ultimate bottleneck limitations of the 'low-latitude' canals (even if enlarged) to move in and out of the Atlantic both northward through the Arctic routes and southward through the Cape Passage. As a result, in the future at least some additional shipping traffic will move through the Arctic.

But the most likely flows will be bulk traffic and some manufactured goods trade, between the Northern Atlantic and East Asia, most likely along the Northern Route passing along Russia's northern coast. Nevertheless, even with warmer temperatures and melting ice, a range of additional costs and risks associated with the still extreme conditions of the region -- including special ice and weatherization shipping technologies, accompanying ice-breaker and related escorts, and related issues affecting insurance costs -- will ultimate impose limitations on the potential shipping traffic volume that can be absorbed by the Arctic route. More importantly, in the end, the Arctic's ultimate impact on global *energy* flows is likely to even more marginal than its probable limited impact upon global shipping flows in general.

We have already mentioned the more-than-likely production of at least some Arctic hydrocarbons (probably most from Russia) and their likely passage through the Bering Strait to East Asia. But all the same extra costs and risks affecting shipping will also limit the amount of oil and gas that ultimately will be extracted from the Arctic. While the region is estimated to possess some 30% of all 'undiscovered' gas in the world and some 15% of all 'undiscovered' global oil, these estimates do not take into account 'unconventional' hydrocarbons. Including 'unconventional' resources in the analysis only renders Arctic oil and gas – almost all of which is not yet considered 'proven reserves' -- to the insignificant margin of the global energy picture. But because the shale and offshore revolutions have left the Atlantic Basin increasingly awash in oil and gas, most of the potential but ultimately limited hydrocarbon flows out of the Arctic will move east through the Bering Strait to the Pacific -- not south and west into the Atlantic. While Europe still provides the exception to the new profile of Atlantic Basin hydrocarbon abundance, LNG imports from the US, Latin America and Africa are more likely to provide for future European gas demand than are any such hydrocarbons from the Arctic.

Therefore, while some early increases of Atlantic-Pacific trade will be absorbed by the enlarged Panama Canal, over the coming two decades more excess incremental West-East traffic will be diverted to the Arctic and the Cape Passage. But given the relatively modest level of ultimate Arctic traffic as a result of the volume limitations of the Northern Route, most of the future growth in this inter-basin trade will be diverted to the Cape Passage – the only potential major sea lane, capable of linking the Pacific to the Atlantic for seaborne trade, that has no traffic limitations physically inherent to the passage. Indeed, while the unfolding story of the contemporary Arctic is very compelling, it will only marginally affect global flows.

The vision of an 'Arctic Renaissance' – to say nothing of a new 'northern polar center of global geopolitical gravity' -- could only ever be realized if the associated and underlying climate change – paradoxically responsible for any such opening the Arctic -- does not completely disrupt the rest of the global system upon which almost all new Arctic economic activity, along with the political-social cohesion of the region, would ultimately depend. There is still much of interest that is now at stake in the Arctic, and in the on-going collaborative discussions of Arctic concerns. This is particularly true in the area of scientific collaboration, environmental protection and local sustainable development, especially with respect to Greenland and the Arctic's numerous indigenous nations. But the current trend to "securitize" the Arctic and to cast the opening of the region as a 'new great game' overstates the Arctic's ultimate potential and exaggerates even the current rate of change.

Renewable Energies and Low Carbon Energy: Driver and Shock-Absorber of the Global Energy Flow Map

The penetration of renewable energies into national energy mixes generally reduces both energy imports (and international energy trade in general) and the volumes of flows on the global 'energy seascape.' However, given the current lack of international interconnection infrastructure, either in physical or regulatory terms, land-based electricity trade will not initially take off, even as renewable energies expand. This means that, during the immediate decade or two to come, 'external energy dependence' will continue to mean external dependence upon the global energy seascape as well as upon the original geographic source of the energy.

However, over the longer-run, renewable energy expansion and low carbon development in general will catalyze momentum toward electrification of the transportation sector and a deeper level of efficiency and technological sophistication in the electricity sector in general. Such trends will be particularly pronounced in the Northern Atlantic, but they could later unfold in the Southern Atlantic (and they could also easily involve – and bind – Eurasia). Renewable energy has a clear electricity bias, which primarily offers the potential of a land-based alternative to the entire global energy transportation network currently configuring the global energy flow map: including the dominant energy seascape and the minor, but important, road-rail-pipeline segment of the global energy landscape. At a certain point the movement toward electrification would catalyze a profusion of international electricity interconnections, which in turn would provoke demand for new structures of transnational energy collaboration around them.

There is no contradiction between (1) a low carbon roll-out (which reinforces the significance of electricity in general, vis-a-vis the other globally 'tradable' energies, and progressively displaces international energy trade from the global energy seascape), and (2) the necessary collective Atlantic Basin effort to successfully (and simultaneously) exploit and protect an already rapidly deteriorating Atlantic Ocean. The business-as-usual global shipping trends have total seaborne cargoes rising by around 3% a year for decades. Any trend which could blunt the effect of that future increase in sea traffic would be a significant boon for the overall ecological health of the Atlantic Ocean, and make Atlantic Basin transnational collaboration on ocean and other related issues all the more feasible in geo-economic and geopolitical terms.

Conclusions: Past Map versus New Map versus Future Map

Energy flows will nearly double by 2050, powered by a significant increase in the international trade in gas, particularly LNG, which will account for nearly 80% of with energy trade flow by then.[41]This projection is based on status quo and other already foreseen dynamics in which gas displaces oil through market forces operating within our fragmented but still largely global energy market. Given that much of this gas will be liquefied, a majority of global energy trade will continue to depend on the global 'energy seascape'. Nearly all of this global energy trade will be moving from West to East.

West-East (Energy) Flow Dynamics and Marginal Traffic Spillover to 'High Latitude' Inter-Basin Passages

In the short-run, the canals may gain marginally in absolute significance, with their various current enlargements (or 'dry canal' or pipeline supplementary transport capacity additions); but they will continue to decline over time in relative strategic terms compared with other key maritime passages between the Atlantic and the Pacific (where the Panama Canal, in theory, competes with the Drake Passage and the still unfeasible Northwest Passage), and between the Atlantic and the Indian Ocean (where Suez competes with the Cape Passage and the now opening Arctic Northern Route). These dynamics -- in which the 'low-latitude canals' ultimately face growing limitations on their capacity to absorb growing east-west flows -- rebound in favor of the 'high-altitude' Arctic (Northwest Passage and Northern Route) and Southern Ocean (ie, the Drake and Cape) passages.

[41] (IIASA GEA Model)

Figure 6: Current global maritime shipping routes

Source: https://people.hofstra.edu/geotrans/eng/media_maps.html

The potential opening of the Arctic passages, in particular, highlights the possibility that some of these growing East-West flows will spill over from the 'low-latitude canals' to the 'high-latitude passages' like the Northern Route and the Bering Strait. However, more future East-West flows will spill into the Indian Ocean, via the Cape of Good Hope passage, and much of the very same traffic will continue through Malacca to East Asia in the Pacific Basin. This is because weather conditions, even with climate change, will still impose capacity limitations on the ultimate East-West traffic capacity through most of the 'high-latitude' passages. Weather limitations are currently the most restrictive for -- in descending order -- the Northwest Passage, the Northern Route, the Drake Passage, and the Cape Passage. Nevertheless, the Northern Route is poised to gain more than the Drake Passage – despite the fact that the latter faces less restrictive weather circumstances than the Arctic passages – due to the extraordinary width of the Pacific Ocean. The passage from the Northern Atlantic to East Asia around the northern coast of Norway and Russia will remain significantly shorter and faster than that of the Drake Passage and the long Pacific crossing, although the more significant weather constraints of the Arctic will eventually impose a limit on flows, causing all spillover, at the margin, of future growth in East-West flows to pass through the 'high-latitude' passage that benefits from the most benevolent weather conditions and from the relatively small Indian Ocean – that is to say, the Cape Passage.

Therefore, the big winner among sea lanes on the future global flow map, in terms of strategic traffic, will be the Cape Passage. Nevertheless, the transpacific transit route across the northern Pacific Basin will likely also gain in significance, although this will be driven mainly by general intra-basin trade between North America and East Asia (with some North American hydrocarbons eventually finding their way to China). In terms, specifically, of global *inter-basin energy flows*, the Bering Strait will emerge in a secondary way as a key chokepoint and inter-basin passage, as Arctic energy flows to East Asia augment the Bering Strait's traditional strategic significance in military terms. However, at the margin of future changes in the global energy flow map, the most strategic inter-basin sea lane passage on the global energy seascape will increasingly be the Cape Passage, through which energy will pass to the east, even as container traffic passes to the west into the Atlantic Basin.

Four Interlocking Global Theses

The conclusions of the previous analysis could be called the 'high-latitude sea lane thesis,' the working hypothesis of which is that growing future East-West flows (particularly West-to-East energy flows) will outstrip the capacity of the 'low-latitude canals' and 'spill over' to the most feasible alternative 'high-latitude passages.' Although this hypothesis assumes that the 'low-latitude straits' (Hormuz and Malacca) will remain the key critical chokepoints of the global energy system, it also implies that the sea lanes to gain the most in strategic significance, at least at the margin, will be, primarily, the Cape Passage and, in a secondary sense, the Northern Route and the Bering Strait.

The 'high-latitude sea lane thesis' interacts with three other theses impacting on the global energy flow map to generate a range of potential implications for foreign, defense and security policies and for global strategic postures over the 2035-50 time horizon. Each of these working hypotheses have already been presented, at least in skeletal form, earlier in our analysis of the dynamics of global energy flows:

(1) ***the Atlantic thesis***,[42] with its two corollaries:

- an increasing share of global flows in general – in contrast to the universally accepted thesis of increasing predominance of the Pacific Basin -- are becoming purely (intra-basin), or partially (inter-basin), Atlantic flows. While we have highlighted energy flows here, opportunities are presented, and challenges range, across a number of traditional disciplinary and policy areas -- and in particular at the multidisciplinary borders between them -- for Atlantic Basin transnational collaboration.

- an increasing share of *global energy demand at the margin* will come from Eurasia and be met by seaborne flows of Atlantic Basin energy into the Indian Ocean Basin via the Cape Passage. Already the Atlantic Basin supplies some 35% of total world petroleum imports -- the same percentage of world imports coming from the Middle East. To 2030, over nearly 60% of the increase in oil production will come from the Atlantic Basin.[43]

(2) ***the Arctic thesis***: the opening of the Arctic – the result of the progressive melting of arctic ice -- will present opportunities and challenges for local autonomous governance and Arctic transnational collaboration, particularly in the realm of local sustainable economies, scientific research and environmental protection. However, while the global public goods of the Arctic commons will likely be increasingly threatened by a lack of sufficient transnational governance,

[42] Of these four thesis, the Atlantic thesis has been explicitly addressed the least in the body of this analysis. For incipient expressions of the thesis, see Paul Isbell, *Energy and the Atlantic: The Shifting Energy Landscapes of the Atlantic Basin*, 2012, op. cit., and "Atlantic Energy and the Strategic Horizon," 2013, op. cit.
[43] BP *Global Energy Outlook 2030* (2013), and own elaboration.

and by the incentives perceived by certain private interests (energy, minerals, etc.), it remains unlikely that much of the Arctic Basin's resources will ever be exploited, given the harsh realities of even a moderating climate, together with a number of other unfolding economic dynamics, like the recent widespread appearance of shale gas and unconventional oil. However, the Northern Route will also eventually attain a minor role in the global sea lane network, and the Bering Strait will achieve a significance rivaling that of the Panama Canal on the global energy flow map.

(3) ***the Ocean Basin thesis***: the increasing economic and strategic importance of the oceans relative to landmasses will generate an increasingly coherent argument for a new style of transnational collaboration based on the new regional geopolitical unit of the 'ocean basin.' The rise of an ocean-basin world will reveal the partiality of our long-held Eurasian-centric thinking. Our strategic focus -- shifting over the course of the 20th century from the Eurasian 'heartland' to the 'continental rimlands' of Eurasia -- will now view the same geographic coastlines of Eurasia (and elsewhere) as 'maritime rimlands.' This coming 'marine-centered' transformation of our mental maps will place the oceans themselves at the center of a ring of 'maritime rimlands' – flipping the perspective of the 'continental rimland' of the landlocked 'heartland' for that of the 'maritime rimland' perceived from the unifying and increasingly strategic 'seascape.' Such a technology and market driven focus on the oceans in the coming decades will also lay the foundation for new ocean basin-based regionalisms -- or new 'lake communities' composed of the societies of their 'maritime rimlands' and integrated by the ocean itself and the imperative for its effective transnational governance. In these new perceptual spaces of the geographic ocean basins, new 'epistemic' transnational communities will overlap with both 'geographically and physically-based transnational associations' and new 'imagined transnational communities.'

Implications of the Future Global Energy Flow Map and the Shifting Global Energy Seascape

The dynamics behind the shifting global flow map will have a number of strategic implications over the coming decades. The heightened strategic import of the seas, continued increasing international seaborne traffic, the emerging westward shift of energy reserves and production, an ongoing eastward shift of manufacturing production, along with the growing spill-over from the capacity-limited 'low-latitude' canals benefitting the Cape Passage and the Northern Route: all these dynamics, and others, will interact to transform the strategic horizon.

<u>Security and Foreign Policy Implications</u>:

Implications for the U.S. foreign policy 'pivot' debate. According to the 'Atlantic thesis,' the geopolitical autonomy of the West will be increasingly heightened over the years to 2035 as a result of reduced 'extra Atlantic energy dependency' stemming from flattening energy demand in the Northern Atlantic, greatly enhanced hydrocarbons reserves and rebounding production, and the relatively faster roll-out of renewable energies in the Atlantic than in the Indian or the Pacific – at least for some time. Moreover, the Atlantic Basin could become the world's swing source of each new barrel of oil consumed at the margin in Asia, once Eurasian demand begins to outstrip Eurasian Supply.

Whether expressed explicitly or not, this underlying change in the tectonics of the geopolitical globe is ultimately what lies behind a desire in the United States to reduce its strategic footprint in Middle East. Traditionally, however, the geographic center of gravity of our strategic focus has coincided with the major geographic areas of energy supply (i.e., the ex-Soviet Union, or Russia and Central Asia, along with the Middle East) – at least since the Bolshevik Revolution. With the currently unfolding pivot to Asia, on the other hand, for the first time since the rise of oil the center of our strategic attention is being focused on an area of the world that is not a major source of resource supply – but rather one of a competitive energy consumer. That China, for example, represents a major part of an increasingly critical Eurasia rimland, with more possibilities than any other Eurasian power to influence the 'heartland' (through a strategic alliance with Russia, for example, with the latter as the 'junior partner'), and the capacity to be 'contained' through an alliance of various 'offshore' island allies, and subtle diplomacy with other rimlands (like India), only reveals our continued unconscious enslavement to an incomplete and obsolete mental map of the geopolitical globe first conceived by Halford Mackinder, the British geographer and geopolitical theorist, around the turn of the 19th to the 20th century, and our incapacity, at least so far, to come to grips with the actual geopolitical flow globe as it is now emerging.

The well-known 'pivot to Asia' has been motivated by war fatigue, deepening fiscal restrictions, and over-blown but real competition with -- and fear of -- China. The pivot is also backed and enveloped by a near global consensus that the 21st century will be the 'Pacific century' and unconsciously reinforced by the above-mentioned lingering subservience to Mackinder's many continentally-obsessed mantras (and the many mantra-like modifications introduced into this 'realist' tradition of geopolitics by the Americans Mahan and Spykman).[44] But today's geopolitical globe resembles far more a set of interlocking major seas -- which, together with their surrounding 'rimlands,' make up four natural ocean basin regions linked together in geographically specific ways – than it does the geopolitical map of the Mackinder-Spykman tradition – one of many islands ranged in concentrate circles around the 'world-island', the Eurasian megacontinent – which many of our leading geopolitical thinkers still employ as their implicit point of departure.

The first strategic alternative to 'the pivot' as currently conceived would be for the United States (and to some extent its Northern Atlantic allies) to remain anchored geopolitically in the Middle East and Central Asia. To pursue such an option would be tantamount to attempting to maintain the Eurasian-centric, status quo vision of the strategic horizon. A range of U.S. and global critics across the political spectrum argue passionately that a number of geopolitical realities – including the vulnerability of Israel, the danger of Iranian nuclear proliferation, and the ongoing challenge of Wahabi/Sunni-inspired radical Islamic political violence -- are simply too critical for existential security to allow for the broader Middle East to be relegated to anything other than US global strategic priority number one.[45]

[44] See, for instance, http://www.foreignpolicy.com/articles/2011/10/11/americas_pacific_century
[45] See, for example, Kenneth, M. Pollack and Ray Takeyh, "Near Eastern Promises: Why Washington Should Focus on the Middle East," *Foreign Affairs*, May/June 2014 issues.

The second alternative to 'the pivot to Asia' would be to also 'pivot back' to the Atlantic. The 'forward pivot to Asia,' according to this thesis, should be accompanied by this dual 'return pivot to the Atlantic Basin' within the equation of our strategic priorities. Indeed, a growing share of the security threats to Atlantic nations are to be identified, traced and challenged solely within the Atlantic Basin.

Implications for Human Security in the Atlantic Basin. A conventional, or 'hard', security focus tends to reinforce our 'continentally-biased,' 'world-island based,' Eurasian-centered strategic visions of the great 'heartland' and its encircling 'rimlands' which together form the 'world-island' – or the supercontinent of Eurasia. To 'epistemologically break' from the incomplete yet anchoring frame of Eurasia within our strategic thought is to shed light upon the relevance of both what is beyond the supercontinent – i.e., the ocean basins, meaning the oceans themselves and their other extra-Eurasian rimlands – and beneath the realm of 'hard' security concerns – ie, proliferating illicit flows (drugs, money, humans, arms) and spreading threats (piracy, organized crime) to legitimate flows. Indeed, a restructuring of our mental map of the geopolitical globe which focuses upon the Atlantic Basin as a single unit of analysis, reveals a density of intensifying transnational human security problems within the broader Atlantic that demonstrates the need for an 'intra-basin focus' in our attempts to augment 'human security.' This means a new transnational collaborative human security process within the Atlantic Basin itself.

A deeper and more threatening web of security threats than those posed in the Indian Ocean and Pacific Basins -- stemming from lingering poverty and state weakness in certain parts of the basin, along with technological evolution -- now threaten the stability of the Atlantic Basin. The Southern Atlantic in particular – despite its record as a relatively peaceful zone, free of conventional 'hard' security threats, is particularly vulnerable. The confluence of state weakness, poverty, corrupted oil and drug money, piracy, national secessionist struggles and violent Islamic fundamentalisms is now threatening what is becoming an increasingly important global oil hub in the broader Gulf of Guinea and the security of the sea lanes along which oil and gas flow north to Europe, and south to the Cape Passage. Atlantic Basin transnational security cooperation would logically address this threat. It would also be more likely to achieve success than a global, bilateral or ad hoc approach because none of these frameworks are geographically-specific, nor are they capable of filling the relevant voids in the Southern Atlantic that is currently being pursued by the powers of Eurasia (China, Russia, India, Iran) under the rhetorical banner of the Global South.

Implications for sea lane security and management of chokepoints. Requiring still further strategic attention is the question of the security of sea lanes critical to global trade. From the 19^{th} century onward, our tendency has been to view the security of the seas (but particularly of critical sea lanes) as a global public good entrusted to the global hegemon for its provision. The status quo arrangement has the security of the seas and their critical passages – including the global energy chokepoints – under the 'benign stewardship' of the United States, the global hegemon since the Second World War. But following the above analysis – and assuming the ultimate inevitability of at least some kind of reconsideration of the global strategic posture of the United States – the shifting tectonics of the emerging 'geopolitical flow globe' call for a US priority focus on the Pacific and Atlantic Basins. The question now arises as to future evolution of the Indian Ocean Basin and the form of security management that will stabilize the Persia Gulf- East Asia flow of oil and gas through the Indo-Asian chain of chokepoints (Hormuz and Malacca) and key controversial sea lanes (South China Sea, Taiwan Strait, East China Sea).

Should the status quo of informal and formal U.S. protection be maintained globally? In any particular basins? Should a global multilateral approach to sea lane security be pursued – perhaps through the context of the UNCLOS or under the aegis of the IMO? Or should regional approaches to transnational collaboration in this arena be encouraged? If so, what regions are ripe for such collaboration?

Some are willing to consider such sea lane security a 'global public good.' However, while it may qualify as a public good, sea lane security is perhaps, in at least some cases, more 'regional' than 'global' in its most immediate nature and implications. For example, the security of the energy flows through the Strait of Hormuz and the Straits of Malacca has a much more direct and immediate energy security relevance for the regional Asian neighborhoods than for the global community, or global market, as a whole. Given that nearly all Persian Gulf oil already passes through Hormuz and Malacca to various destinations in Asia, a disruption along one or more of the critical passages of the Indo-Pacific seaborne energy flows has greater negative implications in Asia than in the Atlantic Basin (particularly if the disruption occurs at Hormuz, cutting off Saudi capacity to respond by bringing into production idle capacity in response to the price shock), even though eventually the supply shortfall will be filled through an upward adjustment in the global oil price. While the upward price adjustment negatively affects all consumers in the global market, many (particular those in net exporting regions) bear only a portion of the total price increase and with some inelasticity-produced delay, and none of the direct negative output effects of the actual supply shortfall.

Independent of the price effect of any such supply shock, the direct economic impact on output of supply shortages falls only on the particular importing countries in question. This observation suggests that oil is only 'imperfectly fungible' and that the global oil market is highly segmented, and in part according to the geographic realities of the 'geopolitical flow globe.' The implication is that the logic to deal with critical sea lane security at the global, 'multilateral' level breaks down if the security of certain maritime passages are more critical in energy (or any other) terms for some consumers than for others.

Given that in the 21st century Middle East oil and its transport security is basically an Eurasian affair, some might be tempted to take a laissez faire approach of benign neglect. While this might force the Eurasians to work out among themselves the security of the Indo-Pacific sea lanes and chokepoints of the South and East Asian rimlands, others will no doubt view laissez faire as a dangerously precipitous and isolationist lurch in U.S. foreign policy, particularly in light of the already pronounced 'pivot to Asia'. However, there are more balanced options available which are consistent with both a double pivot out of the Middle East and Eurasian 'heartland' to the Pacific and Atlantic Basins and an increasingly coalescing 'ocean basin world.' While as a Pacific Basin power the United States could logically continue its current role – or change or even intensify it – in the key sea lanes of the Pacific Basin, it might consider some kind of interim partnership between the United States and the principal Indian Ocean and Pacific Basin naval powers to collaborate on the collective security of the Persian Gulf-East Asia energy supply lines. In an ocean basin world of regional governance processes, the United States might still remain constructively present in the Indian Ocean, for example, as a secondary participant. In any event, the option and capacity to continue the current de facto U.S. protection of all global sea lanes, and these Indo-Pacific lanes in particular, should not be construed as a strategic imperative to be maintained at all costs.

Could regional transnational collaborative or governance structures to guarantee the security of key sea lanes and critical chokepoints replace the current regime in which the global hegemon guarantees the security of the global sea lanes as a global public good? Might not future transnational collaboration over sea lane security devolve to new ocean basin-based arrangements, like an Atlantic Community (or some other Atlantic Basin-based collaborative approach to particular issues like sea lane or energy security) or an equivalent Indo-Pacific Basin initiative?