



Energy and Geostrategy 2019

Spanish Institute for Strategic Studies

Spanish Committee of the World Energy Council
Spanish Energy Club



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The following text is the English version of those originally written in Spanish (Introduction, and chapters 1, 3 and 5), together with those originally in English (Chapter 2 and 4)

Introduction

Claudio Aranzadi

Following a pattern now familiar in recent publications, this sixth issue of “Energy and Geostrategy” contains an article of a general and methodological nature, the article by Manuel Conthe, “Geopolitics of Energy and Game Theory” and four articles focusing on specific geographical areas (Arabia, Europe, Canada and the Gulf of Guinea), whose authors are Miguel Angel Lasheras with his work “Give Peace a Chance: New Opportunities in Saudi Arabia’s Geo-economy”, Christian Egenhofer & Milian Elkerbout, with “The Changing Context for the Geopolitics of Energy: A European View on How Climate Change Starts Affecting Energy Security”, Jennifer Winter with “Canada’s Role in Global Energy Markets” and Emilio Sanchez de Rojas with “Geostrategy and Energy in the Gulf of Guinea”. This year’s edition also features an interview with an important personality: Executive Director of the International Energy Agency, Fatih Birol.

Throughout 2018, the main factors of uncertainty on the geostrategic scenario that were indicated in the preceding issue of “Energy and Geostrategy” have not only not been rectified but, in many cases, have become more uncertain, and new causes of instability have also been detected. However, seeing these uncertainty factors in terms of a quantitative assessment of the global geopolitical risk is an activity that hardly yields any results. There are indicators of the geopolitical risk, as proposed by Caldara, Darío & Matteo Iacoveillo (2018)¹, utilising as the empirical base, the frequency with which geopolitical tensions appear

¹ Caldara, Darío & Matteo Iacoveillo (2018). “Measuring Geopolitical Risk”. (International Discussion Papers 1222/Board of Governors of Federal Reserve System).

in the media. Yet when experts make reference to a synthetic measure such as the geopolitical risk premium when explaining the energy market prices, they normally resort to a qualitative argument that describes a variable correlated with the market fundamentals such as excess demand (indicated by the way stocks evolve); the geopolitical risk premium will only be visible when the markets tighten². These difficulties inevitably remind one of the classic distinction between uncertainty and risk, made by F.H. Knight (1921)³, that J.Y. Halpern⁴ describes as “the distinction between decision making under risk (roughly speaking, where there is an “objective” probability measure that quantifies the uncertainty) and decision making under uncertainty (where there is not)”. In its most habitual usage, the geopolitical risk tends to be more akin to Knight’s concept of uncertainty, but that does not mean to say that it is not useful to resort to the term and that progress can also be made in constructing a measurement for it that is more consistent with the definition that Knight gives of risk.

To a certain extent, as the year went by, 2018 managed to dispel some of the uncertainties surrounding D. Trump’s actions that were still lingering at the time the previous issue of “Energy and Geostrategy” went to print. His climate and domestic environmental regulation policy, together with his positioning at the G-20 Meeting in Buenos Aires were absolutely consistent with the announcement of US withdrawal (which will not take effect until 2020) from the 2015 Paris Agreement, and the same applies to withdrawal from the Nuclear Agreement with Iran, the so-called “Joint Comprehensive Plan of Action” (J.C.P.A.), which dispelled any doubts about Trump going back on his election promises. D. Trump’s confirmation that he was prepared to carry out his electoral programme (something that some commentators did not originally believe) certainly dispelled some doubts. However, it logically gave rise to other uncertainties that combined with the strategic conception of his Administration and his way of behaving when negotiating that were described in the previous publication, leads to a variety of potential pathways in which the combination of likelihoods and damage yield a result that is difficult to predict but which in overall terms is very pessimistic.

This combination of new certainties and uncertainties on the geopolitical scenario is also observed in the development of the climate policy throughout 2018. Two documents were published during the course of the year that showed a general consensus of experts in their analysis of climate change and that give an increasingly accurate portrayal of its effects and how the greenhouse gas emissions pathways must decrease to mitigate these effects. The first of these

² B. Fattouh (2018 February). “Heighten geopolitical risks in the Middle East, and potential impacts in oil markets” (Presentation). (Oxford Institute for Energy Studies). In this presentation B. Fattouh indicates the slight reaction the markets make to the geopolitical risk when stocks are high and their greater importance when the markets are tense.

³ F.H. Knight (1921). “Risk, Uncertainty and Profit”. (New York: Houghton Mifflin).

⁴ J.Y. Halpern (2003). “Reasoning about uncertainty” (The M.I.T. Press)

documents, a special IPCC Report about a global warming of 1.5°C⁵, examines a variety of emissions pathways compatible with the goal of limiting the temperature increase to 1.5°C above pre-industrial levels. The Report indicates that in 2017, an average temperature increase of around 1°C had already been reached, and the temperature was rising at a rate of 0.2°C per decade. At the current level of emissions the temperature would rise by less than 1.5°C, but this increase would be reached between 2030 and 2052 if the emission growth rate were the current rate, the temperature logically continuing to rise as from that time. If the aim is to adhere to the 1.5°C limit, under the hypothesis of that temperature not being exceeded beforehand (or of limited excess), the report plots a pathway for reducing emissions when compared to 2010, by 45% by 2030 and a net volume of zero emissions by 2050. If there were to be a peak in the temperature rise significantly above 1.5°C, the requirement to correct the emission excess would logically be much higher.

The IPCC Report not only sets the net zero emission requirements for achieving the goal of limiting the temperature increase to 1.5°C, it also points out that there are significant differences in the climate effects (average temperature increase, sea-level rise, extreme heat, heavy rainfall, droughts, etc.) between a scenario where the temperature rises by 1.5°C and a scenario where it rises by 2°C, which would also mean a significant difference in the damage caused. This confirmation is important, given the probabilistic nature of the climate models and the care that the IPCC takes to indicate the likelihood of the different estimates and predictions. Nevertheless, although the COP 21 Agreement in Paris sets as a target a global temperature increase considerably below 2°C and to carry on with making an effort to limit the temperature rise to 1.5°C above pre-industrial levels, the IPCC Report now implicitly sets the limit at 1.5°C in its climate policy for the future.

Although the second document, the National Climate Assessment (2018)⁶ issued by the US Administration, focuses on the effects of climate change in the USA, its value lies in that it assumes that the positioning of the Administrative Body is clear (in fact this is the position of a large number of experts responsible for the Report) and their position is the very opposite one to D. Trump's. The Report not only indicates the current and future effects of climate change, but also explicitly states that, "over the remainder of the century, aggressive and sustained greenhouse gas emission reductions by the United States and by other nations would be needed to reduce global emissions to a level consistent with the lower scenario (B1) analysed in this assessment". This US Administration document, like the IPCC Report, stresses the probabilistic nature of the estimates and predictions, which does not mean that it does not attach sufficient statistical significance to them to invalidate the global warming sceptics' position.

⁵ Intergovernmental Panel on Climate Change (Special Report) 2018. "Global warming of 1.5°C".

⁶ National Climate Assessment 2018. "US Global Change Research Program".

However, at the same time as the experts' work consolidated the analytical foundations of climate policy and justified the need to set certain more demanding goals for reducing greenhouse gas emissions by 2050, a series of events took place in 2018 that revealed certain difficulties involved in implementing the climate policy that had perhaps been underestimated.

Although the experience of extreme climate impacts would appear to be making public opinion increasingly more aware of climate risks, the violent protests that occurred in France at the end of the year against an increase in vehicle fuel taxes, served to show that major sectors of society reject a taxation policy that is in keeping with the decarbonisation strategy. The aforementioned IPCC Report already warned about the uneven nature of the effects of climate change, and of reducing emissions in geographical areas and social groups, it being the low-income sectors that are most vulnerable. Therefore, in the future, it will be essential to include, as a core element in climate policy, compensatory mechanisms for the relatively underprivileged segments of society.

The ambivalent results of the COP 24 in Katowice (Poland) are also an indicator of the numerous obstacles that have to be overcome if the 2015 Paris Agreement is to progress. The preservation of a multilateral agreement such as the Paris Agreement is undoubtedly a success, with one country, the USA, still part of the Agreement although it has announced its withdrawal, and others not very enthusiastic, such as Russia, Saudi Arabia and Brazil. Another outstanding factor is the approval of the rules for implementing the Agreement (albeit not completely) facilitating the standardisation of the criteria for measurement and assessment and for guaranteeing the transparency requirements for an Agreement that can count on an incentive for compliance associated with the moral commitment and the "comply or explain" philosophy. However, what is disappointing is the weak reference to the special IPCC Report and the failure to impose more stringent restrictions on the emissions pathway when the aggregation of the goals set in the national commitments taken on so far, exceed the ones established in the Paris Agreement and, moreover, the IPCC would justify the setting of the goal to be achieved in the most demanding extreme of the Agreement (the limit of the 1.5°C temperature rise).

Furthermore, it is also possible that there has been a certain underestimation of the difficulties involved in developing the climate policy both in the institutional and technological areas. One first example is the excessive optimism concerning the existence of substantial emission-reduction processes of the "free lunch" nature. Although K. Gillingham & J.H. Stock (2018)⁷ stated that they were sceptical about the statistical estimates in the majority of the "free lunch" cases, they pointed out two examples regarding the USA: the incorporation of a percentage of ethanol in petrol and replacing coal with natural gas to produce electricity. In both cases, the alternative meaning lower emissions is also the

⁷ K. Gillingham & J.H. Stock (Fall 2018). "The cost of reducing greenhouse gas emissions". *The Journal of Economic Perspectives*.

less costly. In situations like these, the mere functioning of the market, without any need to impose climate policy restrictions, should allow for progress to be made in the emissions reduction strategy. In fact, replacing coal with natural gas and renewable energies to produce electricity in US power plants, induced by the price factor, could lead to compliance with some of the targets in President Obama's climate policy in spite of the regressive measures put into practice by D. Trump. As J. Bordoff⁸ points out, the Energy Information Administration predicts that the mere combination of market forces will bring about a reduction of 28% in CO₂ emissions in electricity generation by 2030, when compared to the 2005 percentage, but considering that natural gas prices will increase by 50% and utilising conservative hypotheses regarding the way the cost of renewable energies will evolve. Bordoff, then, mentions the alternative forecasts of the Rhodium Group think tank that, assuming that gas prices will remain at current levels and a more aggressive profile for the reduction in the cost of renewable energies, opts for a reduction of 35% by 2030 (when the goal set by Obama's Clean Power Plan was a 36% reduction).

However, the hypothesis that market forces can by themselves manage to achieve the global climate policy goals is an illusion that could also serve to confuse public opinion. The reduction in emissions required to comply with the 2015 Paris Agreement goals (and, what is more, the reduction needed to adhere strictly to the 1.5°C limit) will predictably mean an increase in cost^{9 10}, although this cost must logically be less than the "social cost" prevented with that decrease in emissions. So, when implementing the decarbonisation policy, it is just as important to estimate the "social cost" of the emissions as it is to estimate the cost of reducing them.

K. Gillingham & J.H. Stock⁽⁷⁾ define the social cost of CO₂ emission as "an estimate of the net present value of monetised social damages from emission of an additional metric ton of CO₂". As has already been pointed out in preceding issues of "Energy and Geostrategy", controversy surrounds the amount involved in this estimation and the soundness of the climate models used to obtain it. R.S. Pindyck (2017)¹¹, who is critical of the climate models generally utilised, indicates that there is considerable diversity in the social cost estimations (ranging from \$2/Tn. to \$200/Tn). He offers (following his own methodology, whose logic is described summarily in previous issues of this publication), an estimate

⁸ J. Bordoff (22/08/2018). "Trump's latest step backward for the climate". The New York Times.

⁹ If energy policy is regarded as a program for minimising the cost of energy supply (subjected to safety and environmental constraints), to the reduction of emissions, corresponds a "shadow price" that would be the cost of a unit increase on environmental constraint (a cost that would not be negligible).

¹⁰ M.A. Mehling, G. E. Metcalf & R.N. Stavins (2017). "Linking heterogeneous climate policies" (WP). (M.I.T. Center for Energy and Environmental Policy Research).

¹¹ R.S. Pindyck (2017). "Coase Lecture - Taxes, targets and the social cost of carbon". (Economic L.S.E.).

of \$101.24/Tn. P. Howard & D. Sylvan (2015)¹² describe a consensus of experts with lower estimates of the amounts, focusing on a range (for 2020 emissions) of between \$40 and \$50/Tn. These orders of magnitude amount to the value of (\$42/Tn.) that was put forward by the U.S. Environmental Protection Agency before 19th January 2017 in its central hypothesis (3% discount rate) for the social cost of CO₂ emissions in 2020. With a 5% discount rate, the estimate falls to \$12/Tn., and \$62/Tn. is reached with a 2.5% discount rate (which is indicative of just how sensitive the estimated value of the social cost is to the discount rate and, thus how sensitive it is to the degree of valuation attributed to the welfare of future generations). These values have been radically reduced by the Trump Administration, which considers estimates of the social cost of CO₂ emissions at \$6/Tn. for a discount rate of 3% and \$1/Tn. for a discount rate of 7% (R.G. Newell 2017)¹³.

An estimate of the social cost of CO₂ emissions as low as the one proposed by the Trump Administration would lead –as Brad Plumer argues (2018)¹⁴–, by applying the cost/benefit calculation–, to excluding technologies or mature operating procedures to achieve a reduction (or removal) of emissions, whose utilisation would clearly be rational with estimates of the social cost that the experts broadly agree upon. Brad Plumer, also criticises the local nature of the Trump Administration’s estimates (which only assess the damage caused by global warming in the USA), which leaves bereft of clear meaning a measurement that does not take into account the possibility that emissions outside the USA will contribute to global warming within the USA (and conversely, that the effect of US emissions will have an impact on the climate in the rest of the world).

The damage caused by global warming constitutes a global negative externality and, so, estimating the social cost of the emissions (which would enable that negative externality to be internalised) should also be global. Therefore, the utilisation of a tax in accordance with the order of magnitude of that social cost estimate (as proposed by R.S. Pindyck (2017)) would probably be the best tool for implementing the global decarbonisation policy. R.S. Pindyck, points out that international negotiation would be easier and that it would also reduce the difficulties that States would have in imposing a tax. However, the 2015 Paris Agreement calculates its goals in terms of limits to temperature rises and (indirectly) in terms of increases in greenhouse gas emissions. What is more, the global targets are a consequence of the aggregate of national commitments whose achievement is approached by each country or group of countries by means of different mechanisms (tax, cap & trade, and command & control systems for compliance with of technological or operational standards); in some cases, such

¹² P. Howard & D. Sylvan (2015). “Expert consensus of the economics of climate change” (Institute for Policy Integrity/New York School of Law).

¹³ R.G. Newell (2017). “Unpacking the Administration revised social costs of carbon”. (Resources for the future).

¹⁴ Brad Plumer (23/8/2018). “Trump put a low cost on carbon emissions. Here’s why it matters” The New York Times.

as the United Kingdom, a combination of the three types has been devised (European emission rights market, floor price for CO₂, and imposing emission standards for the coal power plants).

It was not possible to establish procedures at the COP24 in Katowice (Poland) that allowed for effective interaction between the various mechanisms in force in the countries (or groups of countries) that signed the 2015 Paris Agreement, which is a clear sign of the technical and political problems involved. M.A. Mehling, G.E. Metcalf & R.N. Stavins (2017) ⁽¹⁰⁾ displayed interaction models devised to guarantee the minimisation of their total cost (promoting the equalisation of the marginal cost of emission reduction in each mechanism). The aim, convergence towards one single unitary price for CO₂, is consistent with R.D. Pindyck's proposal, but it is more complex to apply.

Yet the price of the CO₂ that would be imposed using a tax on a ton of CO₂ equivalent of the social cost of emissions is of a different nature from the price that would come from a cap and trade mechanism. In the former case, the price reflects the social cost of the emissions (i.e., the present value of damages), whereas in the latter case, the price of the emission right reflects (M.A. Mehling & others (2017) ⁽¹⁰⁾) the shadow price for a restriction imposed on the volume of emissions required to fulfil the decarbonisation policy goals (i.e., it reflects the cost of a mitigation policy). The two prices are not necessarily the same. In fact, during the economic crisis, the way in which the price of the rights on the European emission rights market has evolved (Emission Trading System (ETS)) has remained at average values considerably lower than the estimates of the social cost of emissions most frequently considered by the experts (\$40/50/Tn.). The review planned for the 2021/2030 in which the sectors subjected to the ETS must register an emission reduction of 43% when compared to 2005, predicts a reduction in rights at an annual rate of 2.2% (greater than the current 1.74%) and an enhancement of the Market Stability Reserve (MSR) mechanism. Such reforms tend not only to facilitate greater price stability, but also a trend for them to be better adapted to the estimates indicated in the social cost. Although the MSR's way of acting establishes a way of operating subordinate to adherence to predefined rules, it is difficult to avoid an interpretation of the reform envisaged in the ETS as an attempt to provide a pathway for the prices of the emission rights more in harmony with its role as an efficient long-term signal for investors in assets for life periods lasting several decades. If this were the correct interpretation, this would beg a question about the suitability of an indirect search mechanism for a price, when it could be established directly (by means of a tax) and with transaction costs that would definitely be lower.

Whatever the case may be, given that the modification to the cap & trade system in Europe is highly unlikely and that this is also the chosen mechanism in China (which would mean, according to Mehling, Metcalf & Stavins (2017), a cover of around 24% of the global emissions), the progress in the procedural criteria of the Paris Agreement will have to count on the requirements of establishing coordination and interaction mechanisms between heterogeneous emission re-

duction systems. On the other hand, it is true to say that the cap & trade mechanisms provide a more direct link with the emissions reduction target and that establishing emission rights markets allows for a more efficient allocation of these rights. However, the unevenness in the degree of requirement of the “cap” established in every country and region (and the incentive for certain countries to behave as free riders) is added to the potential deficiencies already indicated in favouring a price pathway that functions as a suitable sign for the investments required in the decarbonisation process.

The large number of different types of emission reduction mechanisms also required a coherent response to the developing countries’ demand for the different contributions of each country to be taken into account when it comes to the current stock of greenhouse gases on the planet. Given that the estimates of the marginal social cost of the emissions are growing in time (if one accepts that the cost increases with the concentration level) it is reasonable to consider a share out of the total cost of mitigation on the basis of the past contribution to the current levels of greenhouse gas concentration. This fairer distribution of the cost (which also takes into account the asymmetrical nature of the social and geographical damage caused by climate change and the cost of the mitigation measures) will also make it essential to deal with another one of the requirements not yet correctly determined in the development of the Paris Agreement: financing.

As has been pointed out, the IPCC Report (2018) made analytical progress and meant more stringent control over climate policy, but it also brought new uncertainties. The doubts affecting technological development and, to a great extent correlated with this, the uncertainty surrounding the long-term evolution of the cost of mitigating climate change can be added to those mentioned earlier. The World Economic Outlook (2018) issued by the International Energy Agency¹⁵, shows that the continuity of its most demanding scenario after 2040 (consistent with the goal of obtaining a global temperature growth considerably lower than 2°C after 2040) does not achieve a zero net volume of emissions until 2070. However, even with this scenario (less strict than the one necessary to strictly abide by the 1.5°C limit that would require zero net emissions in 2050), the International Energy Agency, in its monitoring of the technical progress necessary to achieve the target “temperature rise significantly lower than 2°C”¹⁶, has observed that only in four of the thirty-eight technologies examined (solar, photovoltaic, lighting & digitalisation of buildings and electric vehicles) can it be considered that there has so far been a degree of development compatible with the technological pathway required to attain the climate goals; CO₂ capture and confinement technology is not yet mature, and the same applies to all the technologies that the IEA groups under the heading “Energy Integration” (Storage, Intelligent Networks, Response to the Demand, Digitalisation and Hydrogen) and

¹⁵ IEA (2018). “World Energy Outlook”.

¹⁶ IEA (2018). Tracking Clean Energy Progress.

which also ought to play a central role not only in the decarbonisation of the electricity sector but also in transport.

Technological uncertainties also spring up when the scenarios disclosed by the European Commission for achieving zero net emission by 2050 are examined¹⁷. The European Commission considers that with the policies currently approved in the European Union it will be possible to achieve a greenhouse gas reduction of 45% in 2030 (when compared to 1990) and of 60% in 2050. Therefore, to reach neutrality by 2050, the Commission examines different scenarios that involve a sharp net growth in electrification, development of renewable energies (including biofuels), hydrogen, synthetic fuels, energy efficiency and new approaches to mobility. According to the Commission, all this deployment would only permit an 80% reduction in emissions by 2050 (90% with a more efficient combination of all of them and even the use of the ground and forest sinks). This would require an extra effort to reach 100% not only in the technologies deployed but also in sinks and technologies for the extraction of CO₂ from the atmosphere (source of negative emissions).

If one concentrates on Europe, the quasi-total decarbonisation of the electricity sector by 2050 (with deep inroads being made by renewable energies in all the member countries, conserving nuclear energy in some of them and developing new storage technologies) and the quasi-total cover of light mobility with electric cars would appear to be feasible goals. However, greater doubts surround the electrification of heavy land, naval and air transport and the decarbonisation of industry. Furthermore, Europe accounts for only 10% of global emissions and countries that are major emitters of CO₂ like China and India have a decarbonisation deadline for the electricity sector (cornerstone, with the electrification of transport, of the decarbonisation strategy) that is extremely demanding. Moreover, as we have seen, even Europe, which still holds the moral leadership of climate policy, would appear to be in control of its decarbonisation strategy for 2030, but this is not so much the case when the prospects are extended to 2050.

In this context of technological uncertainties, the time profile for the cost of mitigating climate change (and particularly the decarbonisation policy) will depend on how the learning curves develop for the different technologies required. Having currently achieved the competitiveness-cost of such renewable generation technologies as on-shore wind and solar photovoltaic (whose learning curve has shown a sharp decreasing slope in the past decade), are a cause for optimism. Some experts consider it to be an indication of the potential future pathway for climate policy without mitigation costs (or with very low mitigation costs). Nevertheless, if this impression were to become widespread in public opinion it could be a source of political risks. It would appear to be the case that it can be deduced from the aforementioned reports issued by the IEA and the European Commission, that the energy policy will continue to imply a constraint

¹⁷ COM (2018). "A Clean Planet for all. A European strategic long term vision for a prosperous, modern, competitive and climate neutral economy".

(and a “shadow price” linked to this constraint) throughout the entire transition period until 2050. It is likewise possible that the marginal cost of mitigation (the marginal cost of the decarbonisation policy) could be increased when attempting to deal with the sectors where decarbonisation requires technologies that are not yet mature (heavy road transport, naval and air transport, industry) and on tackling the supplementary requirements between 2030 and 2050, which not even the industrialised countries have clearly defined.

The year 2018 was also a clear example of the complex interaction of factors that determine how the oil market is to evolve. One good way of understanding this is by reading the article by M.A. Lasheras in this publication. Although it focuses on Saudi Arabia, it is extremely useful because it provides an in-depth analysis of the context in which energy geopolitics is to be found. There were also many examples in 2018 that demonstrated the difficulties involved in incorporating the geopolitical risk as a variable that explains the way oil prices evolve, as was indicated at the beginning of this introduction.

Most experts find that the beginning of 2018 heralded a period of greater geopolitical risk in the oil market⁽²⁾. Apart from the continuing tension associated with the armed conflicts in the Middle East (Syria, Yemen) and in North Africa (Libya), there was the uncertainty surrounding the possibility of a reduction in the oil supply in Venezuela and the USA's decision regarding the Nuclear Agreement with Iran. However, the impact of this increase in the geopolitical risk affecting oil prices was difficult to anticipate. As B. Fattouh⁽²⁾ indicated, that impact tends to manifest itself when there is tension on the markets and to dissipate when stocks are high, the diagnosis of the nature of the evolution of the fundamentals throughout the year being increasingly complex. The Agreement to reduce oil production made by the OPEC+ in December 2016 led to a significant reduction in the OECD countries' oil inventories throughout 2017, when compared to the average for the five preceding years^{18 19} and a price recovery. At the same time, since midway through 2016 there has been a strong revitalisation of tight oil production in the USA, with a growing world demand for oil would make it possible to accommodate and even in one period of the year (between March and September) led to the values of the stock levels in the OECD countries being lower than the average for the past five years⁽¹⁹⁾.

The USA's withdrawal from the Nuclear Agreement with Iran in May triggered a new factor of uncertainty associated with the amount of reduction in Iranian exports that ought to take place as from November in application of the measures approved by the USA. Although at the time of the denouncement of the Agreement there were doubts about the volume of reduction of Iranian exports that there would finally be, it was generally accepted that this would help to tighten the market, and that it would also contribute to creating tension within

¹⁸ OPEC bulletin (12/18).

¹⁹ B. Fattouh & A. Economou (2018, November). “OPEC choices are getting harder and harder”. (Presentation). (The Oxford Institute for Energy Studies).

the OPEC²⁰. In fact, Saudi Arabia and Russia increased their production as from May⁽¹⁹⁾. Even so, in September/October there was a sharp rise in prices until October, when a peak was reached of \$86/barrel for Brent oil. At that time, some experts²¹ considered that the oil prices could reach about \$100 and remain at those levels until 2020. According to the authors of the article, Venezuela and Libya would be added to the risk of a reduced production in Iran, together with the reduced idle capacity in Saudi Arabia, Kuwait, the United Arab Emirates and the Neutral Zone that would be necessary to regulate that potential decrease in production and the restrictions in the oil transport infrastructure in the US Permian Basin, as well as the increase in demand arising from the MARPOL regulations to limit the sulphur content in the fuel for naval transport. However, in October/November there was a sharp drop of more than \$20/barrel in the price of oil, which led to a new OPEC+ Agreement in December to cut down on production in the first half of 2019 when compared to the levels in October 2018. Moreover, in November, the US Government granted a series of waivers to maintain imports of Iranian oil for six months.

B. Fattouh & A. Economou⁽¹⁹⁾ (in a presentation prior to the OPEC+ Agreement) considered that the period of the acute price peak in October was essentially a speculative phenomenon resulting from the expected reduction in exports from Iran and that it did not reflect a basic structural change. The reaction of OPEC+ would thus have been justified, all the more as the expectations of a growth in the world economy (trade war between the USA and China, slowing down of the Chinese economy, crisis in the EU, etc.) became more unlikely at the start of 2019, which would moderate the growth in the global oil demand.

At the moment this publication went to print, at the beginning of 2019, all the uncertainty factors that had been hovering over the oil market in 2018 were still affecting the short-term future. The extent to which the growth of the world economy is slowing down is still uncertain and the impact on the expectation of a reduction in oil demand difficult to assess, although it is reasonable to expect a moderating effect. The predictions concerning the production of tight oil in the USA if oil prices in 2019 remain below \$50/60/barrel are also tinged with uncertainty. The break-even prices for the deposits of tight oil vary greatly, but for market prices below \$70/barrel (as indicated by M.A. Lasheras in his article) a significant proportion of investment projects would be below the profitability threshold, although it is true to say that the expansion of production since midway through 2016 has occurred with lower prices. A context of excessively moderate prices could temporarily and downwardly pressurise the major thrust in the production of tight oil in the USA (which became an oil exporter in the latter part of 2018), although this affect could be attenuated in 2020, as P. Wilczynski & E. Pagkalou⁽²¹⁾ pointed out, by the planned solution to the congestion in

²⁰ B. Fattouh 2018 (May). "Is this the end of the OPEC deal?" (The Oxford Institute for Energy Studies).

²¹ P. Wilczynski & E. Pagkalou (2018 October). "Geopolitics can lead to a hundred-dollar oil world, but can it sustain it?" (Petroleum Blog. McKinsey and Company Oil and Gas).

the Permian Basin infrastructures. Those authors also mentioned the recovery of a significant idle capacity in Saudi Arabia with the new investments, but for 2020. This would mean that in 2019 tight oil will play a more prominent role as a market regulator, which according to M.A. Lasheras, it will do in a less flexible way than a producer of conventional oil with idle capacity (like Saudi Arabia), in spite of the fact that for longer deadlines the response capacity to its investment programmes is higher than the capacity of the new conventional oil production fields (shorter investment cycles and sharper decline rates) and it offers greater automatism (they are decentralised decisions from private investors with no political strings attached and acting on the basis of the market signs). As a consequence, it is difficult to predict the outcome of that price-production two-directional causality of tight-oil in the USA in 2019.

Nevertheless, it seems clear that the uncertainties affecting the geopolitical scenario will tend to become more acute. The effects of the US military withdrawal from Syria, added to the new atmosphere affecting US/Saudi relations, raise further doubts about the new positioning and geostrategic balances in the Middle East involving such stakeholders as Russia, Turkey, Iran and Saudi Arabia. The OPEC+ (with the presence of Russia) still complying with the December Agreement (with a 6-month period of validity) could modify its geopolitical centre of gravity with uncertain effects on its oil market strategy (the validity period for the waivers affecting the imports of Iranian oil as from November 2018 is also six months). Furthermore, although D. Trump's position in favour of low prices on the oil market is clear, it is almost impossible to predict how he will arrange his preferences, and this is of great importance for predicting the future production in Iran and the internal tensions within the OPEC.

In the long term, the uncertainties in the oil sector are, to a great extent, associated with the way in which the strategy of the sector's main stakeholders adapts to the aforementioned requirements of the decarbonisation policy as an essential component of the climate policy, and those requirements are extremely rigorous. In WEO 2018 issued by the International Energy Agency, for the most ambitious scenario from an environmental viewpoint (Sustainable Development Scenario) the global demand peak (97 mb/d) is expected to be reached around 2020 and oil production is expected to be cut to 69.9 mb/d by 2040. But it must be remembered that the Sustainable Development Scenario is consistent with the Paris Agreement goal defined as the intention to achieve an increase in the global temperature significantly below 2°C and to carry on making efforts to limit the temperature rise to 1.5°C. The requirement to adhere to the strict limit of 1.5°C would lead to a fall in oil production down to a level below 40 mb/day by 2040 (WEO 16, WEO 17).

When this sharp reduction in global oil production in the long term that is required to comply with the climate policy goals is compared with the volume of resources estimated by the IEA (WEO 2012) (remaining recoverable resources), this leads to the expected existence of "stranded assets" in the oil-rich countries and an expected fall in oil prices in the long term. This does not mean that in-

investments in the development of oil resources necessarily have to be stranded investments, given that it is necessary to make up for the major volume of wells that are running out of oil. The IEA (WEO 2018) points out that the development projects for conventional oil resources approved in recent years will be sufficient to cover the demand for the strictest scenario profile (Sustainable Development Scenario) but they will not be enough to cover the demand for the other less stringent scenarios envisaged by the IEA. As indicated in WEO 2018, if the pathway for the global demand for oil were to be adapted to these scenarios, either supplementary investments would be needed in new upstream conventional oil projects to cover the demand for 2025 or it would be necessary to resort to the production of greater quantities of tight oil in the USA (the country to which WEO 18 attributes nearly 75% of the growth in global oil production up to 2025). This also means, logically, that the trend towards a lowering of oil prices in the long term could overlap with periods of oil shortage in the short term (owing to an inadequate scheduling of investments in developing resources) and temporary price rises.

With this perspective of a global oil glut in the long term caused by the restrictions imposed by the climate policy, the oil-rich countries must include optimum scaling among the variables that determine their investment programmes to minimise their stranded assets, which could lead conventional-oil producers with high resources and low production cost to anticipate investments and add a structural pressure to the price falls. However, this more moderate pathway of prices in the medium term would tend to discourage investment programmes headed by private firms whose decisions are taken exclusively in response to price signs (such as tight oil). Therefore, it is likely that the fluctuations in oil supplies in the medium term will still be, as was the case in 2018, the result of intervention from State or para-State decision-making centres (which is what the OPEC+ now contains, subjected to growing stresses of a geopolitical nature) and decision-making centres like the firm that produce tight oil in the USA, with shorter investment cycles and sharper decline rates than the conventional deposits and that also respond only to the market signs. This tension between potential swing producers, which M.A. Lasheras analyses in his article, will remain as a major factor of uncertainty in the medium term, because the traditional swing producer (Saudi Arabia, with a greater capacity for idle production, and, thus, more likely to act as a market regulator) will be subjected to political determining factors that are difficult to anticipate and the supposed replacement (tight oil) presents the limitations indicated above and is not subject to decision-making centres of a political nature, but responds to the whims of the market.

The trends in the natural gas sector continue to evolve in the way described in previous years. According to WEO 2018, the uncertainties associated with possible overcapacity of exports arising from the investments in new liquefaction capacity in Australia and the USA would appear to have dissipated owing to the pressure from the Asian demand, basically from China. However, in the medium-

and long-term, the uncertainties that affect the gas market are different from the ones that hang over the oil market. Firstly, as is indicated in WEO 2018, the global demand for gas envisaged for 2040, is greater than the current demand even in the most demanding scenario envisaged in the IEA Report (Sustainable Development). In this scenario, the gas demand carries on growing until 2025 and remains stable from then until 2040. It will be necessary to wait for demand estimates consistent with a strict adherence to the 1.5°C temperature increase limit to be able to anticipate a demand peak similar to the oil one before 2050.

Unlike what is happening with oil, in the short- to medium-term natural gas is probably going to make it possible to replace coal with a cleaner alternative for producing electricity in the USA (because of the combination of relative gas-coal prices), and all the more so in China and India (because the advantages of gas not only concern CO₂ emissions, but also the emission of particles, SO₂ and nitrogen oxides, all of which are likely to make it a fuel in great demand) so it is likely to remain in great use as a fuel for central heating and in industry. In the short term in Europe and in the longer term in the rest of the world, generating electricity from renewable sources (which is already cost-competitive for on-shore wind and solar photovoltaic) will make inroads displacing gas as base power when the decarbonisation policy requirements become stricter. Replacing gas with electricity in central heating for buildings and the gradual replacement of gas in industry, although this will not take place as soon as oil replacement, will all contribute in the medium-long term to achieving the climate policy goals.

Although the long-term demand profile predicted for natural gas by the IEA is considerably different from the oil profile, the global gas resource estimates in WEO 12 and WEO 13 would also appear to indicate a possible overabundance of natural gas (and, therefore, the likelihood of "stranded assets") in the long term, if the climate policy restrictions are adhered to. Furthermore, in the case of gas, specific uncertainties in the medium- and long-term surround the new capacity not only of transport by gas pipeline but also of liquefaction plants. The increase in the weight of Liquid Natural Gas is allowing, as is shown in WEO 18 and earlier reports from the IEA, a greater price convergence for the major regional markets, and a greater contractual flexibility (removal of the destination clauses, delivery period reductions, de-indexation of the prices over oil prices or oil products, etc.); the existence of hubs (organised markets where the competition fixes spot prices, and derivative instruments) also adds greater flexibility and efficiency in physical flows and risk cover. However, at the same time, it augments the supply options, not only between pipeline and L.N.G., but also between different ways of contracting, which also means a more uncertain horizon in the medium- and long-term. Natural gas markets are also affected by specific geopolitical risks. T. Boersma, T. Mitrova & A. Losz²² point out some of the characteristics of the last few months like the one that affects the North Stream 2 Project (considerable

²² T. Boersma, T. Mitrova and A. Losz (2018 April). "A changing global gas order 20". (Columbia/Sipa. Center of global energy policy).

tension between the European Commission, USA and some European countries, on the one hand, and Gazprom, Russia and other European countries led by Germany, the Polish strategy for supplying, the uncertainties surrounding Ukraine and, above all, the strategy of Qatar, the world's leading exporter of L.N.G., which has been facing an embargo from its associates of the Gulf Cooperation Council since 2017, and which plans a significant expansion of its exporting capacity. The strategic uncertainty associated with Qatar was accentuated still further after its decision to leave the OPEC on 1st January 2019, within the framework of a recomposition of the geostrategic equilibriums not only in the OPEC but also in the Middle East (it must not be forgotten that Russia and Qatar account for 43% of world exports, according to data from WEO 18).

The uncertainties associated with the geopolitics of European energy are analysed extensively by Ch. Egenhofer & M. Elkerbout in their article in this publication, special attention being paid to the European energy security strategy and to their strategy of adapting to the climate policy requirements. As has been pointed out by the European Commission²³, the legislative package known as "Clean Energy for all Europeans" will be completed in the first part of 2019, and the new rules will be formally adopted, which will make it possible to attain the goals set for 2030, in matters concerning emission reduction, inroads made by renewables, efficiency and interconnections. As has already been pointed out in the preceding pages, control over the pathway towards the targets established for 2030 via the set of strategies set in motion in the EU is rigorous and credible. This not so much the case for the pathway towards the goals established by the climate policy for 2050, which is not only defined in a less precise way but also contains considerable technological, political and regulatory uncertainties and hints at a context of growing costs in the final decades. Europe is undoubtedly at the forefront where implementing the decarbonisation policy of the electricity sector is concerned (this being an essential part of the climate policy in the short- and long-term), but as we have already stated, its global impact is limited (around 10% of emissions), whereas in the major emitting countries (USA, China and India) the progress made with that policy is very limited. Furthermore, and as has already been mentioned in earlier issues of this publication, Europe ought to be preparing the regulatory transition towards an entirely decarbonised electricity sector model (something that will surely be feasible in 2050 both in technological and cost terms). It is difficult for this very capital-intensive model with a very low variable cost (if the generation focuses on wind and solar energy and the storage mainly involves decarbonised technologies) to be compatible with the current regulatory framework, which grants a central position to the energy wholesale market. In the medium term, this transition will supply a latent and significant regulatory risk in the electricity sector. Furthermore, the degree of progress that is made by renewable energies in their attempt to make inroads into electricity generation in the EC countries is a cause for considerable uncertainty in the time profile for the demand for natural gas,

²³ European Commission. "Clean Energy for all Europeans".

whose use for generating electricity is expected by WEO 18 to remain in 2025 at a level close to the 2017 level and which will drop by 11% by 2040, (in the central scenario of the IEA Report) but compliance with the strictest requirements of the climate policy (1.5°C limit) will require to decrease more sharply. In any event, as WEO 18 points out, although natural gas consumption in Europe is descending, consumption will still be considerable (400 bcm in 2040 in the central scenario) and with major and growing amounts of imports, which means supply security will be an essential strategic variable, an aspect that is examined in detail in the article by Ch. Egenhofer & M. Elkerbout. The main concern from a geopolitical perspective is the heavy dependence on Russian gas (nearly half the gas imported by the EU in 2017, according to WEO 18) and, thus, in devising a strategy that leads to a reduction in such dependence, but maintaining a suitable balance between security and supply cost in which new geographical sources (such as LNG from the USA) and more flexible markets offer more alternatives. Anyway, it seems unlikely that following these considerations the importance of Russian gas will be radically reduced (WEO, in its central scenario, expects Russia to maintain a market share of over 30% of the EU demand).

**Interview for the Executive Director of
the International Energy Agency Dr. Fatih Birol
(as a result of a questionnaire previously sent)**

1) *Is the “Sustainable Development Scenario” aligned with the goals of the Paris Agreement (i.e. to hold the average global temperature rise to well below 2°C and to pursue efforts to limit the temperature increase to 1.5°C)? Is more rapid decarbonisation possible and what additional challenges would this entail?*

Yes, the Sustainable Development Scenario (SDS) is fully in line with the goals of the Paris Agreement. It describes very ambitious steps towards the transition of the energy sector based on low-carbon technologies, as a means of addressing climate change, reducing air pollution and achieving universal energy access by 2030 – in fact the emissions trajectory to 2040 in the Sustainable Development Scenario is lower than many already-published decarbonisation scenarios that aim to keep the temperature rise to below 1.7 °C and 1.8 °C. Although we don't model the transformation of the energy sector in detail after 2040, the SDS would put the world on track to global energy-related CO₂ emissions falling to net-zero in the second half of the century.

Achieving the multiple goals of the SDS will require stringent policy action – and achieving an energy sector transition of even faster scope, depth and speed would require even stronger policy efforts. This would entail coordinated decarbonisation efforts in both energy supply and demand to accelerate the deployment of existing low-carbon technologies and to ensure the market uptake of technologies that are currently only at the R&D Stage. It would also likely require the timely introduction of CO₂ prices in every country around the world as well as the rapid phase out of all fossil-fuel subsidies.

2) *WEO2018 places special emphasis on electricity. Some European countries are considering 100% renewable energy electricity production by 2050. If this is achieved with wind and solar power, the cost structure will radically change (electricity production will tend towards variable costs around zero, which will lead to a similar trend in wholesale market prices of electricity). Is this scenario compatible with maintaining the current regulation paradigm in liberalised models, focusing on the wholesale energy market?*

The World Energy Outlook 2018 special focus on electricity looked at these issues in detail as part of a wide-ranging analysis of today's transformation of the power sector. Electricity is becoming more central to the global energy picture, but at the same time, ensuring the reliability and security of electricity supply is becoming more complex. We already see some of the effects in markets today from the growing contributions of wind and solar power, including downward pressure on wholesale electricity prices. For example, in the European Union, we estimate that the share of total power generation costs recovered through energy sales fell from 80% in 2010 to about 60% in 2017, in part due to more wind and solar. Similar pressure is apparent in other markets, such as in the United States.

The strain on today's electricity market designs would increase as regions look to achieve ever higher shares of wind and solar. With more downward pressure on wholesale energy prices, additional revenue for all technologies would be needed from elsewhere to fully cover costs.

Flexibility will be the cornerstone of tomorrow's power systems, and so greater revenue for providing flexibility services is a natural fit (building on existing ancillary service markets). Additional revenue streams could come from capacity mechanisms (paying for contributions to reliability) or through direct financial support. Revenues beyond energy sales are set to become central to the financial health of the sector and security of electricity supply where wind and solar dominate the power mix.

3) *The WEO2018 brings to light many challenges Europe faces to guarantee an efficient, secure natural gas supply: geographical source of the supply, contractual methods, choice between gas pipelines and LNG, optimisation of infrastructures, development of organised markets, etc. But the report estimates that dependence on Russian gas by 2040 will still be high (over 30% of the EU's demand). Do you believe that this degree of dependence on Russian gas is the right balance between costs and security?*

There is a lot of attention being paid to issues of natural gas supply to Europe at the moment. There are those who argue that it should be left to the market to decide how much gas to import and from where, while others attach strategic and political importance to specific gas supply routes, and are worried about over-reliance on single suppliers.

What Winston Churchill said for oil over 100 years ago still holds true: safety and certainty lie in variety and variety alone. Import dependence is manageable as long as Europe can keep its options open. This means maintaining sufficient infrastructure - storage, LNG capacity and interconnectors between EU Member States – to ensure that gas can flow from multiple sources, across many different markets, especially during times of disruption.

This is not just about physical infrastructure. Clear and transparent rules are needed. This means high security standards for operators; ensuring third party access to cross-border pipelines; having transparent transport tariffs; and maintaining the separation of suppliers and transporters of gas. On top of this, having places where traders can freely buy and sell gas (virtual or physical 'hubs') makes the actual origin of the fuel less important over time, and forces dominant suppliers – both inside and outside the EU – to price their gas as competitively as possible.

4) *The future of CCS technology is going to condition the electricity generation mix (allowing, for example, significant use of natural gas), decarbonisation processes in industry and even hydrogen production. Do you think this technology will end up moving into commercial exploitation?*

CCUS is a critical technology for achieving energy and climate goals. The reality of today's global energy mix is that two-thirds of coal plants are located in Asia with an average age of only 12 years (in contrast to an average of more than 40 years in the US and much of Europe). Retrofitting CCUS is one of few solutions to address the potential lock-in of the emissions associated with these facilities.

CCUS is also uniquely important in industrial applications such as cement production where there are few alternative technology options for deep emissions reductions, and it can also offer a competitive abatement option for industrial processes that produce a relatively pure stream of CO₂ such as natural gas processing.

The IEA has identified that as much as 450 Mt of CO₂ could be captured for use or storage each year with an incentive of less than USD 50 per tonne. A key to commercialising CCUS technologies will be to establish policy frameworks that help to build the case for investment. Many countries are actively supporting CCUS development and deployment, including the United States where the recently amended "45Q" tax credits could see a significant expansion of CCUS opportunities.

5) *Among the induction mechanisms in the decarbonisation process ("cap and trade", tax on emissions, "command and control" of technology and operating standards), which do you feel is most effective and most likely to favour international interaction?*

The right mix of policy mechanisms depends on particular national contexts and technology needs. Countries differ widely in their existing energy mix, their resources, their market structures and their institutional capacity. No single in-

strument will be the most efficient or effective in all contexts. Moreover, in many cases multiple policy tools will be required to set up the most effective pool of incentives and to tap into all the available opportunities.

This means that it is important not only to ensure that the right policy is in the right place, but also to carefully assess and optimise interactions between policy mechanisms and how they operate in “real-world” conditions. For example, a carbon price may not be sufficient to overcome barriers holding back investment in energy efficiency, even where it makes economic sense. As energy efficiency is a crucial pillar of the IEA’s energy transition scenarios, additional targeted policies - such as minimum performance standards - are often necessary.

The same is true when considering how policy mechanisms can stimulate more cooperation internationally. To give just one example, linking up emission trading schemes – a form of carbon pricing – can enhance efficiency in looking for emissions reduction opportunities across countries. But at the same time, joint cross-border R&D programmes can increase the speed of important energy-related innovation that will be crucial to rapid energy transitions.

6) How do you see the future play-off between two “swing producers” (although with very different characteristics) in the oil market. On the one hand, conventional production with sufficient idle capacity (Saudi Arabia) and on the other, the business collective producing “tight oil” in USA?

There are significant differences between the oil industries, and the role they play as swing producers, in Saudi Arabia (and most OPEC countries) and the United States. In the case of OPEC, for most of the past thirty-five years since the first quota system was introduced, it has adjusted its production to achieve a desired market stability. This *voluntary* swing producer role is a clear government-led policy.

The United States is completely different. There, the government has a very limited role in setting oil policy beyond allowing exploration and development to take place, and it is state governments that have the main power in these decisions. Production is a matter for the companies concerned. They produce if it is financially attractive to do so, and they don’t if it isn’t.

So, in 2010-2015 US crude oil production increased from 5.5 mb/d to 9.4 mb/d as oil prices were close to \$100/bbl for the period. When prices crashed to below \$30/bbl in early 2016, US oil production fell back to 8.8 mb/d. This is *involuntary* swing production. It is worth noting that there is a different system in Canada where the government of Alberta imposed production cuts in early 2019 in response to very low oil prices and rising stocks.

In future, the imperatives will remain the same as before: Saudi Arabia and its fellow OPEC members will likely adjust their production as they deem necessary, and US companies will produce as much as possible unless prices fall too low.

7) How do you think climate policy restrictions will affect the business models of energy companies and the management in oil-rich countries in relation to their resource development programmes?

In the short term, major oil rich countries and the companies operating there will not change their approach in significant ways. This is because global demand for oil is projected to rise for many years to come, under the IEA's New Policies Scenario. This does not mean that they are failing to consider climate change issues and change is underway. Both national oil companies and international companies are very aware that the processes associated with producing, transporting, refining and consuming oil are significant contributors to greenhouse gas emissions and pollution. Many of them have publicly committed to reduce emissions, in response to regulatory requirements, continued tightening of energy efficiency standards, and also, in the case of IOCs, in response to investor pressure. So, in the longer term, although there will still be very large volumes of oil used, we can envisage major changes in how the oil industry carries out its business.

8) Competitiveness /cost reached through producing “on shore” wind and photovoltaic solar power is going to facilitate the decarbonisation process of the electricity sector. Nevertheless, the IEA (Tracking Clean Energy Progress) believes that of the thirty-eight technologies that have been examined to achieve “sustainable development”, only four are actually mature. Do you not think that public opinion could be underestimating the difficulties to achieve the 2050 climate goals, particularly in relation to the steps to be taken once decarbonisation of the electricity power sector and high degree of electrification of light electrical vehicles have been achieved?

In fact, our 2018 tracking clean energy progress (TCEP) platform showed that only solar PV, EVs, data centres and lighting are on track with long-term climate goals while the remaining 34 technologies need further progress. This shows how daunting the challenge is. Nevertheless, the IEA has set out a detailed plan for how the energy sector can contribute to achieving the Paris Agreement climate goals: the Sustainable Development Scenario (SDS).

Wind and solar play a critical role in our SDS. By 2040, wind becomes the largest source of electricity (more than 20% of the total) and solar PV has the largest amount of installed power capacity (almost 30%). Impressive cost reductions in recent years mean that wind and solar PV are rapidly transforming power systems worldwide. However, generation costs becoming equal to or lower those of conventional electricity sources does not automatically guarantee deployment in line with climate goals. System integration challenges need to be addressed. For such large shares of variable renewables to be integrated in cost-effective manner without compromising electricity security, important policy and market reforms are needed to attract investment at unprecedented scale in power system flexibility: This includes stronger grids, more flexible conventional power

plants, affordable storage and unlocking demand-side response, e.g. through electric vehicles and efficient heat pumps.

Additionally, much stronger efforts will be needed beyond the power sector in transport, buildings and industry. Transport is a good example: the SDS sees 950 million electric vehicles in 2040, i.e. half of the global vehicle fleet by that time. This will only contribute to climate goals if the power sector decarbonises at an equally fast pace. And decarbonisation of long-haul transport (e.g. trucks, shipping and aviation) will need a combination of energy efficiency and other low-carbon fuels, including advanced biofuels and hydrogen-based synthetic fuels, which are still at early stage of development today.

Chapter I

Geopolitics of Energy and Game Theory

Manuel Conthe Gutiérrez

Abstract

Game Theory is a sophisticated mathematical approach for establishing the best course of action in the face of uncertainty. This article claims that some classical games (prisoner's dilemma, the trust game, the chicken game, the called bluff game) are at work in international energy markets. A classical prisoner's dilemma can be seen, for instance, in the traditional attempts by OPEC members to raise the oil price, an attempt which, while made easier by Russia's rapprochement to the OPEC under Putin, are becoming harder as a result of the shale revolution in the USA. When a state becomes heavily dependent on imported natural gas its foreign policy may be exposed to the risk of a chicken game, which can be alleviated by a diversification of gas supplies (including through liquified natural gas or LNG) and transformed into a called bluff game. Due to their significant up-front fixed costs and financial dependence on their future revenue stream, big investments in energy projects always entail a trust game. Finally, the international efforts to fight climate change by curtailing CO₂ emissions, as envisaged in the December 2015 Paris Agreement, are another prisoner's dilemma, made thornier not only by the differences in priorities between developing and developed countries, but also by the US recent transformation into one of the main hydrocarbon producer of the world, even ahead of Saudi Arabia and Russia.

Keywords

Game Theory, prisoner's dilemma, geopolitics, energy, OPEC, Russia, USA, Europe, oil, natural gas, non-conventional hydrocarbons, investments, climate change, Paris Agreement.

Introduction

The Bathtub Theory

In 1975, the great US economist William Nordhaus, Nobel Prize Winner for Economics in 2018, coined a metaphor to describe the oil market that made a fortune:¹

“We can see the oil market as one giant bathtub. The bathtub contains the world’s stocks of oil that have been extracted and are available for purchase. There are taps in Saudi Arabia, Russia, the United States and other producers that unload it into the tank; and there are stopcocks through which the United States, Japan, Denmark and other consumers extract oil from the tank. However, the price and dynamics of quantities are determined by the sum total of those supplies and demands and the total level of the tank, and this is independent of whether the taps and stopcocks are labelled “United States”, “Russia” or “Denmark”.

Why is unrefined oil an integrated world market? The reason is that the cost of transporting oil is low, the unrefined oil from different geographical origins (and its by-products) is interchangeable to a large extent, and the different oils can also be mixed. All of this means that oil is fungible: insufficiency in one region can be made up for by sending identical or similar oil from another part of the world”.

In my opinion, Nordhaus’ “global bathtub” metaphor can also be applied to another chemical element associated with energy, not as a source thereof but as a consequence of the combustion of its fossil variants: carbon anhydride (hereinafter CO₂), which is emitted into the global atmosphere by burning coal, oil or gas anywhere in the world and constitutes a major part of the greenhouse gases, responsible for global warming.

The big difference is that the “CO₂ bathtub” has a very narrow overflow, because the natural mechanisms of absorption - such as forests, marine plankton or the sea’s surface - only have a limited capacity, and efficient technologies have not yet been invented that allow for “carbon capture and storage” (or, in its abbreviated form, CCS). As we shall see later, the level in the CO₂ bathtub has shown a sustained growth ever since pre-industrial times, mainly in the industrial countries, led by the USA but also for many years by the developing countries with the largest populations -such as China, India and Brazil-.

The taps that supply the two bathtubs are scattered throughout the world -although until recently the oil taps were highly concentrated in the Persian Gulf, and those who control those taps, and in the case of oil, the outlet stopcocks- are many, scattered over the world and, so, it is different to liaise between them, in spite of the fact that as their conditions affect the bathtub level, they affect everybody.

¹ NORDHAUS, William, “The Economics of an Integrated World Oil Market”, Keynote Address, International Energy Workshop, Venice, Italy, June 17-19, 2009.

That multiplicity and scattering of participants, and the reciprocal influx of their decisions via their impact on oil prices and the CO₂ level built up in the atmosphere, causes some of the classic phenomena described by Game Theory to manifest themselves in the two areas, i.e. in that branch of mathematical analysis of the Economy that studies interdependence situations, in which the result of the decisions that someone takes –known as a “player”– depends decisively on the decisions or performances of other different “players”.

Despite the development of the “liquid natural gas” market (LNG) in recent years, unlike oil, the natural gas market does not yet constitute a great integrated international “bathtub”, because the supply of gas through gas pipelines that cross many countries prevents the gas markets from being fully integrated. Nevertheless, the dependence between the supplying and using countries that those networks of gas pipelines can cause will sometimes have a geopolitical dimension that, as we shall see, can also be analysed from the perspective of Game Theory.

Game Theory

Game Theory is currently a sophisticated mathematical approach for establishing the best course of action in the event of uncertainty –especially when that uncertainty comes from how the others behave–, but here we will use one single and more elementary version, which demonstrates the interdependence of two or more persons –called “players”– by means of a square or matrix in whose rows the potential performances of the first player are indicated and where those of the second player are shown in columns. The result (pay off) that the two players would obtain under that assumption can be seen in each box.²

One of the major contributions to Game Theory is that there are certain archetypical structures in this square or matrix that appear in very different social situations, which makes the incentives and dilemmas affecting the players conceptually similar. Some that appear in the international energy markets will be analysed below.

The Prisoner’s Dilemma

This game, which strictly speaking we should call “dilemma of the arrested”, was announced in 1950 by the US mathematician Albert Tucker and was inspired by a technique used by the police and prosecutors to undermine solidar-

² There is a great deal of economic literature about Game Theory. It begins with VON NEUMANN, John and MORGENTHAU, Oskar, “Theory of Games and Economic Behavior”, Princeton University Press, 1944. A classic and elementary introduction is provided by MORTON D. DAVIS, “Game Theory. A Nontechnical Introduction”, Dover Books on Mathematics, 2003. Other straightforward and recommendable books are BRAMS, Steven J. “Negotiation Games. Applying Game Theory to Bargaining and Arbitration”, Routledge, 1990; RASMUSEN, Eric, “Games and Information. An Introduction to Game Theory”, Wiley-Blackwell, 2006.

ity and connivance between a gang of criminals with the promise of privileges if they betrayed their accomplices and provided the Police with evidence that made it easier to successfully prosecute them.³

Let's imagine that the police have detained two criminals and are interrogating them separately. The criminals have committed the crime, but the police only have evidence against them for other less serious offences. The prosecutor can separately promise each of them that if he confesses to the crime and betrays the other one, he will be released and no charges will be brought against him (whereas the other one will be given a 10-year prison sentence). However, what he will not tell them is that if the two collaborate, the confession will be of little use to either of them, and they will be condemned to, let's say, 5 years, and if neither of them confesses, they can only be sentenced to 1 year, for those lesser offences. The situation can thus be summed up as follows (the figures amount to years in prison, the first for criminal A and the second for criminal B):

		Player B	
		Confessing	Not confessing
Player A	Confessing	-1 -1	0 -10
	Not confessing	-10 0	-5 -5

Image 1

Isolated and unable to coordinate, both of the arrested criminals deduce that it is in their own interest to confess, regardless of what his accomplice does. Because if A thinks that B is weak and will confess, he had better anticipated the other's confession and do so first, otherwise he will face a 10-year sentence and be the sucker; and if he thinks that B will be loyal and keep quiet, criminal A, an unscrupulous individual, will find out that if he betrays him he can take advantage of the situation and be released. Therefore, A will come to the conclusion that he must confess. Yet B's process of reasoning is similar, and he will conclude that it is also in his own interest to confess. In the end, both of them

³ An elementary and entertaining analysis can be found in POUNDSTONE, William, "The Prisoner's Dilemma", Alianza, 2006.

confess and will be condemned to 5 years, in spite of the fact that if they had kept quiet they would have only been given a 1-year prison sentence.

This is the "Prisoner's Dilemma" in a nutshell: the players would have probably been prepared to collaborate with each other if they were both certain that the other would do likewise. But in the face of doubt, plus the fear of laying the "sucker" if they are the only two who cooperate and the temptation to play the "wise guy" and cash in on outside cooperation inevitably leads each player to "act in his own interest", which will mean that both fall between stools and lose out by not collaborating.

In the real world, there are many social situations whose structure is similar to the one demonstrated in the "Prisoner's Dilemma". These are just some of the examples:

- Paying taxes: for all citizens the ideal would be that everybody pays taxes, except for themselves. However, if we rule out this ideal situation, we all prefer to pay all taxes than for the fraud to be widespread and nobody pays.
- The arms race between two rival powers: two countries may prefer to limit their arms at the same time, instead of embarking on a costly rearmament. Yet unless they agree to an effective mechanism that penalises whoever goes ahead with unilateral rearmament, both countries, prisoners of mistrust, will be unwillingly drawn into an upward spiral of military expenditure. Another example could be to consider that by actually starting a war, nuclear or conventional; one suspects that whichever power attacks first will obtain a great advantage ultimately leading it to victory.
- Workers' strike: under the assumption that All company's workers share the same interest, they can all have a collective interest in imposing certain employment conditions on the employer. However, each worker would be tempted to give way to individual pressure, or, not participate in the strike and be "scabs", while at the same time benefiting from the improvements achieved by their colleagues.

However, there are also two suppositions directly related to the international energy market:

- Artificially inflating oil prices.

As always happens in the heart of a "cartel" or colluded agreement between the producers of an expendable asset –such as oil-, all the producers will have a joint interest in the price of the product being high, which would make it necessary to limit the supply by adhering to individual quotas; yet once that high price is achieved, each producer will be tempted to raise its production to a maximum, to cash in on the high price.

As we shall see later, this is the dilemma that is often faced by the Organisation of the Petroleum Exporting Countries (OPEC).

- Limiting the global emissions of greenhouse gases.

As we have already pointed out, the emission of CO₂ and other gases (methane, nitrogen oxides, etc.) and their build-up in the atmosphere, causes a “greenhouse effect” that is warming the Earth, a phenomenon that can have a very negative impact. Therefore, all countries have a collective interest in moderating world emissions, or even eliminating them. However, as reducing them requires sacrifices, each one will be tempted to “pass the buck” and make sure it is the others that collaborate in this effort.

One of the best known techniques for coping with the risk of “passing the buck” in situations with a “Prisoner’s Dilemma” structure –also known as the free-rider problem-, is to commission a “Leviathan” – to use the biblical term coined by Thomas Hobbes, the 17th Century British philosopher -, to punish those who will not collaborate, given that the “fear instilled by that power and that force, can turn all the wills towards trying to reach peace *within* and to providing mutual aid against the enemy *without*”.⁴

Yet on the international energy market there is no Leviathan to take on this task, although on occasions there is a leading country –Saudi Arabia, in the case of the OPEC- that endeavours to play the role of coordinator and puts the spotlight on those producers that do not pull their weight in this collective effort.

The Trust Game

A special variant of the “Prisoner’s Dilemma” also manifests itself on the energy market, fruit of the heavy initial outlay that many activities require (prospecting oil deposits, extracting natural gas, constructing natural gas liquefaction plants, etc.), because these investments can only be recouped and made profitable with the future income which the project produces. However... Will it be sensible to undertake or finance the project if there is a serious risk that in future years the sale price plummets or if the authorities take measures that curtail its profitability?

This dilemma is illustrated in the “Trust Game” or “Investment Game”, which was drawn up in 1995 by a group of economists led by the American Joyce Berg.⁵

Let’s imagine that we give 10 Euros to Player A –who will play the role of “investor”- and we tell him he can keep them or, if he prefers, transfer them, completely or partly, to Player B –which will be, let’s say, the country playing host to the investment. If Player A transfers Euros to B, the game organisers will make a further contribution –the social profitability of the project-, so that B will obtain

⁴ HOBBS, Thomas, “Leviathan”, Editorial Gredos, 2012, Chapter 17, “On the Causes, Generation and Definition of a Commonwealth”.

⁵ BERG, Joyce, DICKHAUT, John, and MCCABE, Kevin, “Trust, Reciprocity and Social History”, Games and Economic Behavior, 1995, n° 10, available at <http://community.middlebury.edu/~jcarpent/EC499/Berg%20et%20al%201995%20GEB.pdf>.

three times the amount sent by A (thus, for example, if A transfers 7 Euros, B will receive 21). However, once B receives that amount, he will be free to decide how much to keep and how much to return to A (so, nothing will prevent B from keeping all that he receives, without returning anything to A). In such circumstances ... How many Euros should A send to B?

		Player B (Sovereign)	
		Return a lot (e.g. half of the earnings)	Not return any
Player A (Investor)	Invest a lot (e.g. invest 10)	+15 +15	-10 +30
	Not invest anything	0 0	

Image 2

In view of the potential profitability of the project –the initial investment is tripled-, the more money A invests, the bigger the “cake” to be shared. So, if A sends his 10 Euros, B will receive 30, the maximum possible. But... What happens if B keeps the lot, and gives back to A less money than A sent?

The situation is described in the enclosed table, in which Player A plays the role of “investor” and Player B is the State hosting and benefiting from the investment, which can decide, once the investment is made, what profitability to allow the investor to have.

The truth is that the structure of the “Trust Game” is that of a Prisoner’s Dilemma, given that if the investor does not put enough faith in the future behaviour of the sovereign, the game will end in a “non-cooperative” solution: A will not invest anything and neither will receive the net earnings of 20 that the initial investment would have yielded.

In the economic literature, the term “stranded” assets has been used to refer to those investments already made that for reasons that have arisen, cannot be capitalised, such as the Euros sent by Player A when Player B has not reciprocated. We shall later examine the nature of those risks that affect the major energy projects.

The Chicken Game

The name of this well-known game comes from the analogy that the British philosopher Bertrand Russell used in 1959 in his book *“Common Sense and Nuclear Warfare”*, to describe the conflict that confronted the two major nuclear powers of the period –the United States and the Soviet Union- in which he drew a parallel with the game played in pairs by some American adolescents: from the driving seats of their cars they started up from a distance and drove towards each other on a collision course –like in a Medieval jousting tournament- and the one who swerved first to prevent a head-on crash was the loser or “chicken”. The game appears in the film *“Rebel without a Cause”* starring James Dean, the only difference being that the cars ran side by side towards a cliff and the winner was the last driver to jump clear of the vehicle. Russell found this game to be a metaphor of the conflict between the two nuclear powers of the period and of the brinkmanship tactic pursued by the American Secretary of State, Foster Dulles – namely allowing international crises to accentuate, even at the risk of triggering a nuclear holocaust.

		Player B	
		Cede	Stand one's ground
Player A	Cede	0 0	-10 +10
	Stand one's ground	+10 -10	-100 -100

Image 3

However, not long after, in his book *“Arms and Influence”* (1960), the American economist and 2005 Nobel Prize Winner for Economics, Thomas Schelling, pointed out that the game had already been described in Homer’s Iliad in Book XXIII, when the young Antilochus snatches the runner-up’s place from Menelaus in the race in one of the funeral games in which Achilles honours the death of Patroclus. Antilochus, who is aware of the fact that the wheels on his chariot are slower than his rival’s, takes his father’s advice and, shortly before some rocks narrow

the track, places his chariot to the left of Menelaus' and whips up the horses. Menelaus becomes alarmed and reproaches him: "Antilochus! You're riding your chariot dangerously- Slow the steeds down; the track is narrow now, and as soon as it widens, you can get ahead of me. Let's not crash and injure ourselves all because of you". "But Antilochus –concludes Homer-, as though he had not heard him, spurs his horses on. Menelaus' mares slow down, and Menelaus voluntarily stops using the whip, so the horses won't trip each other up, overturn the chariots and cause the charioteers to fall into the dust in their eagerness to win the race".

The structure of the Chicken Game is described in the table below:

As we can see, the best thing for each player is to be cold-blooded, take the rival to the brink (brinkmanship) to intimidate him and force him to cede, thereby obtaining an advantage at his cost. If that is not possible, the next best thing is for both players to cede simultaneously and the game will end all square. Yet if this is not possible either, the best thing is to cede to the rival and be called a "chicken", but to survive, because the worst result possible is to lose one's life in the wager, which is what will happen if neither "cooperates". Hence the big difference with the Prisoner's Dilemma, where the worst outcome is cooperating when the other player does not.

A famous historic example of this sinister "game" took place in 1962 during the Cuban missile crisis between Kennedy and Khrushchev.⁶

Although the theoretical analysis of the game does not enable one to know who cedes, the one who will do so in practice, like Menelaus, is the more sensible and responsible, or the one, like the former Russian leader, had less at stake in the wager.

In the international energy market it is possible to make out Chicken being played in those situations where one of the parties, a major energy consumer and with supply sources that are not very diversified, comes to depend heavily on a major supplier, who can take advantage of this dependence to threaten the former with suddenly cutting off the supply and forcing that consumer to submit to the supplier's wishes.

Note that in the Chicken Game both parties suffer from catastrophic consequences if neither cooperates and the conflict becomes real. In the case of energy, that can also happen when the energy supplier is also heavily dependent on its customer, depends on its sales and, as a result, cannot afford to cut off the customer's supply. Yet, even if this is the case, the supplier may be able to intimidate those who depend on its supply.

The situation changes when the game is no longer symmetrical and the consequences of a lack of cooperation are different for the players concerned. That is the case with the "called bluff", which we will now proceed to analyse.

⁶ An entertaining account appears in BRAMS, Steven J., "Paradoxes in Politics. An Introduction to the Nonobvious in Political Science", The Free Press, 1976, Chapter 5.

The Called Bluff Game

This game, described by Glenn Snyder and Paul Diesing, helped them to analyse some international crises in which the players' situations were not symmetrical.⁷ In fact, this is really a combination of the Prisoner's Dilemma and the Chicken Game.

In fact, as can be seen in the bottom right-hand box in the enclosed table, if neither of the players cedes and tries to impose its will, Player A will come off worse than B, for whom the worst possible outcome will be ceding unilaterally (bottom left-hand box).

		Player B	
		Pact	Stand one's ground
Player A	Pact	0 0	-10 +10
	Attack	+10 -10	-20 +5

Image 4

Snyder and Diesing consider that this game is illustrated by the conflict in 1905-1906 between France and Germany, when the former took control over Morocco without consulting the latter, and without offering Germany any compensation –in contrast to what France had done with Spain, Great Britain and Italy-. Germany, that played the role of A- protested strongly, the Emperor went to Tangier to defend Moroccan Independence –although later he attempted to acquire his own sphere of influence in Morocco- and threatened with war, thinking that that threat would make Great Britain stop supporting France –which was playing the role of B-.

Snyder and Diesing point out that “Germany’s threats during the crisis brought about a defensive and hostile reaction from France that greatly increased the value of standing firm against the enemy. One of Germany’s aims was to break the entente between France and Great Britain and demonstrate that the latter would leave France in the lurch if war broke out. Its other objective was to be

⁷ SNYDER, Glenn & DIESING, Paul, *Conflict among Nations: Bargaining, Decision Making, and System Structure in International Crises*”, Princeton University Press, 1977.

recognised as a colonial power, as an official member of the European Club of Major Powers with a right to be consulted about changes in the *status quo* beyond Europe. There were rifts within Germany: the Emperor attributed great value to [good relations with France], whereas [his Minister of Foreign Affairs] Holstein did not expect anything from France and demanded firmness. These rifts were one of the main reasons for German hesitations during the crisis. France expected that if the Conference ended in disagreement, Germany might declare war. However, with the guarantee of support from Great Britain, France expected to achieve a decisive victory, whereas Germany had no real intention to start an unpopular and costly war over Morocco.

The German strategy was based upon the mistaken belief that Great Britain would not back France, that France could not afford to risk a war against Germany and that it was all a game of "chicken". The Germans thought, on the basis of a misinterpretation of certain events, that the threats would make France increasingly back down, when in fact the country's will to stand firm increased. The German strategy was not only ineffective, but also counterproductive".

In the end, Great Britain carried on supporting France, which stood its ground, and Germany, isolated and backed only by Austria, ended up by giving in to the French ambitions at the International Conference of Algeciras. The German Minister of Foreign Affairs, Friedrich von Holstein, resigned soon after.

When a conflict has that structure, one of the players thinks that it is playing a symmetrical game of "chicken", in which it expects to get its own way because the rival will fear that the lack of agreement will end in disaster for both of them. Yet this belief is wrong, given that the other player does not think it is playing a game of "chicken", but a "Prisoner's Dilemma": a lack of agreement will not be a catastrophe for Player B, because its greatest fear is to cede unilaterally to the rival's threats.

Hence the name "*Called Bluff*", taken from poker: when one party threatens with a disaster -a "train crash", is the usual metaphor, if there is no agreement, the other party, which is not making an all-out effort to prevent the conflict, prefers confrontation to an agreement or to give way. And this firmness makes the bluffer back down.

In my judgement, in the real world some of the other situations that have had this structure were:

Some "wildcat strikes", such as the famous one involving the North American air-controllers in August 1981, a few months after President Ronald Reagan took possession. Far from losing his nerve, the President took exceptional measures to confront it, and managed to get those who called the strike to desist soon afterwards.

The threat in 2015 from the new Greek Government of President Alexis Tsipras when it refused to accept the adjustment measures required by the Ministers

of Economy and the Treasury for the Euro Zone as part of the Greek bailout and cause doubts about whether or not Greek would withdraw from the Eurozone.

The challenge from the Catalan Separatists in Autumn 2017 when the Catalan Parliament passed the “Disconnection Acts” and the attempt to hold a referendum about the alleged “right to decide” about Catalonia’s separation from Spain, when not long after King Felipe’s speech on 3rd October of that same year, the Government applied the Constitutional mechanism of Article 155 of the Constitution and the Prosecutor and the Courts began to take legal action against the most prominent pro-independence leaders.

In the international energy market this game comes into play when whoever feels intimidated by an energy producer or group of them attempting to exert its power by threatening to put up its prices or cut off supplies, takes measures that enable them to get around those threats and ends up by preventing them from being carried out. As we shall see later, certain clear features of this game can be discerned in:

- The American producers of unconventional oil’s ability to prevent the OPEC from raising the price to the high levels that it reached in the summer of 2007, by increasing their own production when the international price of oil, shortly before the beginning of the major international financial crisis.
- The efforts of countries in the European Union to comply, even unilaterally, with the “decarbonisation” targets set in the Paris Agreement in December of 2015 and to promote autochthonous renewable energy sources, with a view to reducing their dependence on imported hydrocarbons and to guarantee a better energy supply. It is also possible to see features of this game in the European Union’s wish to create an internal natural gas market, with a variety of supply sources, so as to reduce the dependence of the Central and Eastern European countries on Russian natural gas.

International Energy Market

Sources of primary energy

In 2017, the most recent year for which figures are available, primary energy consumed throughout the world amounted to 13.5 billion tonnes of oil equivalent, whose breakdown into fuel sources was as follows:

As can be observed, oil is still the main source of primary energy, followed by coal and natural gas; then, a long way behind comes hydroelectric power and the renewable energies as a whole (wind, photovoltaic, thermal solar, etc.). Such data reveal the size of the “decarbonisation” task, to which reference will be made later.

The international oil market is, as has already been stated, a global “bathtub” into which production flows from a variety of “taps” all over the world, and the

oil flows out again that has been consumed by refineries, trading companies and users throughout the world.

Primary Energy	Annual Consumption (million tonnes of oil equivalent)	%
Oil	4621.9	34.20
Coal	3731.5	27.61
Natural Gas	3156.0	23.35
Hydroelectric	918.6	6.79
Nuclear	596.4	4.41
Renewable	486.8	4.49
Total	13511.2	100

Image 5. Source: BP Statistical Review of World Energy 2018, p. 9

Although coal is also the subject of international trade, it is mainly consumed in the many countries that produce it. Coal is still the main source of energy in Asia, where it accounts for almost 50% of the total.

Finally, the natural gas market is in expansion, but it is not yet such a standardised “bathtub”, with one single price of reference, unlike oil. However, it is gradually becoming integrated thanks to the fact that traditional supply of crude gas via the gas pipelines is being supplemented by the international trading and supply of “liquid natural gas” (LNG), through liquefaction, transport by ship and subsequent regasification at the destination.

World energy demand

The world energy demand can be expressed as the result of multiplying three factors⁸:

- The world population.

It is expected to carry on growing and that the current 7.4 billion people will reach around 9 billion in 2040, as a consequence of the demographic increase in the emerging economies, led by India.

⁸ COPENHAGEN ECONOMICS, “The future of fossil fuels: How to steer fossil fuel use in a transition to a low-carbon energy system”, Full Report for the Energy Transitions Commission, January 2017, p. 13 and following.

- The world income *per capita*.

It is also expected to carry on growing and, like the population, it is directly linked to the energy demand, owing to the greater utilisation of consumer goods that require energy (vehicles, electrical appliances, air-conditioning, etc.).

- The energy intensity of the world GDP (i.e. the energy consumed/GDP quotient).

It is a variable that depends on the energy-saving measures and on the energy efficiency of the engines and machines that use it.

If the result of the aforementioned multiplication sum –i.e., the energy consumed in the world in one year– is multiplied by the intensity of carbon energy emissions (i.e., CO₂/Energy) we will obtain the gross annual CO₂ emissions.

The combine effect of those three factors, taking into account the expected improvement of the third one –energy efficiency– is likely to cause an increase in the annual overall energy demand of close to 25% between 2017 and 2040, as well as a drastic change in the relative influences of the demanding countries. In 2000, the developing economies of Asia were consuming 20% of the world's energy –compared to 40% for Europe and North America–, whereas in 2040 the percentages will have reversed, and the emerging Asian countries (spearheaded by India and China) will be consuming 40% of the world demand⁹.

How will this significant increase in the global demand be catered for? Will it be possible to reconcile this with the aims of the struggle against global warming that, as we shall see later, were established in December 2015 at the Paris Agreement?

Oil

Market Structure

As has already been explained, the oil market constitutes a genuine international “bathtub” where the price for each variety (Brent, West Texas Intermediate, etc.) is the same the world over, because the transport cost –by pipeline or ship– is low. These international prices are determined at organised markets where not only the end consumers of the commodity but also many intermediaries and financial agents compete as purchasers, taking up positions on the markets by paying in cash (spot), by paying in instalments (forward) and future, where they negotiate the assets with delivery at different deadlines.

The global demand for oil follows a relatively stable growth pattern, which responds in the short term to the macroeconomic situation in the consumer

⁹ INTERNATIONAL ENERGY AGENCY, “World Energy Outlook 2018”, Executive Summary, November 2018.

countries –it increases in periods of expansion and decreases during recessions- and in the medium and long-term, to the absolute growth of the population and the process of replacement by other energy sources. The world demand for oil thus shows significant signs of “elasticity where profit is concerned”, even in the short term, and a moderate “price elasticity” in the short term, -because in the short term the ability to replace oil by-products is limited, but that ability is greater in the long term.

As can be seen in the graph below, the aggregate world demand for oil has been growing steadily over the years, with only slight and fleeting drops during the periods of severe recessions, such as the crisis of 2009. Its absolute level is approaching 100 million barrels per day and its future development will depend, as the latest report issued by the International Energy Commission indicates, on the three major scenarios possible: that the countries stick to their current policies (“hereinafter current policies”); that they adopt the new measures to combat climate change that have already been announced (hereinafter “new measures”); or that they take the much more radical measures required if they are to comply with the targets set in December 2015 in the Paris Agreement to combat climate change, (hereinafter “sustainable development”). Logically, the scenario that prevails will affect the future price of oil.

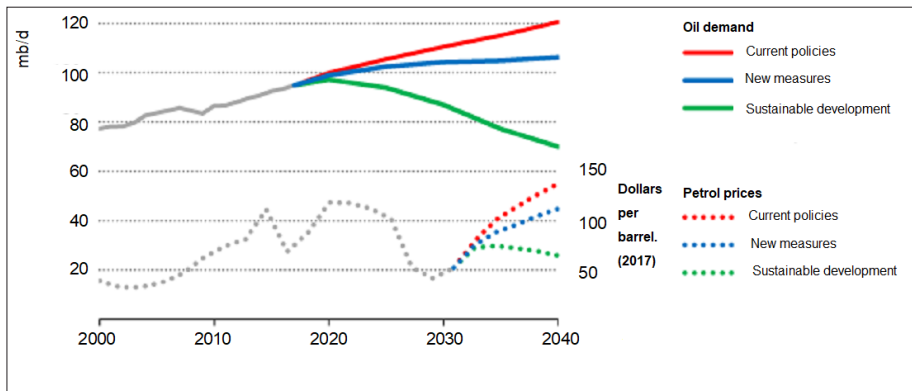


Image 6. Source: International Energy Agency, World Energy Outlook 2018

On the supply side, the world oil production amounted to 92.6 million barrels per day in 2017 that, broken down into countries of origin, was as follows:

In the aforementioned year, the OPEC countries produced 39.4 million barrels per day, i.e., 42.6% of the world’s oil. For the first time, the United States was the world’s top producer. Production in Russia was also very high, close to the Saudi Arabian figure.

Producing Country	Production (million barrels per day)	%
United States	13.0	14.1
Saudi Arabia	11.9	12.9
Russia	11.2	12.2
Iran	4.9	5.4
Canada	4.8	5.2
Iraq	4.5	4.9
Arab Emirates	3.9	4.2
China	3.8	4.2
Kuwait	3.0	3.3
Brazil	2.7	3
Mexico	2.2	2.4
Venezuela	2.1	2.3
Nigeria	1.9	2.1
Qatar	1.9	2.1
Norway	1.9	2.1
Kazakhstan	1.8	2
Angola	1.6	1.8
Algeria	1.5	1.7
Rest	15.9	17.1
Total	92.6	100

Image 7. Source: BP Statistical Review of World Energy 2018, Page 14

The conventional oil market: the OPEC +

The international oil market is by no means a perfectly competitive market with a fragmented supply coming from small producers that are independent of each other, but an oligopolistic market where a significant group of countries formed an organisation in the early 60s -the "Organisation of the Petroleum Exporting Countries OPEC) - to coordinate their production decisions and influence international oil prices.

The founder members of OPEC in 1960 were four large oil-producing countries in the Middle East (Iran, Iraq, Kuwait and Saudi Arabia) plus Venezuela. Other oil-producing countries joined later, in such a way that the OPEC now has 14 members, after the recent departure of Qatar in November 2018. Qatar now concentrates on the extraction and liquefaction of natural gas, and now often has tense relations with two neighbouring OPEC members, Saudi Arabia and the United Arab Emirates¹⁰.

¹⁰ See https://www.opec.org/opec_web/en/about_us/25.htm.

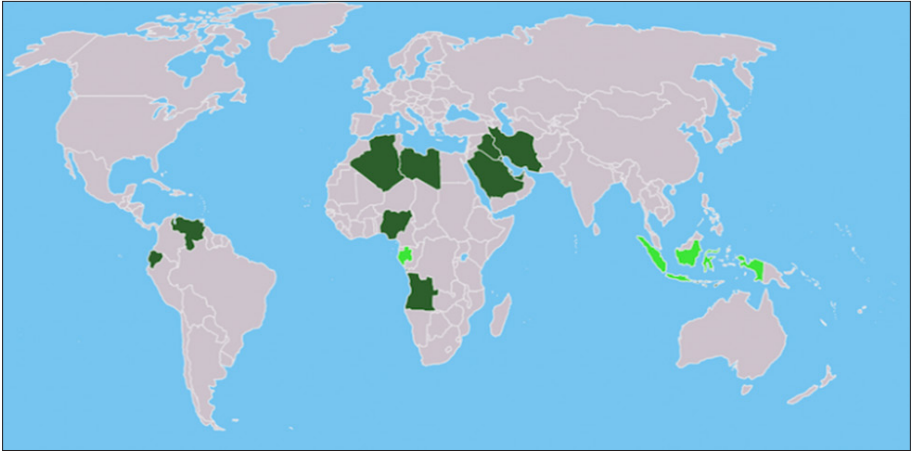


Image 8

The Soviet Union was never an OPEC member and had very strained relations with Saudi Arabia for two reasons, as a consequence of the alliance between Saudi Arabia and the United States and the Soviet support for Marxist regimes in Yemen and Ethiopia.¹¹ However, after the crumbling of the Soviet Empire in 1990, and especially, after Vladimir Putin came to power, there have been attempts to bring Russia and the OPEC countries closer together. Although on occasions there has been talk of Russia joining the Organisation, it has merely acted as an observer during OPEC meetings.

The OPEC has sometimes accused Russia of being a free rider, in view of the fact that as a producer it benefits from the rises in oil prices resulting from the OPEC production cutbacks, without making any significant contributions to those cutbacks. This was particularly the case after the World Trade Center attacks in September 2001, when the OPEC announced that it would cut back production to prevent oil prices from plummeting as a consequence of the political commotion. Russia offered to make up for the reduction in OPEC production and the latter threatened Russia, via the Kuwaiti Minister of Oil, “with lowering the price of oil to 10 dollars, which would affect everyone, but them most of all (in reference to Russia) whose production costs are higher”¹².

In recent years, cooperation with Russia has been closer, because the Russian President Putin and the Saudi heir Mohammed bin Salman see eye-to-eye and have a common interest in keeping oil prices high, especially after the drastic and unexpected drop that occurred in 2014. Ever since, there has been talk of an “OPEC +”.

¹¹ ELASS, Jareer & JAFFE, Amy Myers, “The History and Politics of Russia’s Relation with OPEC”, James A. Baker III Institute for Public Policy, Rice University, May 2009.

¹² ELASS, JAREER y MYERS JAFFE, AMY, “The History and Politics of Russia’s Relations with OPEC”, James Baker III Institute for Public Policy, Rice University, May 6 2009, Page 17.

The OPEC has a proven capacity to exert a short-term influence on oil prices, because its members:

- Have been supplying over 40% of the world's oil production, and a much higher percentage of conventional oil.
- Have a massive percentage of the world's known oil reserves which enables some of them -especially Saudi Arabia- to increase their production with relative ease, at least in the short term, thereby affecting international oil prices.

Prisoner's Dilemma

In economic terms the OPEC countries are a consortium of producers and, as is the case with all organisations of that nature, its members –together with the major producers that are not members but benefit from their decisions, like Russia- are subject to a Prisoner's Dilemma, caused by two opposing objectives:

- Each one has an interest in the group as a whole controlling the world oil supply, in order to achieve the international price that is on the best interests of the producers, taking into account the global demand situation and the risk of oil being replaced by rival products.
- However, once that high price is reached, the ideal for each producer is to increase its production to a maximum, given that when a producer has not reached its short-term production limit, the incremental (or marginal) cost of producing an extra barrel is lower than the sale price.

Yet if producer falls into the temptation of increasing its production above the quota allocated to it and “deceives” its fellow members or does not keep its promises, the Organisation will lose control of the international oil price, which will slump, and all the members will find their aspirations thwarted where the international price level is concerned.

In the heart of the OPEC, Saudi Arabia, as the leading country with the largest production, plays the role of Leviathan to a large extent, and tries to maintain group discipline and adapt its extraction volumes and exports to the fluctuations in demand or supply (swing producer), thereby contributing to price stability. Its weakness lies in the fact that the way of punishing “free riders” is in increasing their production –or at least to not restrict their production-, in order to force down the international price and “punish” the rest of the producers, but also punish itself.

Saudi Arabia has used this typical “Chicken Game” threat on several occasions, causing prices to plummet. This happened, for example, at the beginning of 1986 and in 2014.

The agreement reached at the meeting held on 6th and 7th December 2018 is a good example of that Prisoner's Dilemma structure, showing the OPEC's attempts to limit the production to control international oil prices, the hegemonic

role of Saudi Arabia –as leader of the Organisation- and of Russia’s external collaboration – and of the existence of an “OPEC +”-, when after gruelling negotiations, an agreement was reached to cut back production by 1.2 million barrels per day when compared to the production in October of that year, of which Saudi Arabia itself accepted a significant part and Russia undertook to collaborate with a cutback of around 200.000 barrels a day.

Factors in the consortium’s favour

- The OPEC’s traditional capacity to affect international oil prices and raise them has been favoured in the past by three factors:

The occasional crises, wars and embargos that have weakened the production and export capacity of some major world producers, or been conducive to political decisions aimed at restricting supplies and increasing prices.¹³

The best known episodes were undoubtedly the oil embargo agreed to on 17th October 1973 by the Arab OPEC countries against Israel and the countries that had supported the latter in the war that broke out on 6th October in that same year after the invasion by Egypt and Syria, which was followed at the beginning of 1974 by a twofold increase in oil prices; the major restrictions imposed on production and the consequent price rises that took place first as a result of the Iranian Revolution in 1978-1979 –whose effect was aggravated by Saudi Arabia’s decision in January 1979 to drastically reduce its production- and, shortly after, the Iran-Iraq War in 1980-1981; and the effects of Iraq’s invasion of Kuwait carried out in 1990-1991, initiated in August 1990 by Saddam Hussein.

- A reduction in the production capacity of several countries whose State Authorities, attracted by the prospect of large incomes in periods when prices were high, took over the ownership and control of domestic oil, which in several cases brought about a reduction in the effort required for oil exploration and to expand production capacity and, as was the case in the well-known fable, “killed the goose that laid the golden eggs”.

In fact, as Roberto Aguilera and Marian Radetzki pointed out, as from the 60s and 70s there was a wave of nationalisations in developing countries that were also oil producers (Algeria, Iraq, Kuwait, Libya, Saudi Arabia, Venezuela, etc.), prompted by a wish to have better control over the extraction activity and to obtain greater benefits for the population. However, with few exceptions, that nationalisation had a harmful effect on the oil companies, because politicians were appointed as managers, and they generally had little professional experience; because social functions were

¹³ See PASCUAL, Carlos and ZAMBETAKIS, Evie, “The Geopolitics of Energy. From Security to Survival”, Chapter 1 of the collective works “Energy Security: Economics, Politics, Strategies and Implications”, Brookings Institution Press, 2010. See also, the first author, “The New Geopolitics of Energy”, Center on Global Energy Policy, University of Columbia, september 2015.

attributed to the company that had little to do with running the business; and directly channelling to the State budget, the income coming from the sale of oil, without leaving the firms with sufficient funds to expand their production capacity or even maintain it. This led to “government policies restricting the growth of the oil-producing capacity. Hence, the heavy taxation on the oil sector as a whole have operated like a consortium limiting the supply, whose effect on price rises has probably had greater impact than the OPEC quotas”.¹⁴

- The increasingly close coordination that there has been between the OPEC and its leader, Saudi Arabia, on the one hand, and another major oil-producing country, Putin’s Russia.

Factors that limit the consortium’s power

Yet the producing consortium’s ability to wield its “market power” and keep oil prices high is limited, not only by the risk of “non-cooperation from its members inherent to all Prisoner’s Dilemma, for several additional reasons:

- The adverse impact of excessive price rises on the world demand for oil, owing to the contractive effect on economic and inflationist activity on the price level of oil-importing economies.
- The political pressure that the United States has exerted on Saudi Arabia and other producing countries to get them to increase their production and contribute to relaxing in international oil prices.

Those pressures became particularly clear in Autumn 2018, when the US President Donald Trump, after initially pressurising Saudi Arabia into making up for the effects of the embargo that the United States had imposed on Iranian oil exports by increasing production, intensified its pressure immediately before the OPEC meeting in December 2018, so that Saudi Arabia would not reduce its production and, in contrast, be conducive to a drop in prices that had commenced months before, that Mr. Trump had compared to a lowering of taxes that would lead to economic growth in all the importing countries.

As the murder of the Saudi Arabian dissident and columnist for the Washington Post Jamal Khashoggi in the Saudi Arabian Consulate in Turkey, was attributed to Crown Prince Mohamed Bin Salman, this increased President Trump’s negotiating power. Trump detracted importance from the brutal murder as long as Saudi Arabia and its Crown Prince demonstrated that they were prepared not to cut back oil production and to keep prices low.

¹⁴ AGUILERA, ROBERTO & RADETZKI, MARIAN, “The Price of Oil”, Cambridge University Press, 2016.

Two more factors have been added to those two factors in recent years, both of which will undermine the OPEC's capacity to control international energy prices and the geopolitical importance to the western countries of events in the Middle East: the discovery of alternative or unconventional oil sources in the United States -and, to a lesser extent, in Canada and other countries-; and the international efforts to combat global warming and climate change and to promote a "decarbonisation" of the world economy: when the global demand for oil starts to wane (peak oil), some foresee the "mother of all crises in the oil market".¹⁵

The unconventional-oil revolution

The international oil and gas markets have undergone a genuine "revolution" – the so-called "shale revolution"- since the United States developed a new gas and oil extraction technique in the first decade of this century. The technique is based on the horizontal drilling and subsequent hydraulic fracturing (fracking) by injecting liquids and solvents under pressure into shale and sandstone deposits, and carbonates impregnated with hydrocarbons. Oil produced in this way, which is light, is habitually known as tight oil (i.e. oil obtained from compact formations).

Large-scale production started in the States of Texas -in the Permian Basin to the west of the State and the Eagle Ford Basin in the south- and in North Dakota -in the *Bakken Shale*- and led to a significant growth in US oil production as from 2008, which made up for the fall in production caused by political events between 2011-2014 in oil-producing countries such as Iran, Libya, Sudan or Syria and paved the way for stabilisation of oil prices in those years.

As a result of the aforementioned revolution, and according to the predictions from the International Energy Agency, the United States will account for over half the growth in the world production of oil and gas that will take place between now and 2025, by which time it will already be the biggest producer of both hydrocarbons, with a market share of 20% in oil and 25% in gas¹⁶.

Unconventional-oil production has two characteristic features:

- Progressing cheapening of costs

Although at first the production of that type of oil was only profitable as from 50 dollars a barrel, prices are currently much lower.

- Moderate Investment Cost

The exploration and exploitation of new conventional oil deposits is very costly- those that are easier to access were discovered and began to be operated years ago-, operating and drilling new wells is quick and cheap, and costs only a few million dollars.

¹⁵ "When the sun sets on oil. The Middle East and Russia are ill-prepared for a low-carbon future", The Economist, Special Report, 15th March 2018.

¹⁶ WEO 2018, *op. cit*, Chapter 5.

As the British journal “The Economist” explained in its memorable article “Sheikhs vs. Shale”¹⁷, the development of unconventional oil has radically altered the economic dynamics of the international oil market: “the price of oil will be less vulnerable to shocks or manipulations. American shale oil is a genuine rival to Saudi Arabia as a marginal world producer”.



Image 9

In conclusion, the OPEC countries occasionally underwent the typical Prisoner’s Dilemma of all collusive agreements between producers, but, when the circumstances and the threats if its Leviathan, Saudi Arabia, enabled its members to overcome it and control the supplies, the Organisation was able to intimidate the rest of the world, as it did during the classic oil crises of 1973-1974 and 1978-1979.

Two new events are weakening the OPEC’s ability to control international oil prices and coerce consumer countries in the typical way of the Chicken Game:

- In the short-term, the United States’ transformation into the world’s main oil producer, with decreasing production costs that enable its producers to survive with relatively low oil prices;
- In the medium-term, the risk to the traditional oil producers that international efforts to combat climate change and encourage “decarbonisation” of the economies will cause a drastic reduction in the consumption of hydrocarbons and, if successful, make the countries with large reserves of hydrocarbons have to leave them untapped, as “stranded assets” or “unburnable fuel”.

That risk will be accentuated when a world peak oil consumption point is reached, because from that point on stiff competition will be unleashed in-

¹⁷ THE ECONOMIST, “Sheikhs vs. Shale”, 4th December 2014, available at <https://www.economist.com/leaders/2014/12/04/sheikhs-v-shale>.

volving all producers to dispose of their reserves before they are buried forever.

It could thus be a possibility that the OPEC, together with Russia, attempt to sharply increase oil prices, and that the outcome of this might be typical of the “called bluff” game.

Yet, the fact that the United States has joined the group of major hydrocarbon producers, coupled with the fear they all might share of a global decarbonisation strategy depriving them of income and leaving their major investments and hydrocarbon reserves “stranded”, will forge a new coalition between all of them -United States, Russia, Saudi Arabia, Kuwait, etc.- against the international fight against climate change. A glimpse of such a tacit coalition could already been caught in December 2018 at the 24th United Nations Framework Convention on Climate Change held in Katowice (Poland).

Natural gas

Market structure

Natural gas was historically considered to be a mere by-product of oil extraction and in the supply contracts –which were generally long-term contracts and the purchaser was bound by the take or pay obligation- the price being linked only to oil.

However, natural gas has been gradually detaching itself from oil (decoupling) and has firmly established itself as the cleanest hydrocarbon (its combustion also emits CO₂, but only approximately a quarter as much as coal and half as much as oil).

At present, the natural gas production structure is very different from that of oil, because although Russia is the world leader and the United States is also now among the major producers –thanks to the “shale revolution”, the other major producers are Australia, Norway and Qatar –a major gas producer whose oil production is very limited-, plus other countries scattered all over the world (Nigeria, Trinidad and Tobago, Bolivia, Argentina, etc.).

In spite of the growing development of markets (hubs) where immediate gas deliveries are negotiated (spots) –which received a great boost thanks to the efforts of the European Authorities to create them, especially after Russia cut off the gas supply to Ukraine in Winter 2006, and Japan’s sudden supply requirements after the Fukushima nuclear accident in March 2011- it cannot be said that the international natural gas market is a “bathtub” as standardised and integrated as the oil “bathtub”, because a significant proportion of natural gas is transported from the producing countries to the consumers via gas pipelines, complex infrastructures which make producing and receiving countries heavily dependent on each other.

Yet the development of a booming liquid natural gas (LNG) industry –based on the liquefaction of the gas at facilities in the producing countries, transporting it by ship and storing or regasifying it in the destination countries– has helped to improve integration between the different regional gas markets.

Proof of the fact that this integration process is not complete, is the notable price differences for gas in the three major regional markets: the American, whose main price reference is Henry Hub (in Louisiana); the European, where the primacy of the British National Balancing Point is losing ground to the Dutch Title Transfer Facility (TTF); and the Asian one, where the reference prices are still the Korean and Japanese markets. To a large extent, the reason for this is that LNG not only has a liquefaction cost, but also transporting and storage costs, which are greater than they are for oil.

Nevertheless, those differences are much smaller now than in the past, as a consequence of price arbitration between markets, which causes the deliberate diversion of LNG shipments to those destinations with higher prices. The fact that the rivals' defence authorities in several parts of the world –especially those of the European Union and Japan, which signed a Memorandum of Cooperation in this area in June 2017, as well as Korea, India and other Asian countries– are treating as abusive those clauses in the gas supply contracts –the so-called “destination clauses”– which require the intermediary who purchases the gas to sell it necessarily in a particular destination country, without being able to divert it to other destinations where the prices are higher, or that impose conditions on the amount of the product that can be diverted and the destinations concerned.

The European Union began to clamp down on these gas pipeline contract clauses stipulated by the Russian Gazprom when supplying European Union countries, but has since applied that same approach to all liquid gas shipments to the European Union from anywhere in the world (Nigeria, Algeria, Qatar, etc.). In doing this, it seeks not only to achieve greater integration in the European Union regional gas markets, but also to facilitate a secure supply for the Union countries as a whole.

European dependence on Russia

Natural gas has aroused certain geopolitical concern in Europe, in view of the gradual depletion of reserves in the Dutch and British deposits in the North Sea and the great dependence of Central and Eastern European countries on Russian gas supplies via gas pipeline.

In fact, as can be seen in the graph¹⁸, if we set aside the gas pipelines that reach Spain and Italy from Algeria and Libya and those coming from Norway, the rest

¹⁸ Available at https://www.entsog.eu/sites/default/files/files-old-website/publications/Maps/2017/ENTSOG_CAP_2017_A0_1189x841_FULL_064.pdf of the *European Network of Transmission System Operators for Gas* (ENTSOG).

of the gas pipelines that supply the countries of Central and Eastern Europe all come from Russia, either via Belarus and Ukraine, or they run along the Baltic seabed (what is known as *Nordstream 1*).

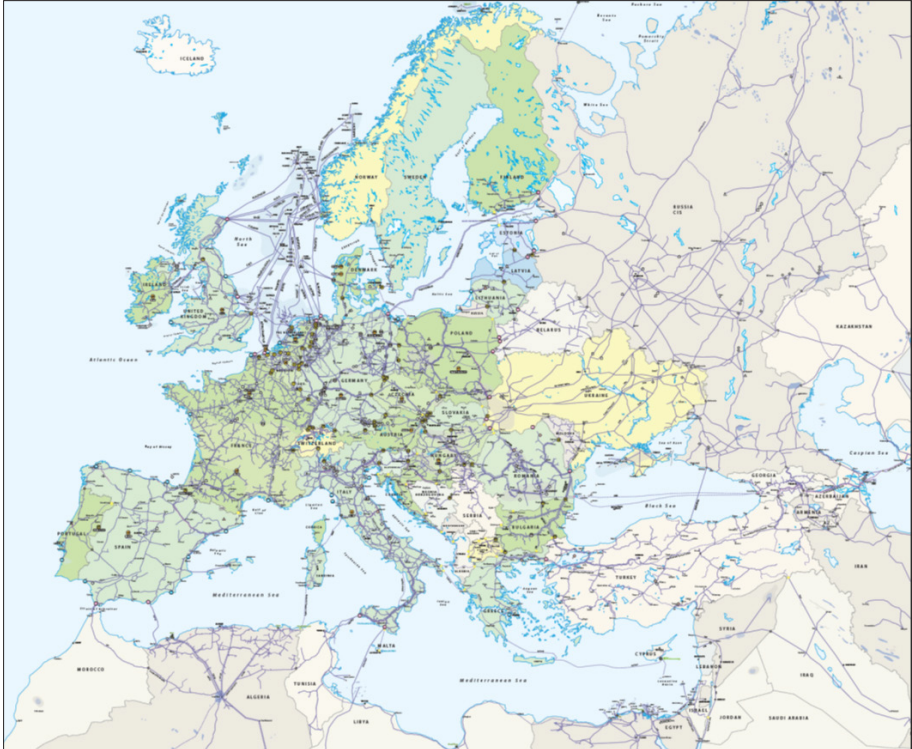


Image 10. Source: The European Natural Gas Network 2017 (ENTSOG)

Some find that this structure runs the potential risk of Russia utilising the gas supply as an “energy arm” at the service of its geopolitical strategies, as it did with and with other former Soviet Republics, such as Georgia, Belarus or Moldova. These people point out that although Gazprom, the public company that rose from the ashes of the former Soviet Ministry of Gas, is listed on the Stock Exchange, it follows the political instructions it receives from the Russian Government. Remember that in January 2006 Gazprom cut off the gas supply to Ukraine over a dispute concerning a price increase, and the supply restrictions also ended up affecting several European Union Member States. Russia then claimed that the dispute with the Ukrainian company Naftogaz was purely commercial. However, Ukraine indicated that such a massive price rise -from 50 to 230 dollars per thousand cubic metres- was a political reprisal for the pro-western attitude adopted by Ukraine’s new President, Victor Yuschenko.

Along the same lines, in January 2009 Gazprom once again cut off the supply, not only to Ukraine, but also to European Union countries, given that gas was supplied mainly through the gas pipelines that cross Ukraine.

Russia subsequently cut off the gas supply to Ukraine again in June 2014, as a result of a trading dispute between Gazprom and the Ukrainian importer Naftogaz; this time, the background to the problem was political, i.e., Crimea's unilateral declaration of independence in March of that year –which was wholeheartedly backed by Russia- and Russian support for the separatist rebel forces of Eastern Ukraine.

Nevertheless, have interpreted the supply of Russian gas to Germany as a perpetuation of the *Ostpolitik* that the Social Democrat Chancellor Willy Brandt embarked on in 1969 with its policy of rapprochement towards the then Soviet Union: it was a way of establishing cooperation ties between the Soviet Union and Germany that, in the end, would lead to a favourable transformation, which is exactly what happened in 1990 with the fall of the Berlin Wall.

To be consistent with this policy, towards the end of the 90s the idea of a new gas pipeline was discussed that would directly connect Russia with Germany via the Baltic. It was eventually named *Nord Stream*, but not laid until 2010 and not commissioned until 2011. Later, to increase its conveyance capacity, a new investment costing approximately € 9.5 billion was devised, to increase the capacity of the connection and create *Nord Stream 2*.

However, the idea of *Nord Stream 2* went against the grain with the initiatives of the European Commission, Austria and other countries, which had unsuccessfully promoted the construction of a new gas pipeline –known as the “Nabucco Project”– to transport gas from the deposits of Azerbaijan on the Caspian Sea via Turkey, to the Balkan States, bypassing Russia to the south.

So, if the first *Nord Stream* project had its misgivings, the new project provoked the opposition of several countries in the European Union, led by Poland and the Baltic States, plus the European Commission, Ukraine and, above all, the United States, which threatened to impose sanctions on any firms participating in its construction (but without actually implementing them, especially after President Trump came to power).

Those who criticised *Nord Stream 2* pointed out that it would increase German dependence on Russian natural gas and, thus, affect the European Union's foreign policy, which would be exposed to the risk of playing chicken with a major power, Russia, on which its energy depends.¹⁹ The critics also added that it would enable Russia to act selectively against the countries -like Poland or Ukraine- through which its land gas pipelines passed, because closing those

¹⁹ See, for example, in The Economist, “Germany's Russian gas pipeline smells funny to America”, 22nd June 2017, “Putin's power play. The Nord Stream 2 pipeline will strengthen Russia's hand”, The Economist, 19th July 2018 y “Why Nord Stream 2 is the world's most controversial energy project”, 7th August 2018.

gas pipelines would not prevent Russia from continuing to supply gas to Germany and other major consumers via *Nord Stream*. Furthermore, this would also reduce the income they currently obtain from rights of transit passage (which in the case of Ukraine exceed 2 billion Euros a year).

Yet defenders of the new gas pipeline indicated that the dependence created would be reciprocal, as Gazprom will need the income from gas sales as much as the German purchasers will need the supply. They likewise argue that the United States' opposition to the new gas pipeline is motivated by trade interests, because the "shale revolution", coupled with the transformation into liquefaction plants of the facilities originally created on the US Coast in the Gulf of Mexico for the regasification of imported LNG, have jointly transformed the United States into an LNG exporter that competes in Europe with the natural gas arriving from Russia.

The truth of the matter²⁰ is that the gas supplied by Russia via its gas pipelines is cheaper than the gas obtained by regasification of the LNG imported by ship, which is limiting the use of LNG in the European Union. As a result, it is estimated that in 2017 Russia supplied via its gas pipelines, 35% of the gas consumed in the European Union.

Geopolitical implications

As the International Energy Agency pointed out in its Annual Report issued in November 2018, "Russia is still the greatest gas exporter in the world, because it is opening up new routes to the Asian markets. However, an increasingly integrated European market offers purchasers more gas supply options".²¹

To ensure that it is not forced to play "chicken" with Russia if the latter threatens to use its gas as a weapon, the European Union is adopting a strategy on three fronts:

- Supporting interconnection of the European gas pipeline network, establishing other new gas pipelines with exporting countries other than Russia –such as Norway– and promoting the development of one single integrated and free gas market in the European Union from which all the countries can be supplied under the same conditions.
- Being able to count on an extensive infrastructure for importing LNG, wherever it comes from, and even if it is not used very often while Russian gas is the cheapest. The very fact that such installations are available for importing LNG will help to provide a secure gas supply for the European Union²².

²⁰ "Why America struggles to sell LNG in Europe, The Economist, 16th November 2018.

²¹ WEO 2018, *op. cit.*

²² JAFFE, Amy Myers, "Renewable Energy, Russian Natural Gas and the Lessons of January 2006". Blog post of Council of Foreign Relations, 26th October 2018.

- Pursuing a decarbonisation strategy, because apart from serving in the fight against climate change, it will reduce the European Union's energy dependence and restrict the bargaining power of the predominant suppliers such as Russia.

Diversifying its gas supply sources, creating an efficient domestic market and decarbonisation –i.e., replacing hydrocarbons with renewable energy– are the tools that will enable the European Union to transform into a “called bluff”, any threat coming from a country that supplies natural gas.

The profitability of the long-term investments

Nearly every energy production and supply project –be it conventional oil, natural gas or even renewable energies– requires major initial investments to be made that can only be recouped in the long term, with the income generated from operating them over many years. However, as such income is likely to depend on unpredictable future circumstances, whoever undertakes or finances such investments will be exposed to serious risks of different types.

On the one hand, as is what generally happens in many industries characterised by a high initial fixed outlay, once the investment has been made and the operation is under way, the “variable costs” of operation and especially, the “marginal cost” of producing one more unit of the product will be relatively low. In such a situation, as the cost of investment will now be a “sunk cost” –i.e., inevitable–, although the product sale prices are not consistent with the original expectations, the producer has a vested interest in producing all that he can, as long as his income covers his variable costs, even if he does not manage to cover the fixed costs of his initial investment. However, if there are many producers who think and react that way, the glut on the market will cause prices to plummet, which will aggravate the situation of all the producers still further, and plunge them into one of those “Prisoner's Dilemmas”, as explained above.

On the other hand, if the sale prices are favourable and the heavy initial investment promises to be profitable, there is a risk that the political authorities, worried about the high prices –that they deem to be much higher than the marginal costs of production–, tempted by the profitability of a business based upon exploiting a natural resource or, motivated by other subsequent concerns, bring about legal changes or take measures that greatly reduce the profitability of the project.

All in all, as we have already explained, whoever makes major investments in the energy sector will inevitably be deeply involved in a “Trust Game” in which those that will play the role of “initial bidder” and will have to trust that the future binomial market conditions–regulatory framework will provide them with operating conditions that, consistent with the increased wealth that the project generates, will enable them to make their original investment profitable.

Therefore:

- If the investors fear that the current regulatory framework at the time they plan their investment will not remain stable, and that it could unexpectedly change to their detriment, they will be reluctant to go ahead with that investment. It is a deeply-rooted problem that we could call the “obsolescing bargain”, for the following reasons.
- If the investors are afraid that when the new installations come into operation the abundance of supply or the lack of demand will be so great the price will plummet –and it will adapt to the moderate marginal costs of the most efficient firms–, they will probably back out of the projects. This is what might happen in the hydrocarbons market if there is a widespread conviction that decarbonisation and energy transition are irreversible phenomena, that the maximum world demand for oil (peak oil) will be reached in the next 20 years and that many of the oil reserves will remain unconsumed.²³ It is what is known on the financial markets as the “financial risk of carbon”.

Paradoxically, if these fears were to bring to a halt investments in new hydrocarbon-based projects –whether through exploring for new oil or gas deposits, or developing natural gas liquefaction, transportation or storage structures- some would not rule out the possibility that in the coming years there could be price tensions, especially in winter periods when energy consumption shoots up and energy production from renewable resources decreases.²⁴

The risk of “obsolescing bargains”

In 1971, Raymond Vernon, a former high-ranking civil servant in the US Department of State and later a Harvard Professor, described the phenomenon that he called the “obsolescing bargain”.²⁵ According to Vernon, before a multinational makes an investment, it will have great bargaining power: the potential host country will be interested in attracting foreign capital and new technologies, and will be prepared to offer the large foreign company a favourable agreement. That good relationship will last as long as the foreign company continues to invest. However, the foreign multinational will become vulnerable as soon as it has made the investment. This is because if the business is profitable, the government and the local inhabitants will start to say that the foreign firm is making

²³ GAPPER, John, “The romance of drilling for oil has faded”, *Financial Times*, 29th November 2018.

²⁴ KHANBERG, TATIANA, “Why Continued Investment in Gas Infrastructure is not Optional”, *Natural Gas World*, 19th November 2018.

²⁵ VERNON, Raymond, “Sovereignty at Bay: The multinational spread of U.S. enterprises” Prentice Hall Press, 1971. See also, from the same author “Sovereignty at Bay: Ten Years After”, *International Organisation*, Volume 35, Issue 3, 1981 and “Sovereignty at Bay: Twenty Years After”, *Millennium Journal of International Studies*, Vol.20, No 2, 1991. As Vernon died in 1999, he could not write any later versions.

an exorbitant profit, having soon forgotten to take into account the risks that the company took on when investing in the first place. Moreover, if the investment aroused the interest of local firms, improved the infrastructures and opened up the country to foreign capital, the local authorities, seeing the range of options being offered to the country, will review the agreement originally reached with a critical eye. In doing so, the authorities will appease local politicians and pressure groups who demand that the country recovers its economic sovereignty and do not “sell out” to foreign capital. So, the political dynamics within the country hosting the investment will end up by rendering obsolete the agreement whereby the original investment was made. It is sometimes the case that, as in the “Trust Game”, investors will even find difficulty in recovering their initial investment and will end up being expropriated.

In fact, the “obsolescing bargain” phenomenon is a general problem that affects all long-term contracts or investments, when the future conditions that can be foreseen at the time the contract has to be implemented give great incentives to one of the parties to disassociate itself from its original commitments. This risk will be particularly great:

- In long-term supply contracts, i.e. “Purchase Power Agreements” (PPA), when the parties take on a quantity commitment –which in the case of the purchaser take the form of a “take-or-pay” commitment and set a price that is different from the prevailing market price “spot” when the contract is being carried out.
- When there are investments in renewable energies protected by the public authorities announcing very favourable investment terms, when there is a future risk of subsequent events making it unfeasible to maintain those terms.

How can a political authority “bind its own hands” to convince an investor that it is not going to change the rules of the game later, for no reason, in order to act to the detriment of the investor and make his project less profitable?

The traditional technique has been to get the host country to subscribe to an International Treaty that protects the investors against expropriation or unjustified regulations that harm their interests, and that in such circumstances, they have the right to receive compensation.

It was this initiative that was adopted at the beginning of the 1990s by European countries and the new republics that emerged from the break-up of the Soviet Union, when they signed the Energy Charter Treaty in 1994.²⁶ The essential element of the Treaty was that cooperation in energy projects could be a positive area for European firms and the new republics and established detailed rules for providing the trust required to carry such cooperation. But such rules ap-

²⁶ The Treaty can be referred to at <https://energycharter.org/process/energy-charter-treaty-1994/energy-charter-treaty/>.

plied equally to all the countries that received investments in the energy sector. That is why it is paradoxical that this Treaty, originally conceived by many European countries as a mechanism to protect Western investors who were going to undertake energy projects in the new republics and exploit their abundant resources, has been the instrument utilised by foreign investors in renewable energy projects to sue Spain and other European countries for alleged non-compliance with that Treaty.

The renewable resources paradox

In some electricity power plant investment projects a problem not unlike the “Trust Game” might crop up as a result of the interaction between the regulations currently governing the electricity markets –drawn up at a time when combined cycle gas power plants were in a period of expansion, when it was assumed that they would be establishing the price– and the gradual success of renewable energies. A group of economists from the Saudi Arabian research centre has called this “the clean energies paradox”.²⁷

In fact, ever since the pioneer reforms in the United Kingdom midway through the 1990s, the “spot” electricity markets have been organised following a “marginalist” principle of price fixing, in such a way that the wholesale price of electricity is that of the most highest bid that is necessary to cater for the global demand in the corresponding time slot. However, as renewable energy invariably forms part of the overall bid at a negligible or very low price. When it is sufficient to cater for the demand, the market price falls to zero or is very low, which is good for consumers, but this deprives all the electricity producers of income and acts as a deterrent to investing in new installations.

The International Energy Agency detected this problem in its most recent report, when it stated that “current electricity market designs are not always ready to tackle the challenge of rapid changes in the generation mix. The income in the wholesale markets is usually insufficient to promote new firm investments in generation capacity, which could jeopardise the reliability of the supply if not dealt with adequately”²⁸.

Therefore, it would seem clear that a growing influence of renewable sources of electricity will make it necessary to thoroughly review the electricity price-setting systems, in order to prevent the disturbing “Trust Game” that causes for investors in electricity power stations the current electricity price-setting system.

²⁷ BLAZQUEZ, Jorge, BOLLINO, Carlo Andrea, FUENTES, Rolando & NEZAMUDDIM, Nora, “The Renewable Energy-Policy Paradox”, King Abdullah Petroleum Studies and Research Center (KAPSARC), 2016, available at file:///C:/Users/usuario/Downloads/KS-1650-DP045A-The-Renewable-Energy-Policy-Paradox.pdf.

²⁸ WEO, *op. cit.*

Combating climate change
The climate change problem

As a result of a build-up of CO₂ and other “greenhouse effect” gases “in the Earth’s atmosphere, scientists from the Intergovernmental Panel on Climate Change (IPCC)²⁹ estimated in their most recent study that human activity already raised the Earth’s global mean surface temperature³⁰ by approximately 0.87°C in the period 2006–2015, when compared to the average temperature for the period 1850–1900 (which is utilised as being representative of the “pre-industrial” period); and that this “anthropogenic” global warming is still increasing by 0.2°C every decade³¹. Those estimates refer to the global mean warming of the Earth’s surface, and are consistent with a warming that is much higher at certain seasons and in certain world regions –such as the Antarctic, where warming is estimated at between twice and three times as high as the global average–.

Most scientists consider that this global warming will have many adverse effects, including:³²

- A rise in the sea level, as a result of the melting of the polar ice caps, which would submerge low-lying islands and land zones.
- An increase in the number and severity of extreme meteorological phenomena (droughts, hurricanes, floods, etc.) with a potentially devastating impact on many parts of the world and serious social and political consequences (famine, large-scale migrations, etc.).
- A serious impact on many ecosystems and biodiversity –which would involve the extinction of many species, unable to adapt to the new climatic circumstances–, and the appearance of tropical illnesses in regions they had never affected before.

The effects could be particularly severe if the temperature rise were to exceed 3 degrees or more. In such scenarios, the Himalayan glaciers would melt, which would alter the courses and discharges of the rivers on the Indian subcontinent, one of the world’s most densely populated zones; the melting of the polar ice caps and the expansion of the water would raise the sea level, which

²⁹ The IPCC was established in 1988 by the World Meteorological Organisation and the United Nations Environment Programme to periodically assess global warming from a strictly scientific perspective.

³⁰ In English, *global mean surface temperature*, or abbreviated to GMST.

³¹ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), “Global Warming of 1.5°C. Summary for Policymakers”, 2018, available at <https://www.ipcc.ch/sr15/chapter/summary-for-policy-makers/>.

³² Despite the scepticism shown by the Trump Administration to climate change, the Fourth National Climate Assessment conducted jointly by 13 federal agencies in the United States and published in November 2018, confirmed the seriousness of the potential damage that climate change could cause –and is causing– in the United States. The assessment is available at <https://www.globalchange.gov/nca4>.

would leave the low-lying coastal zones under water; the Amazon Basin could change greatly; and certain parts of the world would become desertified (possibly including part of Southern Europe). These changes would probably bring about large-scale population movements, as people fled from the worst affected zones. It is difficult to imagine that such migration could take place without causing wars or serious social conflicts.

Some of these effects are already inevitable, and make it advisable that the countries, regions and communities most affected take measures to adapt to the climate change that is under way. They also advise the international community to take the measures required to mitigate the temperature increase and, thus, contain the adverse impacts of warming and prevent the uncertainty of an uncontrolled warming.

The amount of cumulative CO₂ in the atmosphere at the end of 2017 was approximately 2.2 billion tonnes and it is still increasing at a rate that is currently close to 42 billion tonnes³³ per year, an annual increase that could rise to 52-58 milliards a year in 2030 if the States merely comply with the modest limits they have agreed to commit themselves to. That level of emissions would foreseeably cause a temperature rise by 2100 of no less than 3°C.

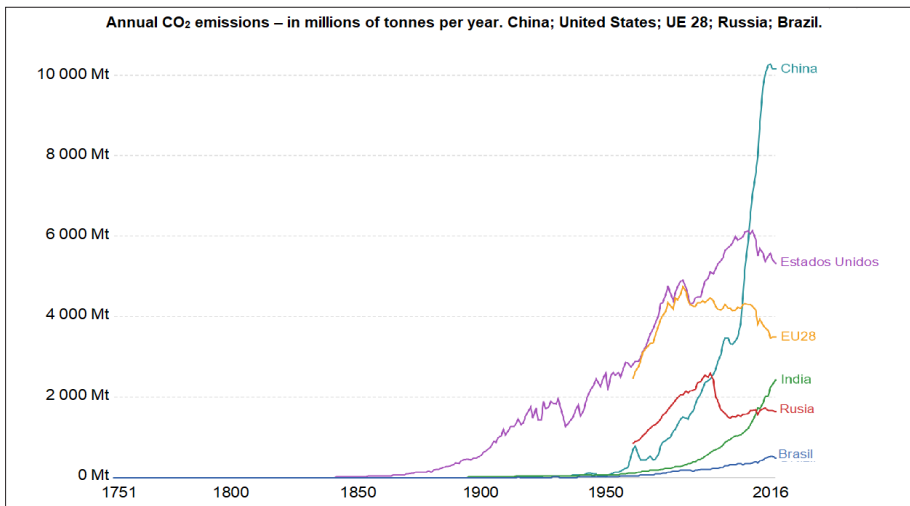


Image 11. Source: Global Carbon Project (GCP); Carbon dioxide information analysis center (CDIAC); adapted from OurWorldInData.org

As the enclosed graphs show, the main emitters of CO₂ have traditionally been the United States and the rest of the industrial countries, and they are still accounting for most of the CO₂ that has built up in the atmosphere. Yet China, and

³³ The Spanish "millardo", i.e., 1,000 million, which is generally equivalent to one "billion" in English. However, the climate change experts generally use the term "gigaton" (abbreviated to Gt) when referring to a millardo of metric tonnes of CO₂ (i.e., GtCO₂).

to a lesser extent, India, Brazil and other emerging economies are rapidly increasing their annual emissions, China now being the world's main CO₂ emitter. However, China's cumulative emissions are still much lower than the levels in industrialised countries.

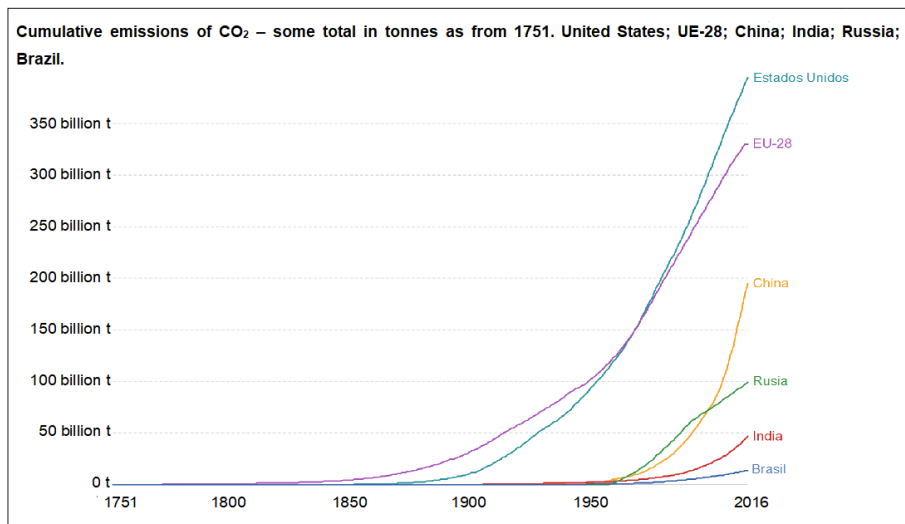


Image 12. Source: Global Carbon Project (GCP); Carbon dioxide information analysis center (CDIAC); adapted from OurWorldInData.org

To make sure that in 2100 the temperature increase does not exceed 1.5°C, the following will be necessary:

- That the annual global CO₂ emission rate is reduced as from 2020, in such a way that the additional amount emitted up to 2050 does not exceed 580 billion tonnes, so that the total cumulative CO₂ in the atmosphere does not surpass 2.8 billion tonnes.

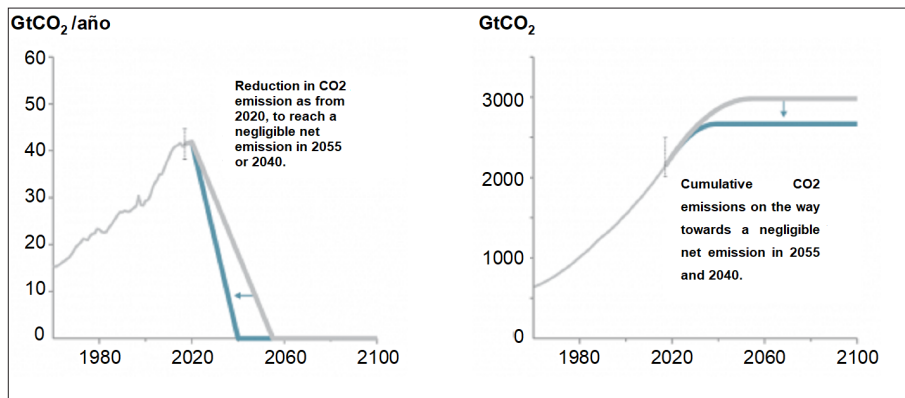


Image 13. Source: IPCC Special Report 1.5 October 2018

- That a negligible net global emission rate is achieved by around 2050.

This great effort can be seen in the following graphs, which show annual and cumulative emissions:

From Río (1992) to Paris (2015)

Aware of the global nature of the problem and that CO₂ and other greenhouse gases emissions from anywhere in the world build up in the atmosphere regardless of their origin, in 1992, during the so-called “Earth Summit”, held in Río de Janeiro, approval was given to the “United Nations Framework Convention on Climate Change”, with the deliberate aim of limiting the emissions of such gases.

Although that first Convention did not involve getting the signatories to accept any specific emission-reduction commitments, it was agreed that the countries that signed would hold periodical meetings to elaborate upon their predictions (known as “Conferences of Parties” (COPs). The most recent of these, -COP 24-, took place between 2nd and 15th December in Katowice (Poland).

Combatting global warming is politically difficult, because:

- The benefits –the prevention of catastrophic phenomena- will be obtained by future generations, but the cost involved must be paid for by today’s citizens and voters.
- There is the classic problem of the “stowaway” or “free rider”, because any CO₂ emission raises the global level in the atmosphere and harms everyone, without anybody having an incentive to reduce their own emissions.
- As what matters is the cumulative level of CO₂ in the atmosphere and past emissions were mainly made by the industrialised countries, the emerging countries (China, India, Brazil, etc.) now consider they have the right to emit their own.
- The total “decarbonisation” of the world economy would prevent a significant proportion of the already demonstrated reserves of fossil fuels from being extracted (“stranded assets” or “unburnable oil”), causing the consequent economic damage to their owners.
- In contrast to initial expectations, cheap methods have not yet been developed to capture and store CO₂ (“sinks” or Carbon Capture Storage systems (CCS). Therefore, efforts must focus on limiting new emissions.

In developing the Framework Convention, in December 2007 several countries –including the United States –which after the presidential elections of November 2002, had Bill Clinton and Al Gore heading the Government- signed a Protocol in the Japanese city of Kyoto, whereby the industrialised countries and the Eastern European countries were required to reduce their emissions of those gases between 2008-2012 to below the 1990 levels.

The United States played an active role in its negotiation, encouraging a “flexibility mechanism” that made the CO₂ emission rights negotiable and transferrable, in such a way that one country could exceed the allocated emission limit if it purchased from another country’s CO₂ emission rights, if that other country was able to do without them. That negotiability means that the total emissions are reduced where they can be attained at a lower cost. The idea, which initially received a hostile reception from the environmentalists, was eventually accepted and the European Union itself adopted it to ration CO₂ emissions.

At Kyoto, every industrialised or developing country or group of countries was allocated a specific reduction percentage (for the European Union, 8% for the United States 7%, for Russia and Ukraine, 0%, etc.). However, the developing countries (China, India, Indonesia, Brazil, etc.) did not accept any quantitative commitment at all, because they argued that taking as a reference the emissions of each country in 1990, favoured the industrialised countries.

The negotiations for that Treaty and its subsequent implementation –which did not bind emerging countries such as China and India and was not ratified by the United States, after George W. Bush’s triumph in the Presidential Elections of 2000– revealed the serious difficulties involved in achieving an effective agreement on a world scale to reduce global emissions of greenhouse gases. There were various obstacles:

- Firstly, some scientists and pressure groups from certain countries –especially, the United States, after the republican victory– cast aspersions on the harmful global effects of that phenomenon or were confident that future technological breakthroughs could render it unnecessary to take immediate and drastic measures to cut down on gas emissions.
- Secondly, the major emerging countries, such as China and India, stressed that the cumulative CO₂ in the atmosphere up until that time had been emitted by the industrialised countries, which meant it was unfair to make the emerging countries give up their economic development to prevent the global build-up of gases from exceeding certain limits, all the more so when the gas emission level per inhabitant was still exceptionally high in the United States and other major industrial countries.

To begin with, Russia did not share these opinions, because its high level of emissions in 1990 and the serious economic and industrial crisis that affected it after the demise of the Soviet Union gave it hope that it could sell emission rights (“hot air”, as the environmentalists derogatively called it) to other countries. However, the renewed prospects of economic growth, the fact that China was not bound by the restrictions, the United States’ withdrawal from the Protocol and President Putin’s coming to power, all served to radically modify the Russian Authorities’ viewpoint. They began to argue that the Protocol was harmful to Russia, because it erected barriers that were incompatible with the country’s growth.

Despite the limited practical success of the Kyoto Protocol in limiting global emissions between 2008 and 2012, the European Union continued to advocate that all the industrialised countries should accept for 2013 to 2020, the emission reduction percentages required to stabilise the CO₂ level in the atmosphere and succeed in ensuring that the temperature increase did not exceed 2°C. The developing countries were expected to substantially modify their growth rate, even if they did not reduce their emissions.

But even the United States flatly refused and, to cap it all, the negotiations for a new and binding Protocol proved to be unfeasible. The serious financial crisis that shook the world after the bankruptcy of Lehman Brothers in September 2008 detracted from the Governments' and citizens' interest in a distant problem like global warming.

The Copenhagen Summit of 2009 failed to achieve a new agreement to replace the Kyoto Protocol, but it did lay the foundations for the limited agreements that were reached in December 2015 in Paris at COP-21.

The Paris Agreement

In December 2015, still with a Democratic Party President in the United States, Barack Obama, COP-21 achieved in Paris an Agreement that, albeit non-binding, put an end to the "negationist" views of those who doubted the existence of an anthropogenic climate change and that to pursue a policy of "business as usual" would predictably lead to a mean temperature rise on the planet of over 4°C by the end of the century, whose consequences could be catastrophic.

The Paris Agreement:

- Setting a limit of 2°C on the mean temperature rise of the Earth by the end of this century, but with the intention of trying to ensure that it did not exceed 1.5°C, given that the effects of climate change are unforeseeable and not linear.
- It was signed by nearly every country in the world, and removed the old distinction between industrialised and emerging countries.
- All the countries that signed undertook to create their own "Intended Nationally Determined Contributions (INDCs)". Once they are voluntarily established by each country, their fulfilment will be subject to international verification.
- The INDCs will be measured every 5 years, the following being applied to all countries: the same methodology, the extent to which the national targets have been achieved and their sufficiency for achieving the global target set.
- A "Green Climate Fund" will be provided with a minimum of 100,000 million dollars to help developing countries to develop climate change adaptation and mitigation policies.

Therefore, the Paris Agreement did not establish legally-binding emission-reduction targets and did not create a leviathan to punish the defaulters. It merely established a transparency and collective monitoring mechanism for the emission moderation commitments accepted voluntarily by the countries that signed.

The Decarbonisation Challenge

As the International Energy Agency indicated in its Report in October 2018, the world CO₂ emissions, after remaining stable in the 2014-2016 period, increased again by 1.6% in 2017 and will foreseeably continue to do so in 2018, which makes it stray from the path required to achieve the targets established in Paris.³⁴

To achieve those targets, the following will be necessary:

- Improving energy efficiency (i.e., less emissions per unit of GDP).
- Closure of coal power plants, unless they are equipped with confinement and CO₂ capturing systems. Here there have been no global breakthroughs: although the use of coal has decreased in the United States and Europe, its use is still on the increase in the emerging countries, led by China and India.
- Investment in renewable generation, making the most of the current cheapening thanks to technological breakthroughs, with an increase in interconnections (to enhance the stability of the total output) and developing mechanisms that take advantage of the intermittency of the wind, sun and water (such as, for example, pumping facilities), as well as utilising “smart networks” that adapt the electricity demand peaks and cycles to the electricity generation profile.
- Use of natural gas –the fossil fuel that contaminates least– as the transition energy.
- Widespread use of electrically-driven passenger vehicles.
- Applying the principle of “whoever pollutes pays” or a cap and trade or emissions trading system. Although only the European Union, Australia and a limited number of countries or States (such as California or Quebec) have them in place many others are thinking about it.³⁵

The lower the price of oil and other hydrocarbons, the higher the cost of the CO₂.

³⁴ WEO, *op. cit.*

³⁵ The World Bank follows these initiatives in its “Carbon Pricing Dashboard”, available at <https://carbonpricingdashboard.worldbank.org/>.

Favourable factors

Although the goals of decarbonisation and consequent “energy transition” for the world economy seem challenging, they fight against climate change could be boosted by certain factors:

- The fact that China and other emerging countries are realising that the measures to combat climate change also serve to fight against air pollution, a serious cause of death.
- The inclusion of the fight against global warming as a weapon for combating world poverty. As part of this strategy, the Millennium Development Goals approved by the United Nations in 2000 gave way in 2015 to the Sustainable Development Goals 2030, whose goal Num. 13 is, precisely, “to adopt urgent measures to combat climate change and its effects”.³⁶
- The pressures exerted by many financial agents, such as insurers or private institutional investors, who have become “the new climate change warriors”, on those firms or projects that promote fossil fuels.³⁷
- The acceptance of voluntary commitments to fight against global warming by major companies (like Shell, or those forming part of the “Energy Transitions Commission”)³⁸.
- The initiatives taken in favour of decarbonisation promoted by sub-national organisations (States, cities, etc.), even in countries like the USA, whose State does not wish to commit itself to firm undertakings where emissions are concerned.

Unfavourable factors

However such factors are outnumbered by those unfavourable ones that stand in the way of compliance with the goals set in 2015 in Paris:

- The political priorities of emerging countries are to enable all their citizens to have access to energy at reasonable prices, not to limit CO₂ emissions (although the fight against pollution will require China to give up on coal).
- The general hostility shown towards nuclear energy which has led to a lack of investment in this source of energy and even to the early shutdown of

³⁶ UNITED NATIONS GENERAL ASSEMBLY, “Transforming Our World: Agenda 2030 for Sustainable Development”, Resolution A70/1, September 2015.

³⁷ RAVAL, Anjali & MOONEY, Attracta, “The new climate change warriors”, Financial Times, 28th December 2018.

³⁸ The host of reports prepared by this coalition of large companies committed to combatting climate change can be found at <http://www.energy-transitions.org/>. The current Chairman is Adair Turner, former Chairman of the Financial Services Authority in the United Kingdom. See TURNER, Adair “Switch to a zero-carbon economy sooner rather than later”, Financial Times, 23rd November 2018.

facilities, will make it necessary to replace its production with another more renewable source, and there will be a growing need for a new installed capacity of that nature.

- The general rejection that could be faced in many countries as a result of a price rise affecting fuels and electricity brought about by environmental taxes or an increase in the cost of emission rights. That phenomenon became evident in France, in November 2018, with the violent manifestations of the “Yellow Vest Movement” against the rise in taxes on gas-oil forced President Macron’s Government to not go ahead with their plans³⁹. But what happened in France could be just a first demonstration of “anti-Paris populism” that could end up by having much wider scope.⁴⁰

The shale revolution has turned the United States into the world’s main producer of hydrocarbons in the world, which, together with the presidency of the republican Trump, has made the United States, far from being a Leviathan that forces other countries not to hold back in the fight against climate change, align itself with Russia and the OPEC countries in opposing compliance with the Paris Agreement goals.

The European Union’s dilemma

Aware of the Prisoner’s Dilemma inherent to the international struggle against climate change, the European Union opted to carry on cooperating with this effort and, so, in November 2016 the European Commission passed an ambitious package of initiatives known as the Clean Energy Package, whose limit is the 2030, whose aim is to make reality of the commitments taken on by the European Union within the framework of the Paris Agreement.

As has already been explained, the European Union is interested in decarbonisation not only because of the fight against climate change, but also for energy security reasons, given that its fossil fuel production is low.

Yet these limitations also mean that the European industrial companies –especially the ones that consume a lot of energy– have to bear environmental cost that producers in other parts of the world do not have to put up with.

In an international free trade context, this could lead without frontier adjustments owing to the indirect charges arising from emission rights or a coal tax, to what Bernardo Velázquez, Chief Executive Officer to the Spanish multinational

³⁹ “Macron forced into climbdown on fuel taxes to quell violent protests”, Financial Times, 5th December 2018, first page.

⁴⁰ HOOK, Leslie, “Populism vs. Paris”, Financial Times, 3rd December 2018.

Acerinox, called the “environmental paradox”.⁴¹⁻⁴² In fact, in the case of steel, China, without the environmental restrictions applicable in other parts of the world, has become a major net exporter in recent years. So, as the immense majority of steel purchasers buy exclusively on the basis of the price and do not take into account how much CO₂ has been emitted by the firm that has manufactured and transported it, it could be the case that replacing European steel with cheaper imported Chinese steel will lead to an increase in the total CO₂ emissions, not only because of the greater emissions during the Chinese steel manufacturing process, but also in view of the emissions involved in transporting that steel to Europe by ship, which adds a further 20% to the emissions.

The theoretical solution to that problem was given by William Nordhaus, in his speech in December 2018 when he received the Nobel Prize for Economics: the answer would be for all the countries that apply a price or tax on CO₂ emissions –whose ideal level would be 50 dollars per tonne– to form a “climate club” and to apply a charge at their frontier that would have to be paid on the imports coming from other countries.⁴³

Unfortunately, with Republican Presidents in the White House –and especially Mr. Trump– this theoretical proposal seems to be fanciful.

Conclusions

1. While oil was the predominant source of the world’s energy and, furthermore, the OPEC countries –with Saudi Arabia at the head– the main producers, they were permanently experiencing a “Prisoner’s Dilemma” in which the collective wish to control the supply and raise the price was threatened by the temptation felt by all the producers to overstep their quotas to increase their incomes.

Paradoxically, that restriction on world production inherent to the collusive agreement was favoured by two circumstances from outside the OPEC:

- The nationalising initiatives in oil production, or the more stringent production conditions introduced by foreign private traders, that –especially after periods of oil-price increases– took place in several countries.
- Wars, economic sanctions and other political events that weakened the production and export capacity of some major producers, such as Iraq and Iran.

⁴¹ VELÁZQUEZ, Bernardo, “China and the environmental paradox”, Expansion, 6th June 2016, available at <http://www.acerinox.com/es/acerinox-insights/insights/China-y-la-paradoja-mediambiental-Bernardo-Velzquez-CEO-de-Acerinox>.

⁴² Remember that Manuel Conthe, author of this article, has been an independent advisor to ACERINOX since June 2011.

⁴³ NORDHAUS, William, “Climate Change: The Ultimate Challenge for Economics”, Nobel Lecture in Economics Science, Stockholm University, 8th December, 2018, available at <https://www.nobelprize.org/uploads/2018/10/nordhaus-slides.pdf>.

Although that coordinated action taken by the OPEC members caused sudden rises in the international price of oil –such as those that occurred in 1973-1974 and in 1979-1980–, it found its main limit in the adverse reaction of the world economy and, thus, in the global demand for oil when the price increases were excessive.

2. The Soviet Union never formed part of the OPEC and the political and economic instability that accompanies its dissolution prevented it from playing a key role as an international oil exporter. However, as President Vladimir Putin came to power, Russia, which had always played a hegemonic role in the gas market, also came to be one of the major oil producers and, without formally joining the OPEC, liaised its actions with the group, giving rise to what came to be known as OPEP+.
3. As fortune would have it, the so-called shale revolution has decisively raised US production not only of natural gas, but also of oil, and has undermined the OPEC's capacity to control international oil prices and has, as a result, weakened the geopolitical importance of the Middle East.
4. Apart from that abundance of new unconventional oil, the efforts of the European Union and its Member States to diversify their supply sources and favour renewable energy has reduced the risk of having to play a "Chicken Game" in which they would have to back down in the face of the threat of a supply cut. Thanks to that strategy, such threats could end up being a "called bluff".
5. The international "bathtubs" of oil and CO₂ are interconnected, given that when more oil is circulating and comes from the former, more CO₂ builds up in the latter and the more the Earth's temperature increases. To stop the bathtub of CO₂ from continuing to fill up, it is necessary that at a certain moment –about midway through the century- oil ceases to flow out of its bathtub, which will immobilise the remaining reserves and put them out of use.
6. The international fight against global warming has to fight against another serious "Prisoner's Dilemma" that the international community is attempting to overcome, i.e. not having a Leviathan to sanction those who make no effort to comply with binding limits. It has to act through a voluntary acceptance of emission limits that the successive Conferences held by the signatories of the United Nations Framework Convention endeavour to measure with a common methodology and then make public.

Although this fragile institutional mechanism has in its favour a growing support from civil society in many countries, it could be hindered not only by the "free riding" tendency prevalent in many countries, but also by the active opposition of the new coalition of major producers of hydrocarbons -United States, Russia and Saudi Arabia- which could be detected in December 2018 at COP-24 held in Katowice.

The shale revolution and the start of the international struggle against global warming have changed energy geopolitics, yet the energy supply to the entire planet and that fight against climate change will still cause serious dilemmas in the coming decades.

Chapter II

Canada's Role in Global Energy Markets

Jennifer Winter

Abstract

Increasing use of hydraulic fracturing and the subsequent rise of shale and tight oil and natural gas production has transformed North American energy markets. These changes have been particularly disruptive for Canada, as the United States is its primary export market and these changes have disrupted historical trade flows. Compounding the effects of market changes are a set of energy and environmental policy changes enacted by federal and provincial governments in Canada, as well as rising domestic opposition to energy development. This chapter explores the effects of these changes on Canadian oil and gas markets and production, and describes the impact on Canada's role in global energy markets.

Keywords:

Hydraulic fracturing, tight oil, natural gas, Canada, United States, market changes, environmental policy.

Introduction

Canada is a nation rich in natural resources, particularly energy. Despite this, or perhaps because of it, Canadians and Canadian governments struggle with determining the appropriate pace of development, and with the balance between the environment and the economy. This struggle is exacerbated by the institutional environment inherent in the Canadian federation, as well as the uneven distribution of energy resources across Canada, which creates tension between net-consuming and net-producing provinces. Canadian federal, provincial and territorial governments walk a delicate line, trying to balance economic growth with environmental stewardship in an increasingly politicized environment. This chapter examines recent trends in energy policy in Canada, focusing on oil and natural gas development, and Canada's challenges adjusting to shifting global markets and settings.

The development of Canada's energy resources, and hence the evolution of energy policy, is characterised by three primary themes¹. First, the tension between federal and provincial jurisdictions over energy development and energy transportation. Provinces control the development of energy resources within their borders, while interprovincial transport and offshore development is federally regulated. The differing jurisdictional responsibilities creates inter-regional tensions over market access. Second, regional resource endowments resulted in disparity in economic development. In various periods throughout Canadian history, federal policies have been alternately pro-consumer and pro-producer, benefiting some regions at the expense of others and furthering inter-regional tensions. Third, the role of the United States as a primary export market has affected interprovincial cooperation and coordination in energy policy.

Despite vast resource endowments, the future of Canadian oil and gas production has become less certain in recent years. Historically, Canada has been a net exporter of both products, almost exclusively to the United States. The shale revolution has resulted in a resurgence in U.S. production, compounding market access constraints. This, combined with a series of policy and regulatory changes, has increased political risk and investor uncertainty.

In the case of oil, there is a sole pipeline to Canada's West Coast; all others send Canadian product south to the U.S. These pipelines are at capacity, resulting in a switch to rail. Low oil prices have squeezed Canadian producers even further, a situation compounded by delays to expanded pipeline capacity.

In the case of natural gas, Canada lacks export facilities beyond pipelines to the U.S. A steady decline in exports to the U.S. has prompted substantial interest

¹ Jennifer Winter, "Making Energy Policy: The Canadian Experience," in *Meeting the Paris Mandate: A Cross-National Comparison of Energy Policy-Making* ed. Lorna A. Greening Patrice Geofron, and Raphael Heffron (Springer, 2019 (in press)).

in building LNG export terminals on both West and East coasts. As yet, projects have been slow to move beyond the planning stage. Some projects have even been put on hold or cancelled due to worsening market conditions.

Canada has robust and responsible regulation of energy development at all levels of government. Still, energy development and energy infrastructure is controversial. Oil pipelines are subject to the most opposition, as communities across Canada protest that they bear the risk of spills but receive none of the benefit. This debate is compounded by politicians making statements both for and against various pipeline projects, increasing politicization.

Increasing politicization contributes to uncertainty, which has been and continues to be detrimental to business investment. This, combined with low oil and gas prices, makes the future and extent of Canadian exports unclear. Adding to the complexity of Canadian energy markets is numerous policy changes over the past decade, changes which have reformed the business and regulatory environment. Policy changes can, have and will add costs to energy production. The hope is that recent changes to environmental policy and regulation will pave the way to a more constructive and less adversarial discussion about Canada's role as an energy producer and exporter. It is this, more than global prices, which will determine the direction of Canadian oil and gas production.

Background and context

Energy use underpins the global economy, and Canada is no exception. There is a clear positive correlation between energy use and economic activity. Even the most stringent International Energy Agency scenario — where the world meets commitments on climate change objectives, air quality and access to modern energy — projects substantial and continued use of oil, coal and natural gas². There is a continued future for fossil fuels, particularly for natural gas, which is an opportunity for Canada.

However, increasing global consensus on a need to reduce greenhouse gas emissions means not all energy producers will have a large role in global energy supplies. An open question is which countries will continue to produce hydrocarbons, and where Canada be one of them. Canada has the benefit of stable governments, robust institutions, stringent environmental regulations, and in general, stable policies.

Recent and aggressive policy changes by Canadian governments have caused policy, regulatory and investor uncertainty³. In addition, Canada is limited by a lack of current export infrastructure, and in the case of oil, is on the high end of the cost curve. Lack of market access has exacerbated industry challenges

² International Energy Agency, "World Energy Outlook 2018," (2018).

³ Dave McKay, "A New Silicon Valley," (Royal Bank of Canada, 2018).

from low commodity prices. All together, it creates a less-than-rosy picture of the future of Canadian oil and gas development. There is the potential for improvement, if the policy changes can help Canada move beyond the past decade of fractious and acrimonious debate on energy development and enable a more certain business environment.

This section provides global context, an overview of recent energy market changes in Canada, and a brief review of Canadian policy changes to provide context for the remainder of this chapter.

Canadian energy resources

As noted above, Canada is an energy-rich nation. In 2015, Canada ranked in the top ten (and often the top five) for the majority of its energy resources (measured by reserves, production and exports) compared to the rest of the world (Table 1). Energy security is not generally a concern (it has been in the past)⁴, though the pace and scope of resource development has been, as well as access to export markets (both domestic and international).

Resource	Proved reserves/capacity	Production	Exports
Crude oil	3rd	4th	3rd
Natural gas	17th	5th	4th
Coal	15th	12th	8th
Uranium	4th	2nd	2nd
Electricity	7th	6th	3rd
Renewable energy	–	7th	–
Hydroelectricity	4th	2nd	–
Wind	7th	–	–
Biofuels	–	5th	–

Table 1: Ranking of Canadian Energy Production and Reserves Relative to Other Countries, 2015. Source: Natural Resources Canada. 2016. “Energy Fact Book 2016-2017”. Note: Rankings are based on proved reserves for oil, natural gas, coal and uranium, and capacity for the other energy sources.

⁴ The exception is Northern Canada, where remoteness and lack of an infrastructure grid makes energy very expensive and the colder climate means per capita energy use is higher. For more details, see National Energy Board, “Energy Use in Canada’s North: An Overview of Yukon, Northwest Territories, and Nunavut - Energy Facts,” <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/archive/2011nrgsncndnrthfct/nrgsncndnrthfct-eng.html>.

Canada's energy resources are geographically disparate. Most hydrocarbon resources are in the western part of the country, as is most historical and current production. With oil, 70 per cent of historical production is from conventional sources, and the remaining 30 per cent from the oil sands (Figure 1). Oil sands account for 92 per cent of remaining established reserves, dominate potential reserves, and are expected to support most of the production growth to 2040⁵.

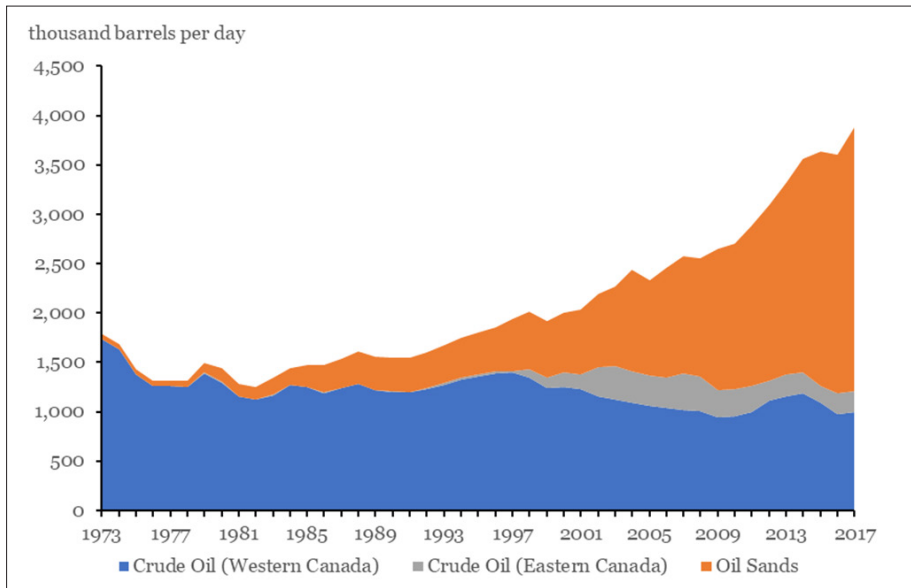


Figure 1: Canadian crude oil production by type and region, 1973-2017. Source: CAPP, "2018 Statistical Handbook: Canadian Crude Oil Production and Canadian Oil Sands Production - Synthetic and Bitumen". Note: The increase in non-oil-sands crude oil production in Western Canada starting in 2009 is attributable to the rise of tight oil. Annual production data on tight oil is not available. However, an October 2014 "Market Snapshot" from the National Energy Board indicates that tight oil production in Western Canada has grown from approximately zero in 2005 to over 400,000 barrels per day in 2014

As with crude oil, the majority of Canada's natural gas resources are concentrated in Western Canada, which is also the source of most production⁶. At the end of 2016, approximately 81 per cent of marketable reserves were in Western Canada, of which 42 per cent is unconventional gas⁷. Frontier areas (West Coast offshore, Arctic, the territories and Eastern and Atlantic Canada) accounted for 19 per cent of potential reserves. Resource development in the frontier areas

⁵ "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040," (2018).

⁶ "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040".

⁷ "Canada's Energy Future 2017: Energy Supply and Demand Projections to 2040," (2017).

will depend on policy changes, particularly around offshore drilling and hydraulic fracturing. Western Canadian natural gas reserves are expected to support the majority of future production to 2040⁸.

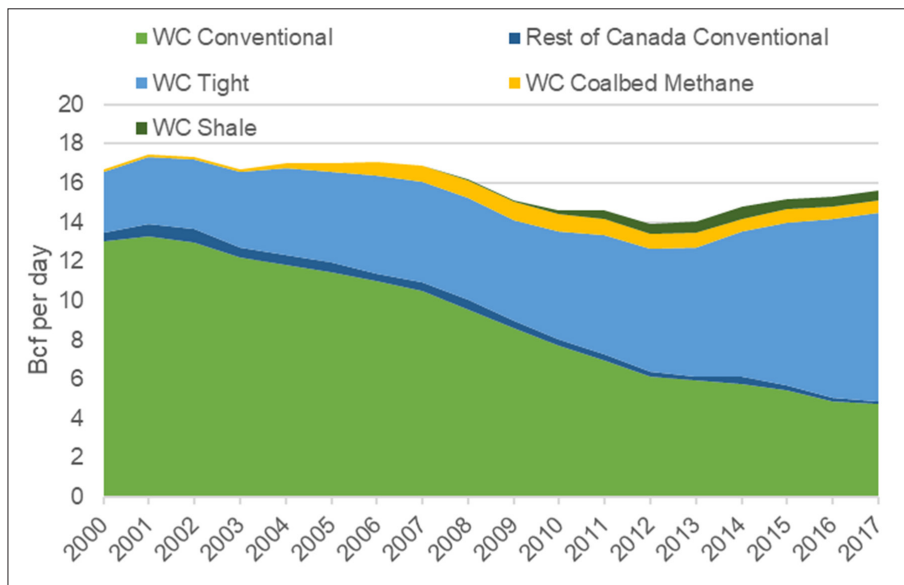


Figure 2: Canadian natural gas production production by type and region, 2000-2017. Source: National Energy Board, "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040," (2018). Note: WC refers to Western Canada

Commensurate with the geographic disparity in energy resources is regional tension over policy that differentially impacts consumers and producers. This is a defining feature of many policy discussions in Canada, historically and today⁹. While full discussion of these tensions is beyond the scope of this chapter, they generally fall along the lines of distribution of benefits and costs of energy development.

Canadian energy trade

Trade with the United States has historically dominated Canada's trade relationships, and this pattern is even stronger with energy trade. With very rare exceptions, all of Canada's crude oil and natural gas exports go to the U.S

⁸ "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040".

⁹ Winter, "Making Energy Policy: The Canadian Experience".

Figure 3 shows crude oil production, domestic consumption, imports and exports by volume between 1985 and 2015. Declines in domestic use starting in the mid-2000s corresponded with increased production and exports. There is limited internal trade in Canadian, especially relative to trade with the United States, as limited pipeline infrastructure supports interprovincial trade. Eastern Canadian markets are more readily supplied by international imports supplied by tanker, and the U.S. is a substantially larger market for Western Canadian producers.

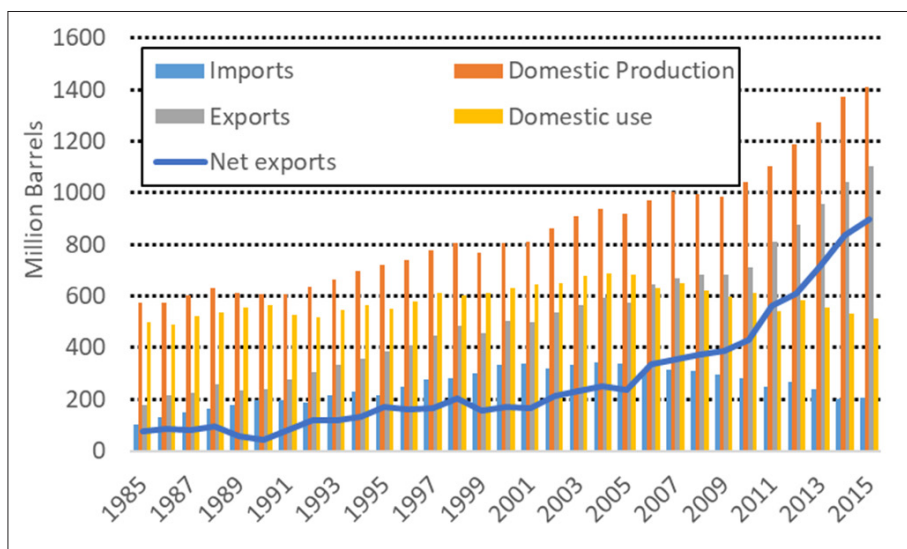


Figure 3: Canadian Crude Oil Production and Consumption (million barrels), 1985 – 2015.
 Source: Statistics Canada. Table 25-10-0014-01: Crude oil and equivalent, monthly supply and disposition (x 1,000). Note: Domestic use includes refinery consumption, inventory changes, deliveries to other purchasers, and losses and adjustments

Exports as a share of production increased from 31 per cent in 1985 to 78 per cent in 2015, all absorbed by the U.S. market. As noted above, the U.S. is entirely dominant as an export market: between 1985 and 2015, an average of 99 per cent of Canada's exports of crude oil and equivalent by volume went to the U.S. This is a function of proximity of the U.S. and the size of U.S. markets. Proposals for export pipelines to access tidewater and alternative markets have been developed only in the last ten years as a response to changing North American market fundamentals (discussed in more detail below).

With natural gas, a deliberate policy choice was made in the late 1940s to supply Eastern Canada with Western Canadian natural gas production, setting a differ-

ent trade pattern in natural gas¹⁰. As a result, domestic production supported most domestic consumption, with limited imports and any excess production was exported to the United States (Figure 4). However, starting in the mid-2000s, Western Canadian gas supplying Eastern Canada and U.S. markets began to be supplanted by U.S. gas. The decline of two major export markets for Western Canadian gas has depressed wellhead natural gas prices in Western Canada, and also prompted consideration of liquefied natural gas as an export alternative (discussed in more detail below).

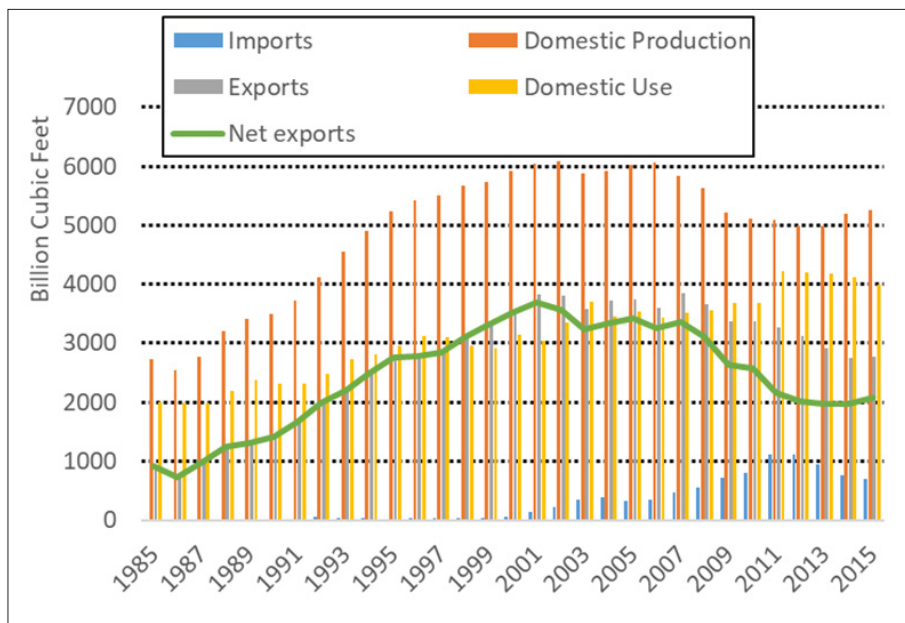


Figure 4: Canadian Natural Gas Production and Consumption (million cubic metres), 1985 – 2015. Source: Statistics Canada. Table 25-10-0047-01: Natural gas, monthly supply and disposition (x 1,000,000). Note: Domestic use includes utility sales, direct sales, deliveries to storage, pipeline fuel and losses, and adjustments

With the scope of Canadian energy resource endowments and historical patterns of energy trade in mind, we now turn to recent developments in Canadian energy policy of relevance to oil and natural gas production. As a precursor to the discussion below, the geographic disparity of resources has driven regional tensions over the relative benefits and costs of energy development accruing to each region, as well as over the simple fact that the more populous provinces are net energy importers.

¹⁰ Ibid.

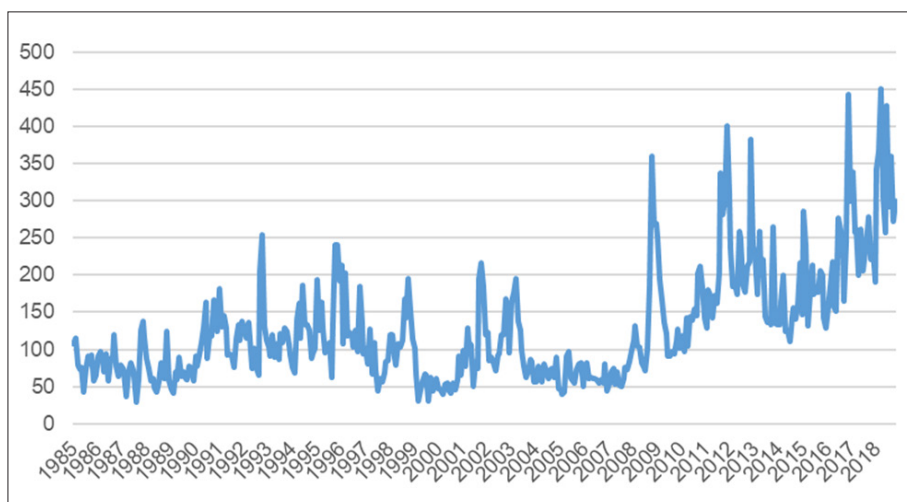


Figure 5: Monthly Economic Policy Uncertainty in Canada, 1996 to 2018.
 Source: Economic Policy Uncertainty, "Canada Monthly Index," http://www.policyuncertainty.com/canada_monthly.html (accessed November 30, 2018)

Policy change and increasing policy uncertainty

Policy uncertainty is increasing globally¹¹, and Canada is no exception (Figure 7). For those in the energy sector, however, this result is not likely to be surprising. Numerous policy changes, a difficult regulatory environment, market access challenges, court challenges of pipeline proposals, and increasing concern about the environmental impacts of energy development have all combined to increase uncertainty and decrease investor confidence in Canada. This is exhibited by decreased investment in Canada¹².

Major policy changes federally and provincially have impacted investor confidence in Canada's oil and gas sector. Changing market conditions and increasing concern over environmental impacts of energy development (especially oil) has sparked controversy around pipeline development domestically. Numerous policy changes have unfolded in the energy space in Canada since 2012, greatly impacting the energy sector. At the federal level, these changes include regulatory change as well as increasingly stringent environmental policies.

The first major change of relevance to the energy sector is related to foreign investment in the energy sector. In 2012, the federal government began a review of foreign energy-sector investment, prompted by the attempted acquisitions of the oil sands firm Nexen by China National Oil Corporation and the natural

¹¹ Hites Ahir, Nicholas Bloom, and Davide Furceri, "The World Uncertainty Index," (2018).

¹² National Energy Board, "Market Snapshot: Investment in Canada's Oil and Gas Sector Declined from 2014 High," <http://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/2018/08-01nvst-mntcndl-eng.html>.

gas E&P Progress Energy by Malaysia's Petronas. Under the Investment Canada Act (1985), the Government of Canada is required to review and approve foreign investment above a certain threshold of asset value of \$1 billion CDN for WTO investments in 2018¹³, \$1.5 billion for trade-agreement investments and \$398 million if the foreign investor is a state-owned enterprise) to determine if the acquisition is of net benefit to Canada^{14, 15}. The acquisitions were approved, but the Minister of Industry stated afterwards that acquisition of a Canadian oil sands firm — and by extension, other energy sector companies — by a foreign state-owned enterprise would “going forward, be found to be of net benefit on an exceptional basis only”¹⁶.

Also in 2012, the Government of Canada introduced changes to the *Canadian Environmental Assessment Act* and the *National Energy Board Act*, which created fixed timelines for project reviews and changed the environmental assessment process^{17, 18}. These changes were widely criticized as limiting the ability of stakeholder to participate in federal regulatory processes and reducing the comprehensiveness of regulatory reviews and environmental assessments¹⁹. Opposition politicians responded to the changes by claiming Canadians had lost trust in the National Energy Board (NEB) and its processes. These claims were in part supported by statements of federal politicians prior to the enacted changes. In 2011, Minister of Natural Resources Joe Oliver declared one pipeline currently under review to be “in the national interest”²⁰. This statement was made during the NEB's evaluation and before the its formal recommendation on the pipeline, creating a perception that the NEB's process was irrelevant for the government's final decision. Similar statements have been made by provincial politicians supportive of their energy sectors²¹. While less impactful on regulatory processes, this advocacy has increased the politicization of energy projects.

¹³ The threshold value increases annually based on GDP growth.

¹⁴ Canada, “Investment Canada Act (R.S.C. , 1985, C. 28 (1st Supp.))”.

¹⁵ Government of Canada, “Investment Canada Act: Thresholds,” https://www.ic.gc.ca/eic/site/ica-lic.nsf/eng/h_lk00050.html.

¹⁶ “Government of Canada Releases Policy Statement and Revised Guidelines for Investments by State-Owned Enterprises,” <http://news.gc.ca/web/article-en.do?nid=711489>.

¹⁷ The National Energy Board is Canada's federal energy regulator, currently responsible for making a public-interest recommendation to the Government of Canada on the merits of energy infrastructure projects.

¹⁸ For more detail on the evolution of Canadian energy policy, see Winter, “Making Energy Policy: The Canadian Experience.”

¹⁹ John Colton et al., “Energy Projects, Social Licence, Public Acceptance and Regulatory Systems in Canada: A White Paper,” *The School of Public Policy Publications* 9, no. 20 (2016).

²⁰ Claudia Cattaneo, “Northern Gateway Won't Succumb to Keystone's Fate,” *Financial Post* 2011.

²¹ For example, Alberta politicians commonly advocate for oil export pipelines, and politicians in British Columbia are boosters for new LNG developments.

Exacerbating the politicization and controversy around pipelines and energy projects more generally is the issue of benefits (accruing to producing provinces, predominantly Alberta) and risks and costs from pipeline spills (borne by non-producing provinces). As a result, the Government of British Columbia laid out five conditions for accepting heavy oil pipelines in 2012²², and the Governments of Ontario and Quebec stated seven conditions in 2014²³. Related, citizens' and environmental lobbyists' concerns about the environmental impacts of energy development has led to protests and court challenges of government and NEB decisions on the public interest of pipelines and other energy projects²⁴.

A shift in power at the federal level in 2015, from the centre-right Conservatives to the centre-left Liberals prompted a change in the direction of energy and environmental policy in Canada. A major policy initiative of the Liberals, initiated in late 2016, was expert panel reviews of the National Energy Board (mandate, governance, decision-making role for major projects, and public participation and engagement with affected Indigenous peoples)^{25,26} and the Canadian Environmental Assessment Agency (responsible for environmental assessments)^{27,28,29}. These two reviews led to substantive and sweeping policy change in 2018, likely taking months if not years to enact, changing the form and process of federal energy regulation^{30,31}. Interestingly, a key change in

²² Government of British Columbia, "British Columbia Outlines Requirements for Heavy Oil Pipelines Consideration," <https://news.gov.bc.ca/stories/british-columbia-outlines-requirements-for-heavy-oil-pipeline-consideration>.

²³ Adrian Morrow, "Premiers Wynne and Couillard Set Seven Criteria for Energy East," *The Globe and Mail*, 21 November 2014 2014.

²⁴ National Energy Board, "Court Challenges to National Energy Board or Governor in Council Decisions," <https://www.neb-one.gc.ca/pp/ctnflng/crt/index-eng.html>.

²⁵ Government of Canada, "National Energy Board Modernization: Expert Panel," <https://www.neb-modernization.ca/neb-welcome>.

²⁶ Helene Lauzon et al., "Forward, Together – Enabling Canada's Clean, Safe and Secure Energy Future," (2017).

²⁷ Government of Canada, "Consultation Paper on Approach to Revising the Project List: A Proposed Impact Assessment System," (n.d.).

²⁸ "A Proposed New Impact Assessment System," <https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/environmental-assessment-processes.html>.

²⁹ Johanne Gelinas et al., "Building Common Ground: A New Vision for Impact Assessment in Canada," (2017).

³⁰ Jennifer Winter, "Big Changes Ahead for Energy Regulation in Canada," *The School of Public Policy Blog* (2018), <https://www.policyschool.ca/big-changes-ahead-energy-regulation-canada/>.

³¹ Specific details are beyond the scope of this chapter. For specifics, see: (1) Martin Olszynski, "In Search of #Beterrules: An Overview of Federal Environmental Bills C-68 and C-69," *ABlawg* (2018), <https://ablawg.ca/2018/02/15/in-search-of-beterrules-an-overview-of-federal-environmental-bills-c-68-and-c-69/>. (2) Sharon Mascher, "Bill C-69 and the Proposed Impact Assessment Act: Rebuilding Trust or Continuing the "Trust Us" Approach to Triggering Federal Impact Assessment?," *ABlawg* (2018), <https://ablawg.ca/2018/03/29/bill-c-69-and-the-proposed-impact-assessment-act-rebuilding-trust-or-continuing-the-trust-us-approach-to->

2012, which made the final public-interest decision a political one, was kept in the 2018 changes³². This is expected to maintain and potentially increase the political risk project proponents consider in making investment decisions. On the other hand, the current federal government has invested significant political capital in moving these regulatory changes forward, and so it has a vested interest in seeing the new regulatory process result in positive and timely outcomes for investors.

Increasing Canada's political risk is several policy decisions made by the Government of Canada since 2016. In November 2016, Prime Minister Justin Trudeau approved two proposed pipelines and rejected a third³³. At the same time, the federal government announced its intention to ban tankers on British Columbia's northern coast, an action currently making its way through the legislative process³⁴. This ban is being challenged by B.C. First Nations³⁵. Another federal policy action in late 2016, joint with the Obama Administration, made Canadian Arctic waters closed to new oil and gas exploration³⁶.

Also of relevance to this discussion is a series of court decisions pointing to the failure of the Crown to meet its duty to Indigenous Peoples. In Canada, federal and provincial governments (the Crown) have the duty to consult and obligation to accommodate where the Crown's actions, such as approving an energy project, may adversely affect potential or established Aboriginal or Treaty rights³⁷. This failure is currently a structural problem for energy development in Canada, with project after project subject to court challenges where Indigenous groups allege the Crown's failure to meaningfully consult. As case law evolves there is increased certainty, but the fact that this is a policy issue resolved through the courts rather than by governments does expose project proponents to considerable risk.

triggering-federal-impact-assessment/. (3) David Laidlaw, "Bill C-69, the Impact Assessment Act, and Indigenous Process Considerations," *ABlawg* (2018), <https://ablawg.ca/2018/03/15/bill-c-69-the-impact-assessment-act-and-indigenous-process-considerations/>. (4) David V. Wright, "Indigenous Engagement and Consideration in the Newly Proposed Impact Assessment Act: The Fog Persists," *ABlawg* (2018), <https://ablawg.ca/2018/02/27/indigenous-engagement-and-consideration-in-the-newly-proposed-impact-assessment-act-the-fog-persists/>. (5) Winter, "Big Changes Ahead for Energy Regulation in Canada."

³² Olszynski, "In Search of #Bettrrules: An Overview of Federal Environmental Bills C-68 and C-69."

³³ Details are discussed below.

³⁴ Government of Canada, "Oil Taker Moratorium on British Columbia's Coast," <https://www.tc.gc.ca/eng/marinesafety/oil-tanker-moratorium-british-columbia-north-coast.html>.

³⁵ A group of B.C. First Nations have proposed an oil pipeline from Alberta to B.C.'s North Coast, and a successful tanker ban would force routing to Alaska. The pipeline is not yet formally proposed, and so is excluded from the analysis presented below. See Claudia Cattaneo, "an Unjustified Infringement: First Nation Sues Ottawa, British Columbia over Oil Tanker Ban," 2018.

³⁶ Indigenous and Northern Affairs Canada, "Faqs on Actions Being Taken under the Canada-Us Joint Arctic Statement," <http://www.aadnc-aandc.gc.ca/eng/1482262705012/1482262722874>.

³⁷ The terms 'Aboriginal' and 'Treaty' have distinct definitions in Canadian law.

Canadian governments have also made large strides in reforming environmental policies focused on reducing greenhouse gas (GHG) emissions and mitigating the impacts of climate change. A key platform of the federal-provincial-territorial plan entitled the *Pan Canadian Framework on Clean Growth and Climate Change* is Canada-wide carbon pricing³⁸. These environmental policy reforms affect energy development via changing the regulatory environment and increasing the cost of doing business via carbon pricing. New methane regulations are also being developed at the federal level, which will impact natural gas producers in an already difficult price environment. Mitigating these impacts is a separate pricing system for large emitters, which prices industrial emissions and simultaneously provides a subsidy per unit of output (defined by industry-level benchmarks) to lessen cost increases^{39, 40}.

Part of Alberta's Climate Leadership Plan, introduced in 2015, is a legislated cap on total emissions from the oil sands, of 100 million tonnes per year. However, this will not necessarily constrain production. Based on 2014 average emissions intensities, oil sands emissions from production only exceed the 100 Mt limit in 2038. If oil sands producers reduce their emissions intensity — Alberta's large-emitters emissions pricing scheme adds to the already-present economic incentive — then it is quite possible this cap will never bind in any real sense.

Finally, the North American Free Trade Agreement (NAFTA) renegotiations during 2017 and 2018, prompted by the Trump Administration, also contributed to political risk and uncertainty. While the negotiations did not affect the energy sector directly, the negotiations contributed to overall uncertainty about the Canadian economy and the future of its trading relationship with the United States.

Combined, these policy changes have vastly changed the calculus of energy development in Canada, and bolstered political risk. These changes have sent mixed signals to investors, and increased regulatory complexity⁴¹. With this broader policy context in mind, we now turn to a discussion of the state of the Canadian energy industry and future trends.

An energy supplier of the future?

Canada has the resources to be a significant supplier to world oil and natural gas markets. And yet, a combination of policy choices and market forces has stymied

³⁸ Government of Canada, "Pan-Canadian Framework on Clean Growth and Climate Change," http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf.

³⁹ Sarah Dobson et al., "The Ground Rules for Effective OBAs: Principles for Addressing Carbon-Pricing Competitiveness Concerns through the Use of Output-Based Allocations," *The School of Public Policy Publications* 10, no. 17 (2017).

⁴⁰ Sarah Dobson and Jennifer Winter, "Assessing Policy Support for Emissions-Intensive and Trade-Exposed Industries," *Ibid.* 11, no. 28 (2018).

⁴¹ McKay, "A New Silicon Valley."

this potential to date. This section reviews and explains current context of oil and natural gas development in Canada, and outlines opportunities for the future.

The future of Canadian oil

Current context

North American crude oil markets have changed significantly in recent years, with increased production from the United States — primarily from shale plays producing light oils — and increasing heavy oil production from the Canadian oil sands, causing a corresponding rebalancing of trade flows.

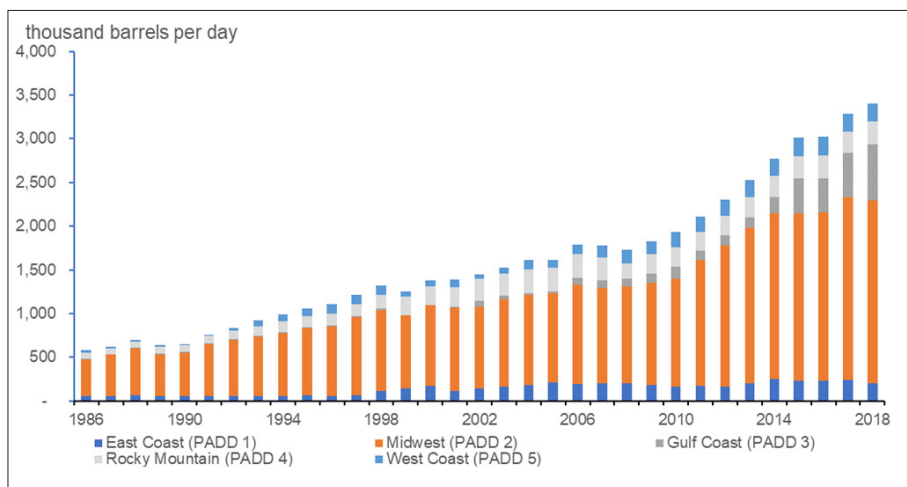


Figure 6: Annual Canadian Crude Oil Exports to the United States by PADD.
 Source: National Energy Board, “Commodity Statistics, Crude Oil and Refined Petroleum Products, Crude Oil - Summary by Type and Destination,” <https://apps.neb-one.gc.ca/CommodityStatistics/Statistics.aspx?language=english>

Note: 2018 data is January to September, inclusive.

The U.S. is the largest market for Canadian crude oil and has received 99 per cent of Canadian exports over the last 30 years. Movements of crude oil within the United States are tracked according to the Petroleum Administrative Defence Districts (PADDs)⁴². Due to existing infrastructure, most of Canada’s American-bound exports are sent to PADD 2, the U.S. Midwest (Figure 6). More

⁴² There are five PADDs in the United States; PADD 1 is the East Coast, PADD 2 is the Midwest, PADD 3 is the Gulf Coast, PADD 4 is the Rocky Mountain Region and PADD 5 is the West Coast. The PADD system was originally established in World War II and is currently used for regional analysis of crude oil and petroleum product supply and movement.

recently, Canadian exports to PADD 3 (U.S. Gulf Coast) have increased as a result of oversupply in the U.S. Midwest (from increasing light tight oil supply in the U.S.), infrastructure constraints and increasing oil sands production in Alberta. Exports to PADD 3 increased from five per cent of U.S.-bound exports in 2013 to 16 per cent in 2017⁴³. These changes in production have had a significant impact on North American crude oil prices.

The North American crude benchmark is West Texas Intermediate (WTI), a light and sweet crude oil produced in the U.S. Midwest and priced at Cushing, Oklahoma. Crude oil from Canada is generally priced against WTI, though crude produced in Eastern Canada with better access to world markets is typically measured against Brent. As crude oil exports from Western Canada typically account for well over 90 per cent of Canada's total crude oil exports, and also represent the largest opportunity for future growth, this chapter focuses on the pricing of Western Canadian heavy crude oil relative to other North American crude oil streams. The dominant heavy crude oil stream in Canada is Western Canadian Select (WCS). WCS is comprised of heavy conventional and bitumen crude oils blended with diluents⁴⁴, and is priced at Hardisty, Alberta, the starting point for several of Alberta's export pipelines. WCS is typically sold at a discount to WTI due to its lower quality (heavy and sour) and distance from U.S. refineries (Figure 7, Panel A). A third crude oil stream of relevance is Mexican Mayan, a heavy and sour blend similar to WCS. In a market without any infrastructure or other transportation constraints, WCS should trade at a price similar to Mexican Mayan, less the difference in transportation costs, and so Mayan provides a useful reference for WCS at the U.S. Gulf Coast (Figure 7, Panel B)⁴⁵.

The average discount between WCS and WTI is \$18 USD per barrel, though the discount is quite volatile, ranging from a minimum of -\$6.08 in April 2009 to a high of -\$41.50 in December 2007. In contrast, from 2005 through 2010 WCS generally tracked the price of Mexican Mayan quite closely, with an average discount of -\$6.50, close to the difference in transportation costs. Starting in 2011, increasing production from the oil sands in Canada and tight oil plays in the U.S. increased the WCS discount relative to both WTI and Mayan. There are two reasons for this change: the increasing production overwhelmed refinery capacity in PADD 2 and pipeline capacity for moving crude production to other U.S. refining centres, most notably PADD 3.

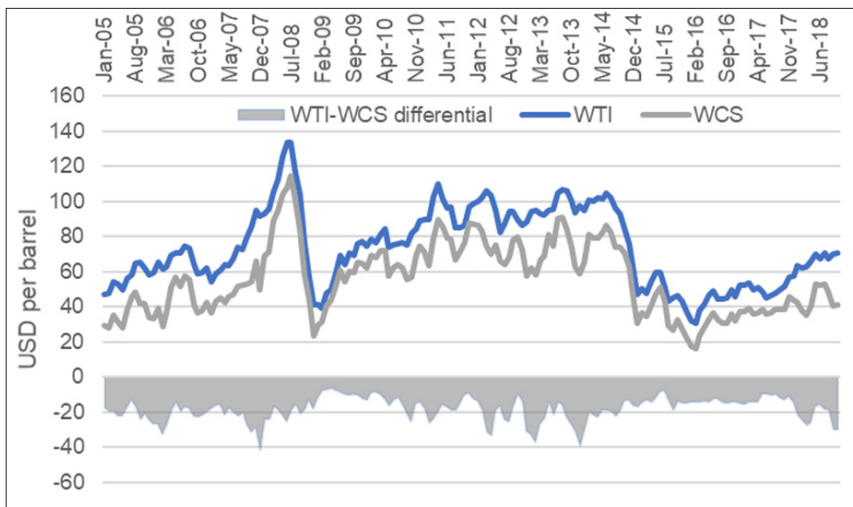
Source: U.S. Energy Information Administration, "PADD regions enable regional analysis of petroleum product supply and movements," *Today in Energy*, February 7, 2012, <http://www.eia.gov/todayinenergy/detail.cfm?id=4890>.

⁴³ National Energy Board, "2017 Crude Oil Annual Export Summary," April 13, 2018, <http://www.neb-one.gc.ca/nrg/ststc/crdlndptrlmprdct/stt/crdlsmmr/crdlsmmr-eng.html> (accessed November 29, 2018).

⁴⁴ Diluents are light hydrocarbons used to lower the viscosity of oil sands bitumen, allowing for pipeline flow.

⁴⁵ Mayan is priced at ports in the Gulf of Mexico and is typically transported to the U.S. via low-cost tanker transport.

Panel A: Western Canadian Select, West Texas Intermediate and differential



Panel B: Western Canadian Select, Mexican Mayan and differential

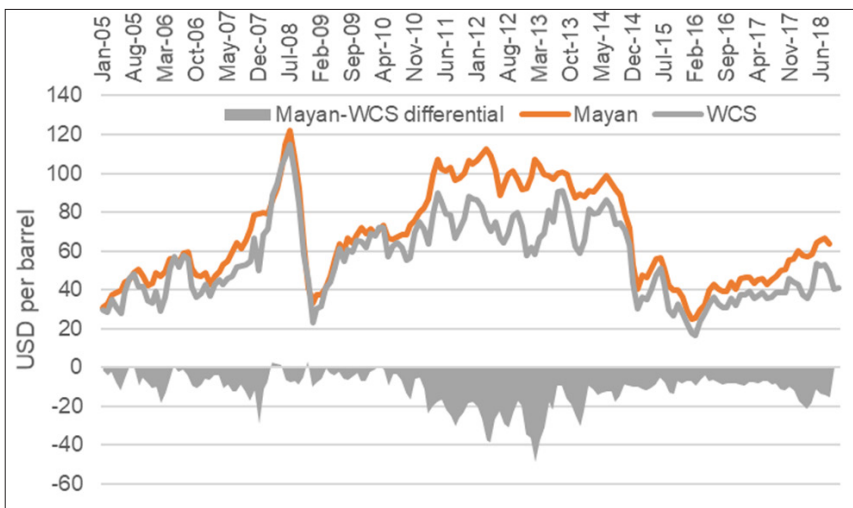


Figure 7: North American Crude Oil Prices: Western Canadian Select, West Texas Intermediate and Mexican Mayan. Source: (1) Sproule Associates Ltd., “Price Archives: October 2018, Escalated Forecast, History” (accessed Nov. 29, 2018) and (2) EIA, “Landed Costs of Imported Crude Oil for Selected Crude Streams,” https://www.eia.gov/dnav/pet/pet_move_land2_k_m.ht (accessed Nov. 30, 2018). Note: WTI is priced at Cushing, Oklahoma; WCS is priced at Hardisty, Alberta; and Mexican Mayan is the landed cost at the U.S. port of import, which includes “charges associated with the purchase, transportation, and insuring of a cargo from the purchase point to the port of discharge. Does not include charges incurred at the discharge port”. As each crude stream is priced at a different location, some of the differential is due to transportation costs

An increase in pipeline capacity starting in early 2014 and increasing utilization of rail as a transportation option helped narrow the WCS-Mayan and WCS-WTI differentials. Also helping was the completion of refinery upgrades in December 2013 which allowed greater processing of Canadian heavy crude⁴⁶, and weaker Canadian dollar. However, steady increases in oil sands production and delays in new takeaway capacity have again increased the differentials. Analysis suggests this differential will have a significant impact on Government of Alberta revenues from royalties (a decrease of \$5 billion in 2019)⁴⁷, with trickle-on effects to the Canadian economy (\$15.6 billion per year)⁴⁸. Constrained pipeline capacity will continue to detrimentally affect revenues and industry expansion for the near future. We now turn to a discussion of existing pipeline capacity and expected increases before discussing near-term future trends.



Figure 8: Canadian and U.S. Oil Pipelines and Proposals (circa 2016). Source: National Energy Board. 2016. *Canada's Pipeline Transportation System 2016*. <http://www.neb-one.gc.ca/nrg/ntgrtd/trnsprttn/2016/index-eng.html>

⁴⁶ Claudia Cattaneo, "Bp's Whiting Refinery Overcomes Opposition, Providing Relief for Canadian Crude," *Financial Post*, 13 February 2014.

⁴⁷ Peters & Co. Limited, "Canadian Oil Takeaway Update: Curtailments and Significant Impact on Government Royalties," in *Energy Update* (2018).

⁴⁸ Jean-Francois Perrault and Rory Johnston, "Pipeline Approval Delays: The Costs of Inaction," in *Global Economics Commodity Note* (2018).

Canadian producers have three main export pipelines: the Trans Mountain pipeline from Alberta to Canada’s West Coast, Keystone from Alberta to Cushing, Oklahoma, and the Enbridge Mainline from Alberta to the U.S. Midwest and then on to southwestern Ontario (Figure 9). The Keystone pipeline also connects to PADD 3 via the Marketlink pipeline, running from Cushing to Nederland, Texas. These pipelines have a combined nameplate takeaway capacity of 3,365 thousand barrels per day⁴⁹. In early 2016, there were five pipeline projects proposed and proceeding through regulatory processes, which would increase takeaway capacity by 3,715 thousand barrels per day (discussed further below).

Pipeline	Nameplate Capacity (thousand barrels per day)	Estimated Export Capacity (thousand barrels per day)	In Service Date	Origination Point	Destination
Enbridge Mainline	2,851	2,307	1950	Edmonton, Alberta	U.S. Midwest & Ontario
Kinder Morgan Trans Mountain	300	250	1953	Edmonton, Alberta	West Coast
Express	280	246	1997	Hardisty, Alberta	U.S. Midwest
TransCanada Keystone	591	561	2010	Hardisty, Alberta	U.S. Midwest & Gulf Coast
Range-land/Milk River					
Total	3,792				

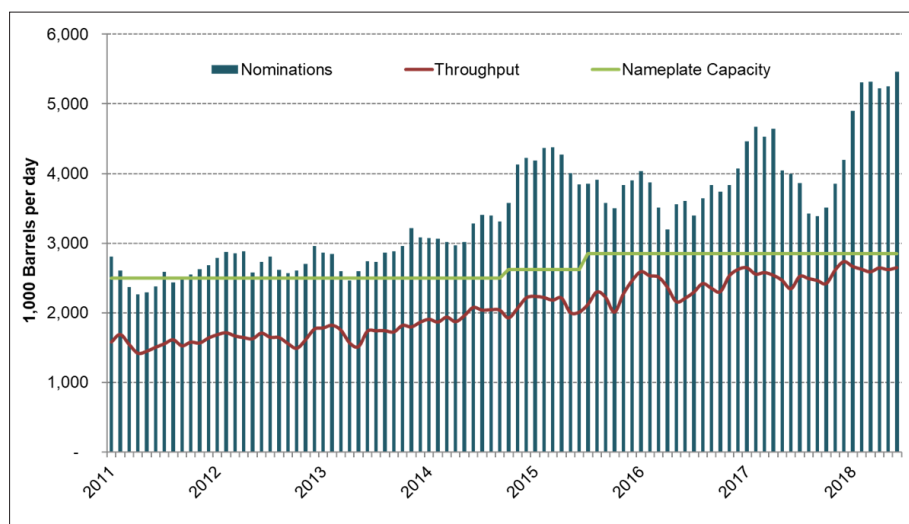
Table 2: Major Western Canadian Crude Oil Pipeline Takeaway Capacity. Source: (1) National Energy Board. 2016. Canada’s Pipeline Transportation System 2016. <http://www.neb-one.gc.ca/nrg/ntgrtd/trnsprtn/2016/index-eng.html>. (2) Canadian Association of Petroleum Producers. 2018. 2018 Crude Oil Forecast, Markets and Transportation. Note: The Enbridge mainline operates at less than full capacity due to downstream constraints. The Enbridge Mainline and Trans Mountain also carry intra-Canada trade and refined petroleum products, reducing their effective capacity to export crude oil.

⁴⁹ National Energy Board, “Canada’s Pipeline Transportation System 2016,” (2016).

Oil export pipelines are required to provide service to any party wishing to ship oil; as a result, all pipelines are regulated as common carriers and are required to have some uncommitted (non-contract) capacity each month for shippers without contracts⁵⁰. Shippers nominate the volume they desire to ship each month, and if total nominations are greater than existing capacity, the uncommitted capacity is apportioned, whereby each shipper's nominated volume is reduced to meet uncommitted capacity. Due to delays in constructing new pipelines, these existing pipelines have again become increasingly capacity constrained, with throughput close to capacity (Figure 10), resulting in the large price differentials noted above.

As a result of the capacity constraint, export pipelines are increasingly under apportionment (Figure 11). Most recently, in fall 2018, pipeline capacity constraints have also negatively and substantially impacted the prices of Canadian light sweet and synthetic crude oil, which typically have little to no differential relative to WTI⁵¹. Canadian producers have responded to these capacity constraints by increasing exports by rail (Figure 12). While rail has more flexibility, it is also a more expensive transportation mode, and is viewed as a temporary measure to alleviate the constrained pipeline system.

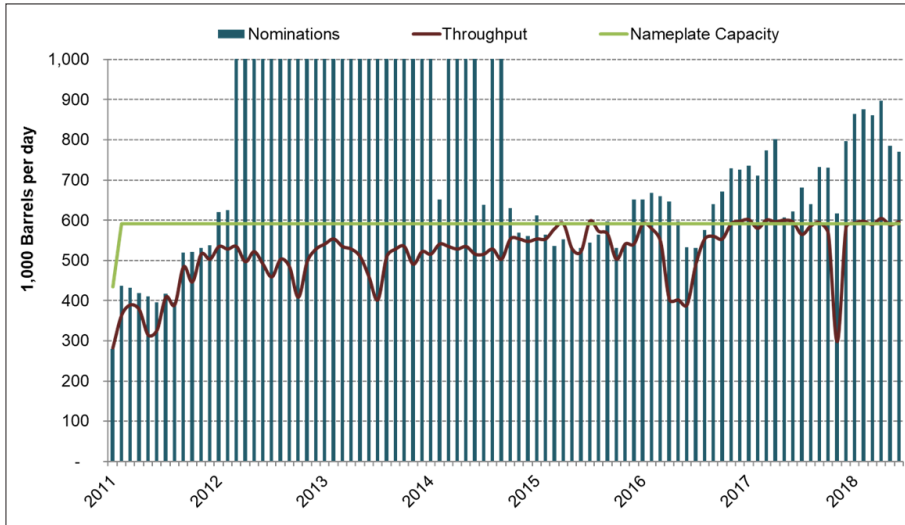
Panel A: Enbridge Mainline capacity and throughput



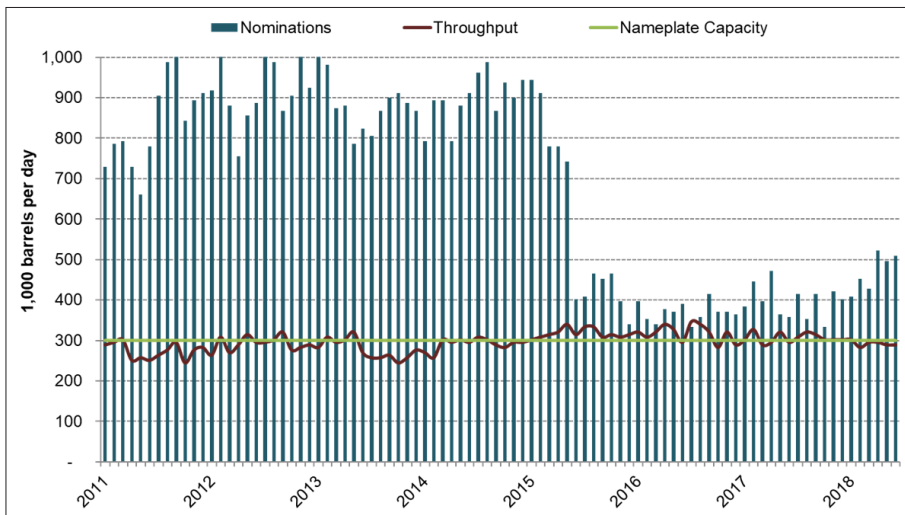
⁵⁰ "Market Snapshot: What Is Pipeline Apportionment?," <https://www.neb-one.gc.ca/nrg/nt-grtd/mrkt/snpsht/2018/08-03pplnprntmmt-eng.html>.

⁵¹ Own calculations, based on Sproule Associates Ltd., "Price Archives: October 2018, Escalated Forecast, History".

Panel B: Keystone capacity and throughput



Panel C: Trans Mountain capacity and throughput



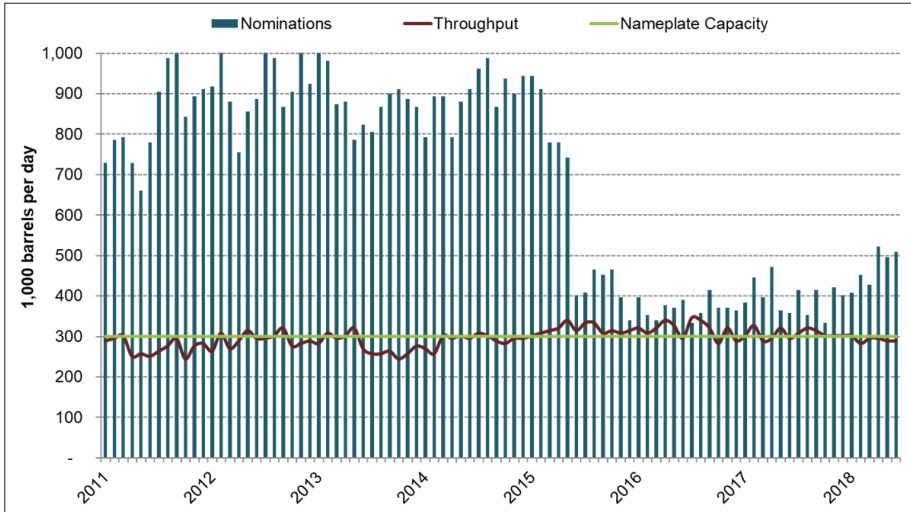


Figure 9: Nominations, throughput and capacity on major export pipelines. Source: Government of Canada. "Pipeline Throughput and Capacity Data," (accessed November 15, 2018)

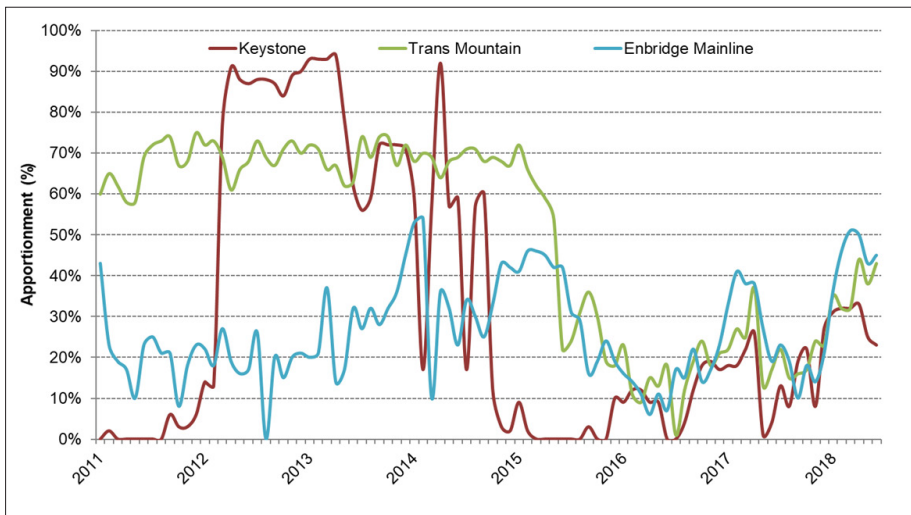


Figure 10: Apportionment on major Canadian export pipelines. Source: Government of Canada. "Pipeline Throughput and Capacity Data," (accessed November 15, 2018)

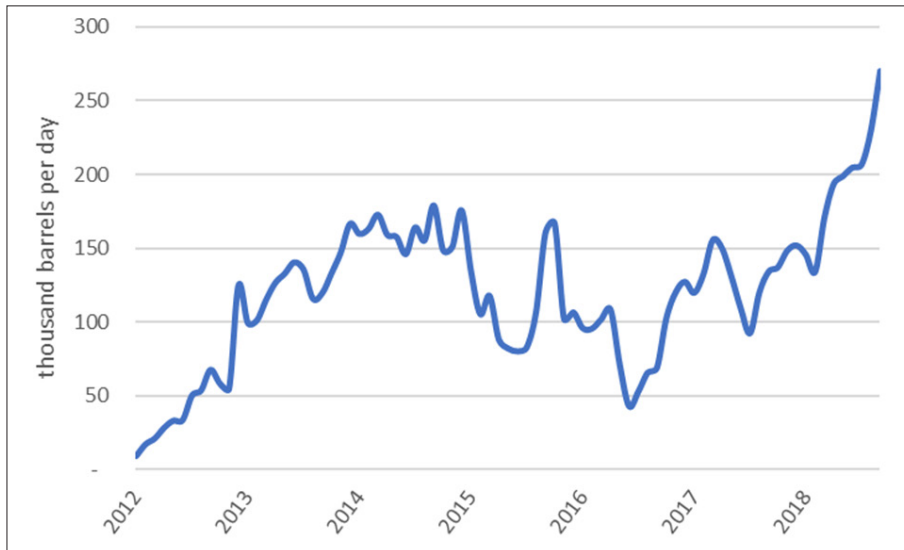


Figure 11: Monthly crude by rail exports, January 2012 to September 2018. Source: National Energy Board, “Canadian Crude Oil Exports by Rail – Monthly Data,” <https://www.neb-one.gc.ca/nrg/sttstc/crdlndptrlmprdct/stt/cndncrdxprtssl-eng.html>

The uncertain future of Canadian takeaway capacity

Growing crude oil production in combination with existing constraints on pipeline takeaway capacity spurred a series of proposed additions to Western Canada’s pipeline infrastructure. Between 2009 and 2014, five major additions were proposed⁵² (Table 2). However, increasing public interest in, and scrutiny of, major pipeline developments and the corresponding interest in participating in regulatory processes has resulted in lengthened timelines associated with regulatory and government approvals of pipeline proposals. Combined with a changing policy and regulatory environment as well as increasing political and public concern regarding environmental impacts of pipeline and oil sands development, the proposed pipelines have been significantly delayed, and two cancelled.

⁵² Pipelines are technically proposed before the regulatory application is filed. However, the year of filing is a useful benchmark for the seriousness of the project proponent, and so it is used to define when the pipeline is ‘officially’ proposed.

Proposed Pipeline	Capacity (thousand bpd)	Application Submitted	Initial Proposed In-Service Date	Current Status and Expected In-Service Date	Origin	Destination
Keystone XL	830	2009	Late 2012	Approved in Canada in 2010. U.S. SEIS required. IS: 2020+	Hardisty	Cushing, Oklahoma & U.S. Gulf Coast
Northern Gateway	525	2010	Q4 2016	Denied in 2016.	Edmonton	West Coast
Trans Mountain (Expansion)	590	2013	Late 2017	Approved in 2016. IS: 2020+	Edmonton	West Coast
Line 3 Replacement	370	2014	Late 2017	Approved in 2016. IS: Late 2019	Edmonton	Superior, Wisconsin
Energy East	1,100	2014	Q4 2021	Application withdrawn in 2017.	Hardisty	East Coast
Total	3,415					

Table 3: Proposed Major Additions to Western Canadian Pipeline Takeaway Capacity. Source: (1) Canadian Association of Petroleum Producers. "2018 Crude Oil Forecast, Markets and Transportation." 2018. (2) Enbridge Northern Gateway L.P. "Enbridge Northern Gateway Project Application." 2010. (3) Enbridge Pipelines Inc. "Line 3 Replacement Program (Canada)." <https://www.enbridge.com/Projects-and-Infrastructure/Projects/Line-3-Replacement-Program-Canada.aspx>. (4) Enbridge Pipelines Inc. "Line 3 Replacement Program Application." 2014. Energy East Pipeline Ltd. "Consolidated Project and Asset Transfer Applications." 2016. (5) National Energy Board. "Enbridge Northern Gateway Project – Sunset Clauses Extension Request." <https://www.neb-one.gc.ca/pplctnflng/mjrpp/nrthrngtwsnst/index-eng.html>. (6) National Energy Board. "Enbridge Pipelines Inc. – Line 3 Replacement Program." <https://www.neb-one.gc.ca/pplctnflng/mjrpp/ln3rplcmnt/index-eng.html>. (7) National Energy Board. "TransCanada Keystone Pipeline GP Ltd. - Keystone XL Pipeline." <https://www.neb-one.gc.ca/pplctnflng/mjrpp/kstnxl2/index-eng.html>.

Note: Expected in-service date as of Nov. 30, 2018.

Each proposed pipeline has had a beyond-the-usual regulatory journey which has significantly impacted Canada and Canada's energy sector⁵³. TransCanada's Keystone XL was approved by the National Energy Board in 2010, but U.S. Sec-

⁵³ Perrault and Johnston, "Pipeline Approval Delays: The Costs of Inaction."

retary of State Kerry denied its Presidential permit in 2015⁵⁴. A statement by President Obama at the time on the rationale for rejection referenced the pipeline's contribution to the U.S. economy, expected role in lowering gas prices, and impact on American energy security — all negligible⁵⁵. The election of President Trump, who was in favour of the pipeline, revived the project. In January 2017, the proponent (TransCanada) resubmitted an application for the Presidential permit, which was granted in March 2017⁵⁶. In November 2018, a U.S. federal judge ruled that a supplementary environmental impact statement (SEIS), updating the 2014 statement, is required for a national interest determination⁵⁷.⁵⁸ This has delayed the pipeline further, pushing its potential in-service date beyond 2020.

The Northern Gateway pipeline, intended to supply Asian markets, was the victim of political change in Canada. Initially approved by the Harper Conservative government in 2014, it was subject to court challenges of the decision over adequate consultation with First Nations along the pipeline route^{59,60}. In June 2016 the Federal Court of Appeal ruled against the government decision⁶¹, and in November 2016, the Trudeau Liberal government rejected the pipeline⁶². Part of the rationale for rejecting the pipeline was it was a greenfield project. Rejecting the \$7.9 billion project after six years and a prior approval undermined investor confidence in Canada, even though Trudeau approved two other pipeline projects in the same announcement.

Both the Trans Mountain Expansion and the Enbridge Line 3 replacement were approved in late 2016. Both projects were subject to court challenges based on the Government of Canada's fulfillment of its duty to consult⁶³. Line 3 was also subject to court challenges in the U.S., but is less controversial, and is expected

⁵⁴ U.S. Department of State, "Department of State Record of Decision and National Interest Determination: keystone XI Pipeline Application," (2017).

⁵⁵ Barack Obama, "Statement by the President on the Keystone XI Pipeline," news release, 6 November 2015, 2015, <https://obamawhitehouse.archives.gov/the-press-office/2015/11/06/statement-president-keystone-xl-pipeline>.

⁵⁶ U.S. Department of State, "Department of State Record of Decision and National Interest Determination: keystone XI Pipeline Application."

⁵⁷ Helen Pike, "U.S. Judge Halts Keystone XI Pipeline Construction," *CBC News*, 8 November 2018.

⁵⁸ Reuters, "U.S. To Conduct Additional Keystone XI Pipeline Review," (2018).

⁵⁹ National Energy Board, "Enbridge Northern Gateway Project – Sunset Clauses Extension Request," <https://www.neb-one.gc.ca/ppctnflng/mjrpp/nrthrngtwsnst/index-eng.html>.

⁶⁰ John Paul Tasker, "Trudeau Cabinet Approves Trans Mountain, Line 3 Pipelines, Rejects Northern Gateway," *CBC News*, 29 November 2016.

⁶¹ National Energy Board, "Enbridge Northern Gateway Project – Sunset Clauses Extension Request."

⁶² Tasker, "Trudeau Cabinet Approves Trans Mountain, Line 3 Pipelines, Rejects Northern Gateway."

⁶³ National Energy Board, "Court Challenges to National Energy Board or Governor in Council Decisions."

to be completed by late 2019⁶⁴. It is intended to increase supply to the U.S., rather than alternative markets.

In contrast, the Trans Mountain Expansion has been and continues to be exceptionally controversial. It has spurred inter-provincial political rhetoric and a renewed conversation about provincial rights and the federal 'national interest' determination. Both the provincial governments of Alberta and B.C. acted through legislation, with B.C. attempting to prevent the pipeline⁶⁵ and Alberta engaging in retaliatory measures⁶⁶. This unusual situation prompted the project proponent (Kinder Morgan) to request political clarity on a path forward for construction, citing "unquantifiable risk"⁶⁷. In May 2018, attempting to resolve the political uncertainty, the federal government purchased the pipeline, planning to sell it once built⁶⁸. However, the pipeline's saga is not yet over. In August 2018, Canada's Federal Court of Appeal overturned the 2016 approval of the pipeline, due to a flawed review of impacts and lack of meaningful consultation with Indigenous peoples by the federal government⁶⁹. The Government of Canada is proceeding with additional project review and consultation⁷⁰, but the in-service date remains uncertain.

Finally, the Energy East project was proposed in 2014, with the idea of supplying Eastern Canada and European markets, but was delayed by controversy and political change. In January 2016, the Government of Canada announced interim pipeline review rules which included the assessment of upstream emissions for the Energy East pipeline⁷¹. In September 2016, the NEB's hearing was adjourned due to an "apprehension of bias" in the review panel⁷², prompting the formation of

⁶⁴ James Wilt, "The Mega Oilsands Pipeline You've Never Heard Of," *The Narwhal*, 17 October 2018 2018.

⁶⁵ Government of British Columbia, "Province Submits Court Reference to Protect B.C.'S Coast" news release, 26 April 2018, 2018, <https://news.gov.bc.ca/releases/2018PREM0019-000742>.

⁶⁶ "British Columbia Files Constitutional Challenge of Alberta Legislation," <https://news.gov.bc.ca/releases/2018AG0035-000984>.

⁶⁷ Catharine Tunney, "Morneau Says Government Willing to Compensate Kinder Morgan against Political Delays," *CBC News*, May 16 2018.

⁶⁸ Mia Rabson, "Ottawa Buying Kinder Morgan's Trans Mountain Pipeline, Terminal for \$4.5 Billion," *Maclean's*, <https://www.macleans.ca/politics/ottawa/kinder-morgan-pipeline-bill-morneau-to-announce-if-ottawa-is-buying-trans-mountain-live-video/>.

⁶⁹ Laura Kane, "Ottawa Loses Key Trans Mountain Court Case, but Pushes Ahead with Pipeline," *Financial Post*, 30 August 2018 2018.

⁷⁰ National Energy Board, "Trans Mountain Pipeline Ulc – Trans Mountain Expansion Project," <https://www.neb-one.gc.ca/pplctnflng/mjrpp/trnsmntnpxpnsn/index-eng.html>.

⁷¹ Natural Resources Canada, "Interim Measures for Pipeline Reviews: Backgrounder," news release, 27 January 2016, 2016, <https://www.canada.ca/en/natural-resources-canada/news/2016/01/interim-measures-for-pipeline-reviews.html>.

⁷² National Energy Board, "Energy East Hearing Panel Steps Down," news release, 9 September 2016, 2016, <https://www.canada.ca/en/national-energy-board/news/2016/09/energy-east-hearing-panel-steps-down.html>.

a new panel which started the process from the beginning⁷³. In August 2017, the NEB announced an expanded focus for its assessment of Energy East, including the market impacts of GHG reduction targets and policies as well as an assessment of upstream and downstream GHGs associated with the project⁷⁴. In October 2017, citing “existing and likely future delays resulting from the regulatory process, the associated cost implications and the increasingly challenging issues and obstacles” facing the proposed pipeline, the application was withdrawn⁷⁵.

Canada’s complex regulatory environment and changing political landscape has clearly delayed pipeline infrastructure development. These delays have exacerbated current constrained pipeline capacity, and resulted in the fall 2018 WTI-WCS differential being referred to as a “crisis” by several politicians. The Alberta government has taken policy action to support increased domestic processing⁷⁶. In late November 2018, Alberta premier Rachel Notley announced her government would purchase rail cars to alleviate transportation constraints⁷⁷, and in early December 2018, announced government-mandated curtailment of production to rebalance the market in the short-term⁷⁸. The production cut is temporary and is expected to decline over 2019; it will decrease production by 325,000 barrels per day (8.7 per cent) until barrels in storage are shipped, the rail cars become available, and Enbridge’s Line 3 pipeline comes on-line⁷⁹. The motivation behind these two policy actions is to ensure Albertans get ‘fair value’ for their resources, and ensure Alberta’s economic recovery from the 2014-15 oil price fall is not jeopardized. The government action is not universally supported by industry, with some CEOs warning that this type of government intervention “carries trade risks and sends a negative message to investors about doing business in Alberta and Canada”⁸⁰.

Both Alberta premier Notley and Prime Minister Trudeau acknowledge that the long-term solution for the current difficulty is new pipelines. Until then, Alberta and Canada are unlikely to be a strong investment prospect, or a potential supplier of crude oil to new markets in Europe or Asia.

⁷³ “Energy East Hearing to Restart from the Beginning,” news release, 27 January 2017, 2017, <https://www.canada.ca/en/national-energy-board/news/2017/01/energy-east-hearing-restart-beginning.html>.

⁷⁴ “Expanded Focus for Energy East Assessment,” news release, 23 August 2017, 2017, https://www.canada.ca/en/national-energy-board/news/2017/08/expanded_focus_forenergy-eastassessment.html.

⁷⁵ Energy East Pipeline Ltd. and TransCanada PipeLines Limited, “TransCanada Withdraws Energy East and Eastern Mainline Project Applications,” (2017).

⁷⁶ Government of Alberta, “Partial Upgrading Program,” <https://www.alberta.ca/partial-upgrading-program.aspx>.

⁷⁷ Rachel Notley, “Rachel Notley: Alberta Faces a Momentous Decision on Oil Production,” *Edmonton Journal*, 30 November 2018 2018.

⁷⁸ Michelle Bellefontaine, “Alberta Premier Announces 8.7% Oil Production Cut to Increase Prices,” *CBC News*, 2 December 2018 2018.

⁷⁹ Ibid.

⁸⁰ Tony Seskus, “Alberta Bets on Oil Production Cuts but Industry Remains Divided on Market Intervention,” *Ibid.*, 3 December 2018.

Future production trends

In the absence of new pipelines, Canadian production will continue to outstrip available takeaway capacity, forcing continued reliance on rail (Figure 12). In 2016, production was forecast to increase gradually, with the capacity constraint binding again in 2030 with two of three potential pipelines built. This situation has changed just two years later, with forecast production increases suggesting all three pipelines would be needed by 2030. As discussed above, the future of the three pipelines is still uncertain, with corresponding implications for Western Canadian prices, production and exports. Moreover, with only the Trans Mountain Expansion remaining to provide access to non-U.S. markets, Canada's role as a global supplier will be marginal at best⁸¹.

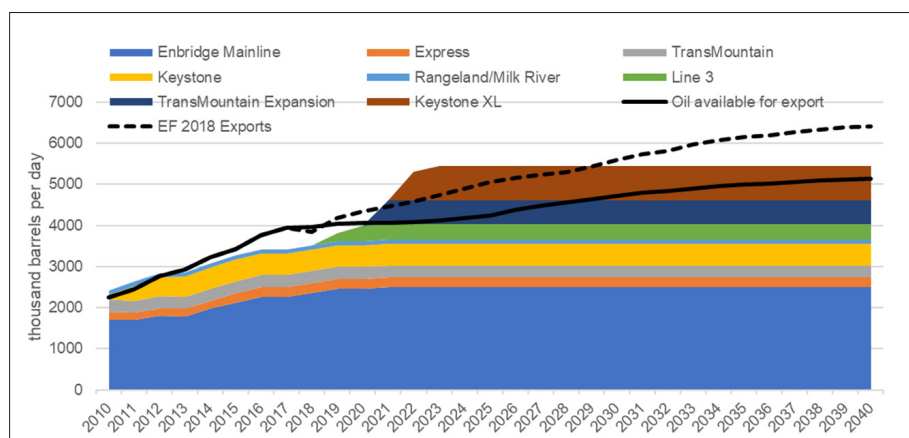


Figure 12: Canadian Export Pipeline Capacity and Forecast Oil Exports, 2010 to 2040.
 Source: (1) National Energy Board. "Canada's Energy Future 2016: Energy Supply and Demand Projections to 2040." <http://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2016/index-eng.html>. (2) National Energy Board. "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040." <https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2018/pblctn-eng.html>

Note: Oil export forecasts based on Reference Scenario from the NEB's Energy Futures 2016 and 2018 reports. Oil available for export is available supply less domestic use.

As to be expected, forecast oil production depends heavily on high(er) prices supported by market access (Figure 13). In its forecast, the National Energy Board identifies global and benchmark prices, takeaway capacity and technological developments as key uncertainties affecting Canadian production⁸². Ongoing and vocal opposition to pipeline development means there is still uncertainty about

⁸¹ There is some potential for rail transport to Canada's West or East coasts to provide access to non-U.S. markets, but these volumes are unlikely to be large or persistent, due to the cost of rail transport to either coast constraining Canadian crude's competitiveness internationally.

⁸² National Energy Board, "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040," (2018).

future takeaway capacity. Also of relevance is further stringent action to reduce emissions and mitigate climate change, which would impact demand for Canadian crude oil domestically and abroad. In order to become a supplier of countries other than the United States, Canada will have to address investment uncertainty and crucially address market access constraints, with much riding on one pipeline.

Reference, Low Price and High Price Scenarios

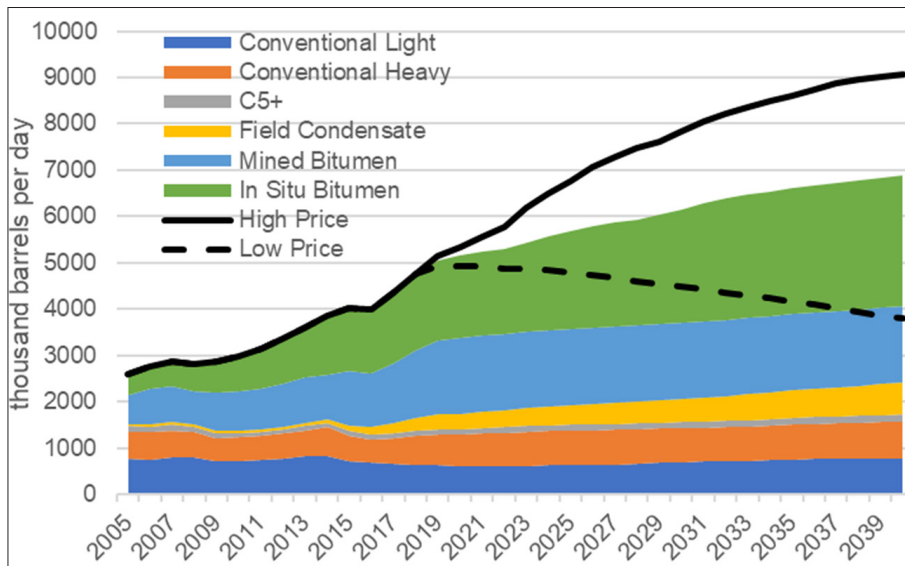


Figure 13: Forecast Canadian Crude Oil Production, 2005 to 2040. Source: National Energy Board, "Canada's Energy Future 2018: Energy Supply and Demand Projections to 2040". Note: Production by type is from the Reference Scenario

LNG ambitions

Current context

As alluded to above, North American natural gas markets have changed significantly along with oil markets. Increased production from the United States — as a result of development of tight and shale gas plays and associated production from oil wells — disrupted the status quo and price fundamentals. While Canadian producers are more than capable of supplying domestic demand, increased production from the Marcellus and Utica plays in the U.S. has priced out Western Canadian gas from Eastern Canada and disrupted historical trade patterns. Faced with a declining market, combined with high natural gas prices in other markets in 2011 and beyond (Figure 15), prompted a rush by Canadian companies to promote and develop liquefied natural gas (LNG) projects as a solution to market access constraints. The differential between North American, European and Asian prices spurred project proposals in both Canada and the U.S. While the U.S. has success-

fully moved ahead — owing to the conversion of several LNG import terminals to export facilities and a quicker regulatory process — Canada has seen delays.

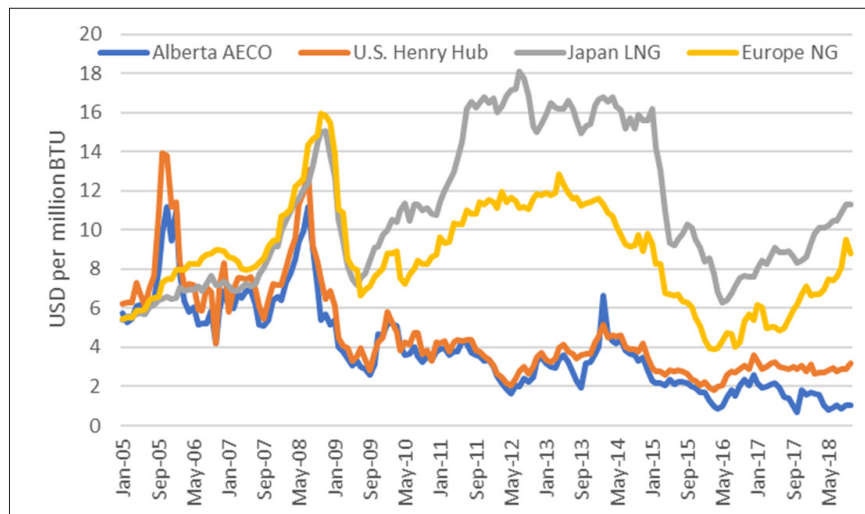


Figure 14: North American and World Natural Gas Hub Prices (2005 – 2018).
 Source: (1) Sproule Associates Ltd., “Price Archives: October 2018, Escalated Forecast, History” (accessed Nov. 29, 2018) and (2) World Bank, “World Bank Commodity Price Data (The Pink Sheet)” (accessed Nov. 30, 2018)

High prices between 2010 and 2014 prompted an “LNG race” globally and within Canada. Since 2010, 24 distinct Canadian LNG projects have been proposed; 18 on the West Coast to supply Asian markets, and six on the East Coast to supply Europe and West Asia⁸³. Despite interest evidenced by the numerous project proposals, Canada is a late entrant to the global LNG market. Part of this is due to Canada’s historical trade relationship with the U.S., and the other explanation is Canada’s relatively slow regulatory system. The window between 2010 and 2015 closed without a final investment decision (FID) from Canadian projects. Despite this, there remains significant interest in developing LNG on both West and East coasts. The West Coast projects have secure natural gas supply, and two projects have moved forward with a final investment decision. On the East Coast, gas supply is less certain, Canadian projects will compete with lower-cost U.S. Gulf Coast facilities, and the openness of the European market is dependent on European desire to diversify from Russian sources⁸⁴.

Part of the ‘success’ of Canadian LNG relative to oil exports is that crude oil is far more controversial. That said, unexpected delays, regulatory burden, and lower

⁸³ “Canada’s Role in the Global Lng Market – Energy Market Assessment,” (2017).

⁸⁴ Jennifer Winter et al., “The Potential for Canadian Lng Exports to Europe,” *The School of Public Policy Publications* 11, no. 20 (2018).

than expected international natural gas prices prevented the industry from developing quickly, and it is unlikely to be a significant growth area. One project, cancelled in 2017, cited local opposition and economic and regulatory headwinds as contributing to the decision^{85, 86}. There is a current lull in projects globally, which will impact future developments in Canada⁸⁷. However, in the short term, lack of market access has also caused Western Canadian gas prices to decouple from the U.S. hub price (Henry Hub). This has depressed Canadian production, but the low prices also emphasize Canada’s potential role as a low-cost supplier.

In Canada’s favour in the global LNG market are abundant and low-cost natural gas supplies, shorter shipping distances and a colder climate. Working against Canada, of course, is the requirement for new infrastructure — pipelines and export terminals — in remote locations, making capital costs higher than other locations. A desire for diversity of supply by LNG buyers will matter for future developments in Canada. The two FIDs are a positive step, and it appears that Canada can potentially, at least in part, realize LNG ambitions.

Future production trends

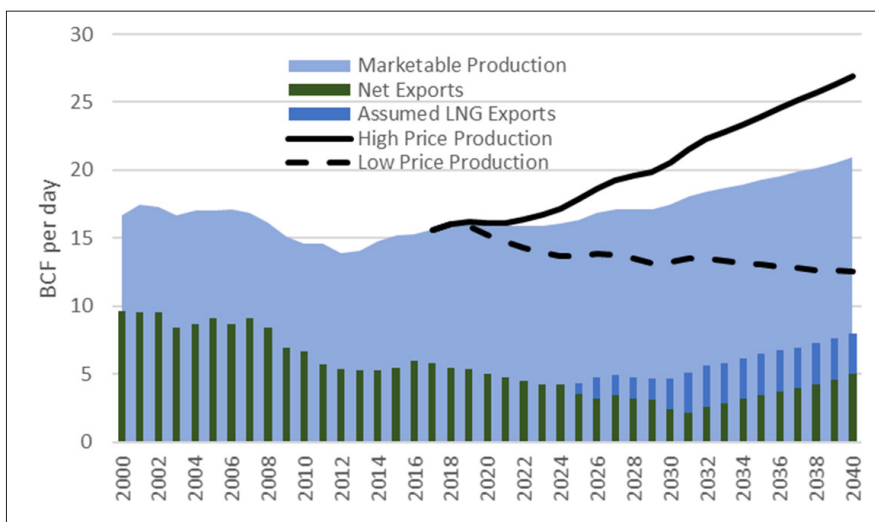


Figure 15: Canadian Natural Gas Production and Exports (2000 – 2040) Reference, Low Price and High Price Scenarios. Source: National Energy Board, “Canada’s Energy Future 2018: Energy Supply and Demand Projections to 2040”

⁸⁵ Claudia Cattaneo and Geoffrey Morgan, “Pacific Northwest Lng, 2012-2017: How to Kill an Lng Project in Canada,” *Financial Post*, 28 July 2017. Cite CBC and FP articles on Pacific NW LNG

⁸⁶ The Canadian Press, “Cancelled \$36b Lng Project Was ‘Wake-up Call’ to Industry, Says Energy Exec,” *CBC News*, 12 October 2017.

⁸⁷ Jennifer Winter et al., “An Overview of Global Liquefied Natural Gas Markets and Implications for Canada,” *The School of Public Policy Publications* 11, no. 21 (2018).

The future of natural gas production in Canada is uncertain, as Canadian exports to the U.S. are expected to continue to decline. As shown in Figure 15, production depends heavily on natural gas prices, which will be a function of market access as well as domestic demand and demand in the oil sands⁸⁸. Domestic demand will be influenced by environmental policies, including a phase-out of coal-based electricity generation and increasing electrification. Starting in 2025, LNG exports from Canada's West Coast support increased production. Key for Canada in successfully entering the global LNG market will be demonstrating that projects can proceed; this means that developments in oil pipelines (and lessening political risk) will influence the feasibility of future LNG projects.

Conclusions and a look ahead

The past decade has seen turbulence in Canadian energy and environmental policy. Recent policy changes have vastly changed the calculus of energy development in Canada, and bolstered political risk. As discussed above, these changes increased regulatory complexity, sending mixed signals to investors⁸⁹. Lack of investor confidence in Canada is exhibited by decreased investment in Canada's oil and gas sector overall (Figure 16) and specific investment in new drilling. Notably, drilling in the U.S. has partially recovered from the decline prompted by the 2014-15 oil price crash, while drilling in Canada remains flat (Figure 17).

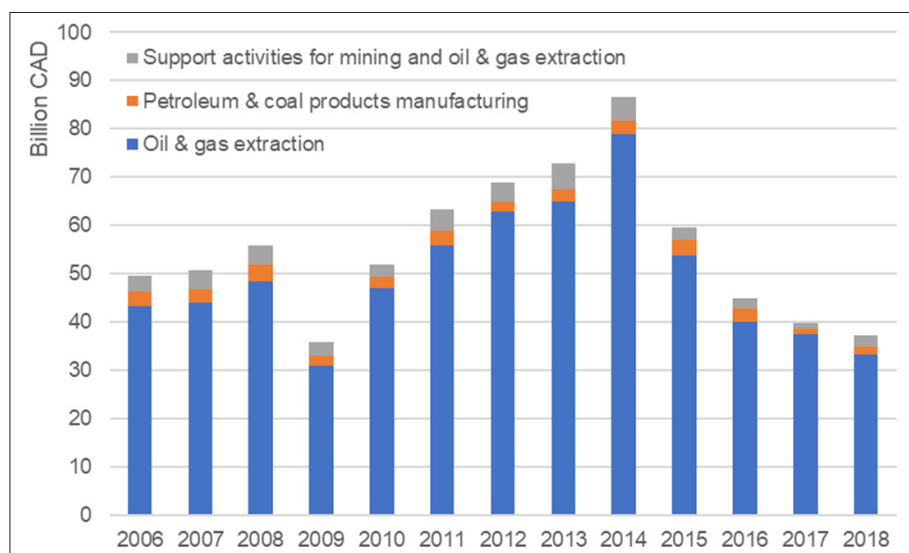


Figure 16: Capital and repair expenditures in oil and gas in Canada (billions), 2006 to 2018. Source: Statistics Canada. Table 34-10-0035-01: Capital and repair expenditures, non-residential tangible assets, by industry and geography (x 1,000,000). Accessed December 1, 2018. Note: Data in 2017 and 2018 are preliminary actuals and intentions

⁸⁸ Natural gas is used in the oil sands to generate steam for in situ production.

⁸⁹ McKay, "A New Silicon Valley."

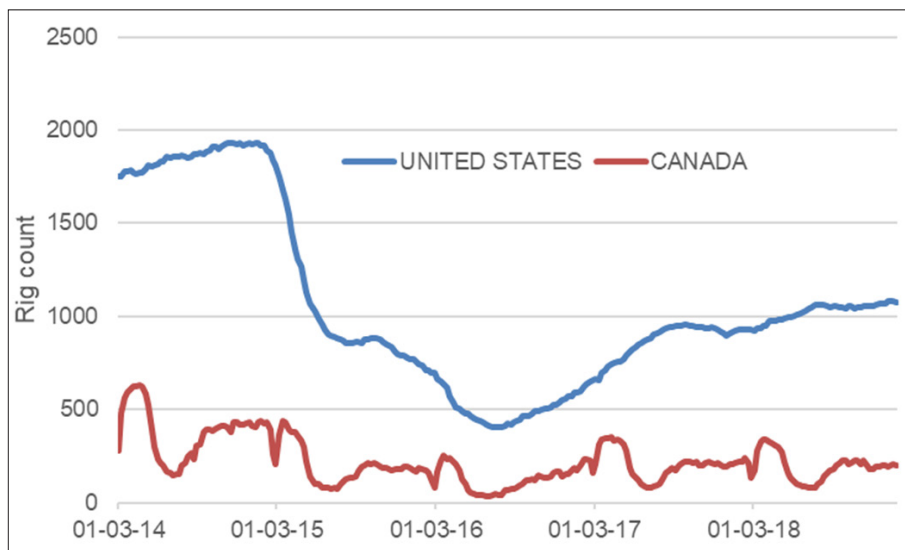


Figure 17: North American weekly rotary rig count, 2014 to 2018. Source: Baker Hughes. “North American Rig Count.” (Accessed Dec. 2, 2018). Note: Data current to the week of Nov. 30, 2018

From all appearances, Canada has reached a low point for investor certainty due to substantive policy changes and political risk. Restoring investment and investor confidence in Canada’s energy sector is not likely to be a simple task. The politicization of energy and energy infrastructure remains a challenge, particularly with respect to the Trans Mountain Expansion project, opposed by the government of B.C. and supported by the federal and Alberta governments.

Notwithstanding the considerable policy changes enacted by Canadian governments, political risk should decrease as these changes are implemented and create a more stable business environment. Demonstrating that projects can be built even in times of policy and regulatory change demonstrates that Canada is still open for business. A prime example is LNG Canada, which made its final investment decision in October 2018, and was touted as “a vote of confidence in a country that recognizes the need to develop our energy in a way that takes the environment into account, and that works in meaningful partnership with Indigenous communities” by Prime Minister Trudeau⁹⁰.

The consequences of these policy changes — lack of market access and corresponding low prices for both oil and natural gas — has a small silver lining: low-cost resources for international markets. Should Canada be able to solve its market access constraints and demonstrate projects can proceed in its new regulatory environment, it can be an energy supplier of the future. The next six

⁹⁰ LNG Canada, “Lng Canada Announces a Positive Final Investment Decision,” news release, 1 October 2018, 2018, <https://www.lngcanada.ca/wp-content/uploads/2018/10/LNG-Canada-Takes-FID-Media-Release-October-1-2018.pdf>.

months to a year will be crucial for demonstrating a better political, regulatory and business environment for Canada's energy sector.

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Chapter III

Geostrategy and Energy in the Gulf of Guinea

Emilio Sánchez de Rojas Díaz

Abstract

The article aims to analyze the Gulf of Guinea as an open energy system, and describe the main factors affecting the energy sector in the Gulf of Guinea. In the first block, we approach the global scenario, that is, geopolitics, the strategies of the great powers, the energy scenario and the importance of climate change. The geographical scenario, includes political geography, energy resources, local and regional governance, and the security framework and its possible effects on investments and other decisions of multinationals. Energy exploitation addresses the role of energy multinationals, local energy companies, energy policies, or how pollution and decontamination affect the decisions of multinationals.

The first conclusion is the great importance of the global scenario as a whole, characterized by uncertainty and defined by the strategies of the great powers and their attitude towards climate change. It can also identify the growing importance for multinationals of the security of their personnel and facilities, and corporate social responsibility (soil contamination), which favors a change from the upstream exploitation model focusing on off-shore exploration, transferring the land holdings to local companies.

Keywords

Energy, geostrategy, Gulf of Guinea, security, piracy, Nigeria, Angola, pollution, climate change.

Introduction

The article's title "Geostrategy and Energy in the Gulf of Guinea" invites us to analyse the Gulf of Guinea as an open energy system.

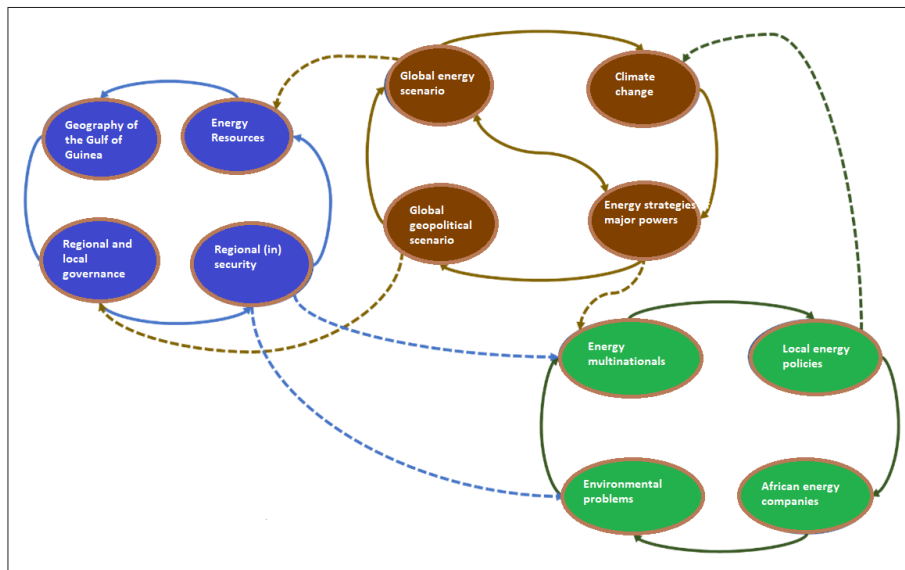


Image1: energy and strategies in the Gulf of Guinea, a systematic vision

A dynamic study of the system will enable us to describe the main factors affecting the energy sector in the Gulf of Guinea (GoG), and find out how they relate to each other dynamically. The diagram in Illustration 1, attempts to describe –in simplified form– the aforementioned dynamics and to identify its main subsystems, which are also interrelated:

- The global scenario: the geopolitics, the major powers' strategies, the energy scenario and the importance of climate change.
- The geographical scenario: including the political geography, the energy resources, local and regional governance, the security framework and its potential effects on the multinationals' investments and other decisions.
- The exploitation: the role of the energy multinationals, the local energy companies, the energy policies, or how soil contamination and decontamination affects the multinationals' decisions.

The first conclusion that can be deduced from the figure is, on the one hand, the great importance the overall global scenario has, this being a scenario that is characterised by uncertainty and is defined by the major powers' strategies and their attitude towards climate change. What can also be detected is the growing importance the multinationals attach to the security of their personnel and in-

stallations, as well as corporate social responsibility (soil contamination), which favours a change from the upstream exploitation model focusing on off-shore exploitation, transferring the land holdings to the local companies.

We have opted for an approach from top to bottom: studying the global scenario and the major powers' strategies towards the region, then continuing with the geographical scenario, the governance and the security situation, to end up with the exploitation scenario, the energy area of the Gulf of Guinea.

The global scenario

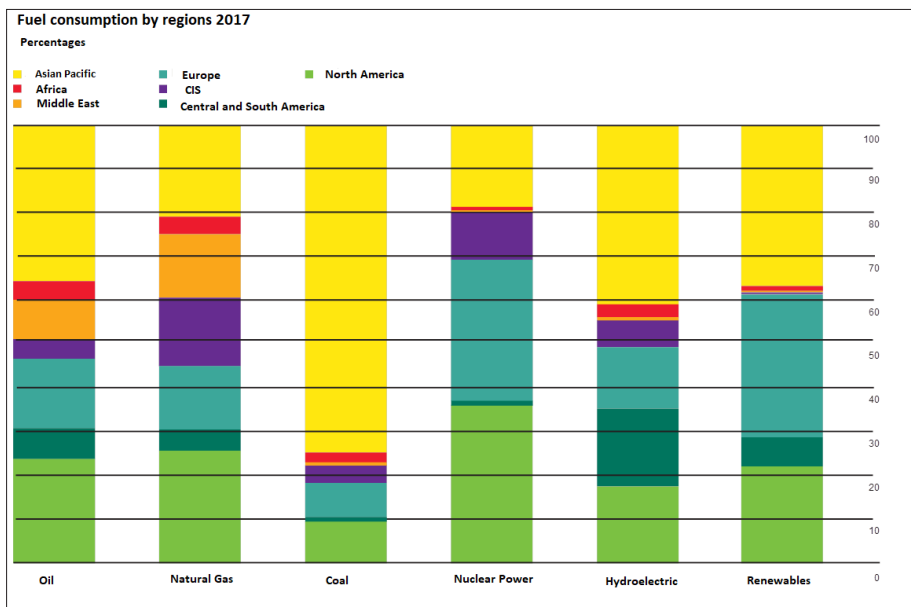


Image 2

Globalisation, is transforming the foundations of the international system. Globalisation is a phenomenon that has defined a new framework of reference with four basic characteristics: its extension (the global networks); its intensity (global interconnection); its speed (that of the global flows and the time changes) and, finally, its impact (given the propensity of the global interconnections).

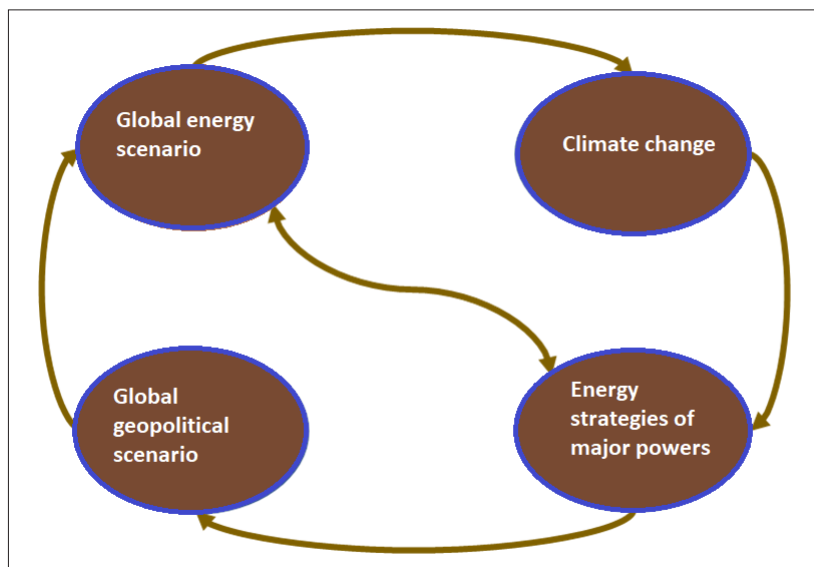


Image 3

The globalisation idea encourages a belief in a gradual reduction in the role of geography and geopolitics in the States. Yet exclusive control over the routes and resources cannot be replaced by the «market», and we can state that geography and geopolitics are just as important today as they were in the past¹.

We agree with Grygiel when he states that the global geopolitical scenario influences and is influenced by the global energy scenario, and this, in turn, along with the policies associated with climate change, influence the energy strategies of the major powers, which, in turn “define” the global geopolitical scenario. Let’s begin with the global geopolitical scenario:

Geopolitical scenario

We can imagine the interaction between geopolitics and geostrategy. When one state takes into account its geopolitical situation and develops a geostrategy that reflects it –it controls the resources centres and the communication lines– raising its position of power and it has the ability to build-up wealth and make the most of others’ wealth².

Henry Kissinger stated in “Diplomacy”³ that, with respect to relations between states, “the new order” will be more akin to the 18th and 19th Century system of European states than to the Cold War. Zbigniew Brzezinski thinks that states are run by inherited tendencies – traditional geopolitical leanings and a sense

¹ Grygiel, Jakub J. *Great Powers and Geopolitical Change*, 2006, Baltimore : JHU Press, p.x

² Grygiel, Jakub J., *Op. cit.*, p. x.

³ Kissinger, Henry A. *Diplomacy*, 1994, New York: Simon & Schuster, pp. 23-4.

of history – and they are distinguished by their capacity to make a distinction between patient ambitions and careless self-deception⁴.

Josep Baqués believes that:

“The USA is still the first power. However, China is catching up fast and Russia has shown that it is extremely resilient. In the coming years we’ll see how the already existing trend towards the consolidation of a multipolar world is confirmed, in which a gradual evanescence of US power will converge with the slow-but-sure rise of China. In these circumstances, although Russia’s weight is much more limited (with hardly any global ambitions) the country can still play a major role when it comes to deciding (and perhaps tilt the balance) about the major world alliances”⁵

The document “Global Trends until 2035: Geopolitics and International Power”, points out a series of confirmed trends:

- There are major differences in the demographic changes between developed and developing countries. There is a population stagnation or decrease in the countries in the high-income bracket, whereas the developing countries, especially Sub-Saharan Africa, are undergoing a population increase especially among those of working age.
- A loss of enthusiasm for globalisation is a relatively recent reality. In the most likely scenario, the globalisation patterns will be less marked by politics and more by structural factors that depend upon a global economy oriented towards services. We will move on from an emphasis on “free” trade, to “free and fair” trade.
- By 2035, technological breakthroughs will have made themselves felt with automation and automatic learning altering the employment markets, making millions of jobs obsolete.
- As far as competing for energy resources is concerned:
 - It is possible that the energy sector will see little competition for resources by 2035, partly owing to the rapid inroads made by renewable energy. The energy companies are positioning themselves in the face of this new business model, and getting rid of assets with high carbon content.
 - The drop in the price of solar and wind-land energy puts renewable energy in a new position. By 2035, they will comply with the affordability criteria, without subsidies in developing countries, which will lead to an increased generation capacity all over the world.

⁴ Brzezinski, Zbigniew. *Strategic Vision: America and the Crisis of Global Power*, 2012, New York: Basic Books, Page 76.

⁵ Baqués, Josep, Análisis de tendencias geopolíticas a escala global (Analysis of Geopolitical Trends on a Global Scale). *ieee.es*. [Online] 09/01/2018. http://www.ieee.es/Galerias/fichero/docs_investig/2018/DIEEINV18-2017_Analisis_Tendencias_Geopoliticas_EscalaGlobal_JosepBaques.pdf.

- In many senses, the balance of power in 2017 is similar to the balance in 2000, yet in other basic aspects, the world has changed. The wars in Iraq and Afghanistan have made the USA and its partners wary of interventions. China has increased its global presence, with investments, aid and military bases. Russia has shown that it is intervene in neighbouring countries with information “wars”.
- Although climate change is a gradual process that will make itself felt over the decades, the likelihood of sudden natural disasters occurring is also on the increase. By 2035, it is probable that the world will be facing more natural disasters and the political system will be required to adapt to them.⁶

Oxford Analytica thinks that the USA will still be the most powerful actor in the international system, but other powers will have closed the gap, and it will be reluctant to use its power in kinetic operations. The United States will still be the world’s greatest military power in 2035, but China will have increased its military expenditure⁷.

Climate change, together with the technological revolution, has become an essential factor for the global geopolitical and geoenergetic scenario, and thus for energy demands from the major powers.

Climate change

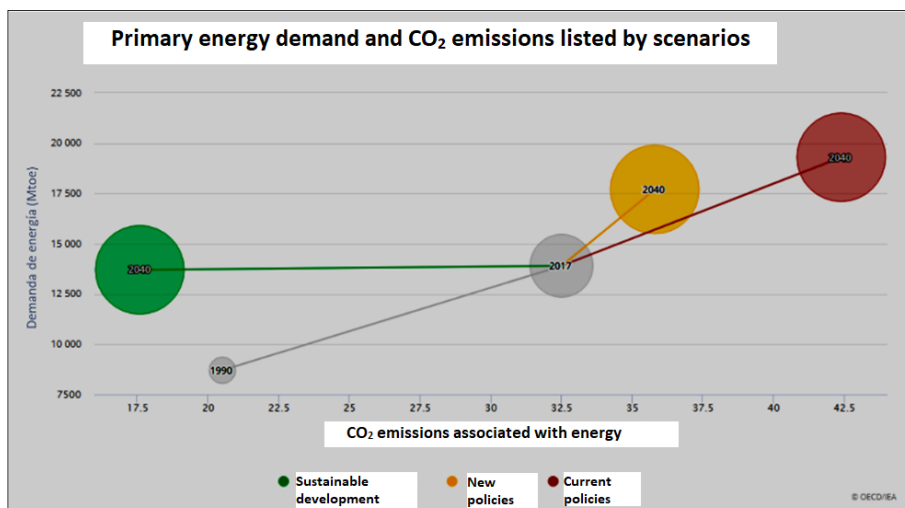


Image 4

⁶ Oxford Analytica. *Global Trends to 2035, Geo-politics and international power*, 2017, Brussels: EU Directorate General for Parliamentary Research Services, ISBN 978-92-846-1494-3.

⁷ Ibid.

In September 2015, 193 countries, both developed and developing, gave their approval to Agenda 2030 for stable development, with 17 Sustainable Development Goals (SDGs), among which there is one specifically aimed at providing universal access to modern, sustainable, reliable and affordable energy (SDG 7), which requires the proportion of renewable energy in the global mix to be increased. Energy affects other SDGs, namely SDGs 3, 11, 12 and 13.

Energy production and use is the biggest source of air pollution caused by humans. Increasing importance is being attached to air quality policies, yet the effects of the pollutants on health are still serious. Every day, 18,000 people die as a result of air pollution.

On the one hand, the Paris Climate Change Summit, COP21 established goals for 2040, and on the other hand enabled countries to announce their environmental policies, and their energy policies account for an essential part. These policies form the basis for defining a scenario of “new energy policies”, which give us insight into what the energy sector will be like in 2040, incorporating the aforementioned domestic contributions⁸⁹.

In the “new policies” scenario, the global emissions of CO₂ associated with energy show a slight increase up to 2040 but consider certain positive signs: it is expected that in China the CO₂ emissions will stabilise at 9.2 Gt (slightly above current levels) by 2030, after which they will begin to fall. But despite national efforts, premature deaths caused by air pollution will rise from the current 3 million to more than 4 million in 2040¹⁰.

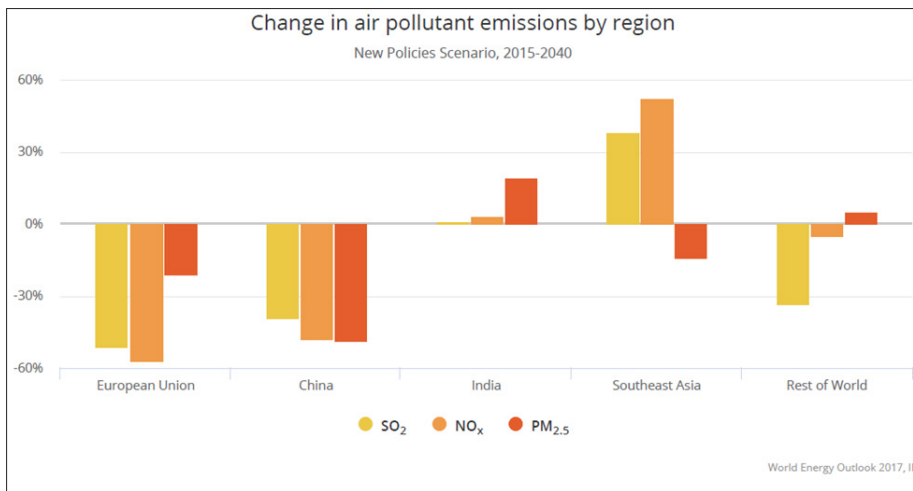


Image 5

⁸ Although in some cases, the latter are subsequently modified (USA)

⁹ WEO. *World Energy Outlook 2017*, 2017, Paris: OECD/International Energy Agency, p. 37.

¹⁰ WEO. *World Energy Outlook 2017*. IEA. [Online] 2017. <https://www.iea.org/weo2017/#section-6-7>.

Energy production and consumption accounts for two-thirds of the world emissions of greenhouse gases (GHGs), which means that the commitments taken on in COP21 must significantly reduce GHG emissions¹¹.

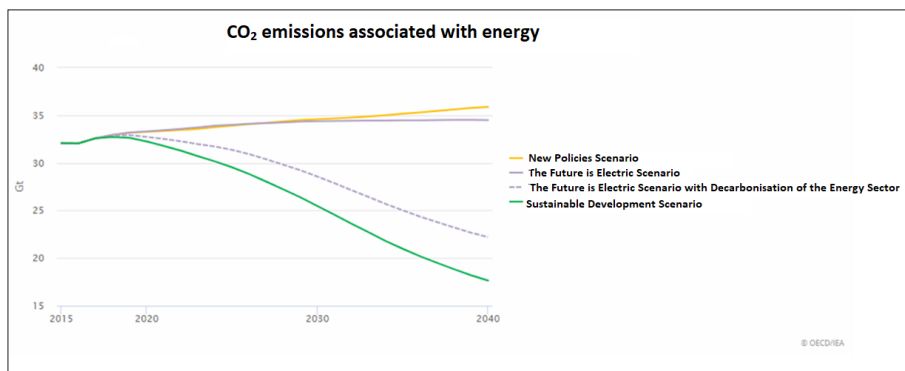


Image 6

The national commitments at the COP21 must provide a “virtuous circle” with ambitious aims. The energy sector –clearly strategic- needs clear objectives and certainty regarding the future actions of political leaders¹².

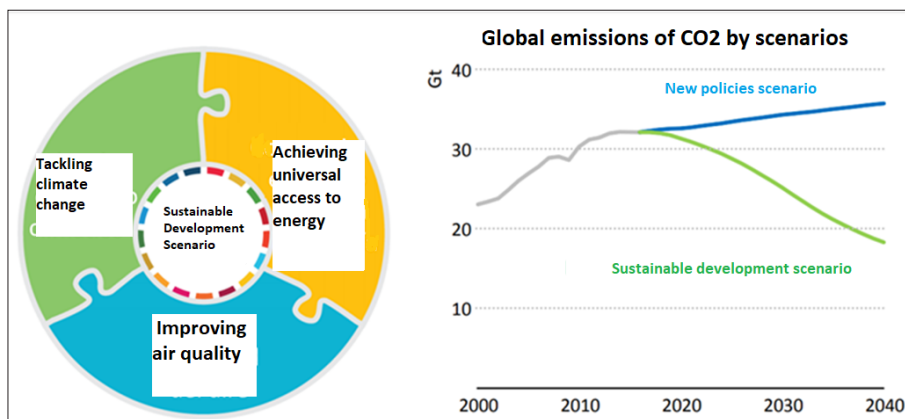


Image 7

A “sustainable development” scenario (SDS)¹³, stems from a vision regarding where we ought to be heading in the energy sector to achieve the Sustainable Development Goals (SDGs), focusing on three goals:

¹¹ WEO. *Energy and Climate Change World Energy Outlook Special Report RÉSUMÉ*. 2015, Paris: OCDE/AIE.

¹² WEO. *Energy and Climate Change World Energy Outlook, op cit.*, p. 3.

¹³ IEA. Sustainable Development Scenario. *iea*. [Online] 2018. <https://www.iea.org/weo/weomodel/sds/>.

1. Universal access to energy for 2030 (clean electricity and cooking).
2. An image of 2040 consistent with the Paris Agreements (reach emission peaks rapidly, followed by a substantial reduction).
3. A clear reduction of other pollutants associated with energy, consistent with a substantial improvement in air quality and a drop in premature deaths¹⁴.

Global emissions of CO₂ reach their peak around 2020 and then decrease sharply until 2040.

GHG emissions associated with energy would also peak in 2020. By 2040, we would cut the current level by half and there would be zero emissions by 2070, in line with the Paris Agreement goals¹⁵.

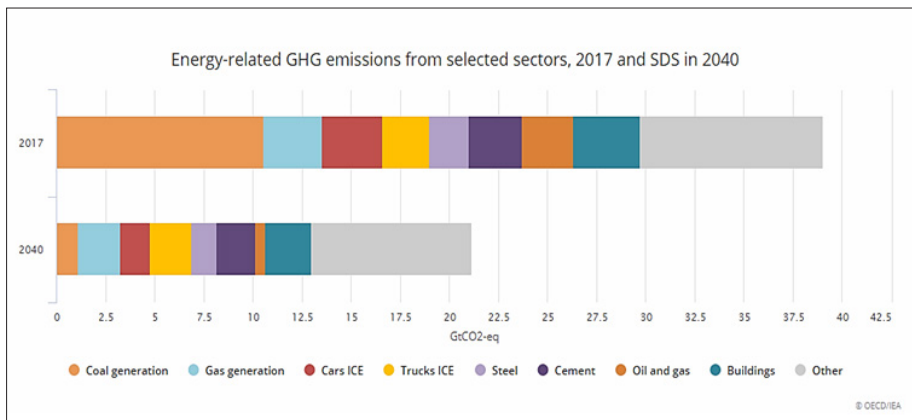


Image 8. The SDS reduces CO₂ emissions in compliance with the COP21, and tackles air pollution and universal access to energy

But the reality is a different matter, and it seems difficult to comply with the Paris Agreement. The indicators provided at Climate Conference COP24, suggest that the global growth of emissions is boosted by the energy consumption increase, associated with the 3.7% expansion of the global economy¹⁶.

On the basis of the “new policies” scenario, the world is not on the way to achieving the results of the United Nations SDGs where energy is concerned; to achieve universal access to energy (SDG 7), to reduce the serious impacts of air pollution on health (part of SDG 3) and to cope with climate change (SDG 13)¹⁷.

¹⁴ WEO. World Energy Outlook 2017, *Op. cit.*, p. 37-8.

¹⁵ IEA. Carbon emissions from advanced economies set to rise in 2018 for first time in five years, reversing a declining trend. [Online] 04/12/2018. <https://www.iea.org/newsroom/news/2018/december/carbon-emissions-from-advanced-economies-set-to-rise-in-2018-for-first-time-in-fi.html>

¹⁶ *Ibid.*

¹⁷ IEA. Sustainable Development Scenario, *Op. cit.*

The energy policies of the major energy consumers will be the most crucial factor in defining the global energy scenario, our next section

Global energy scenario

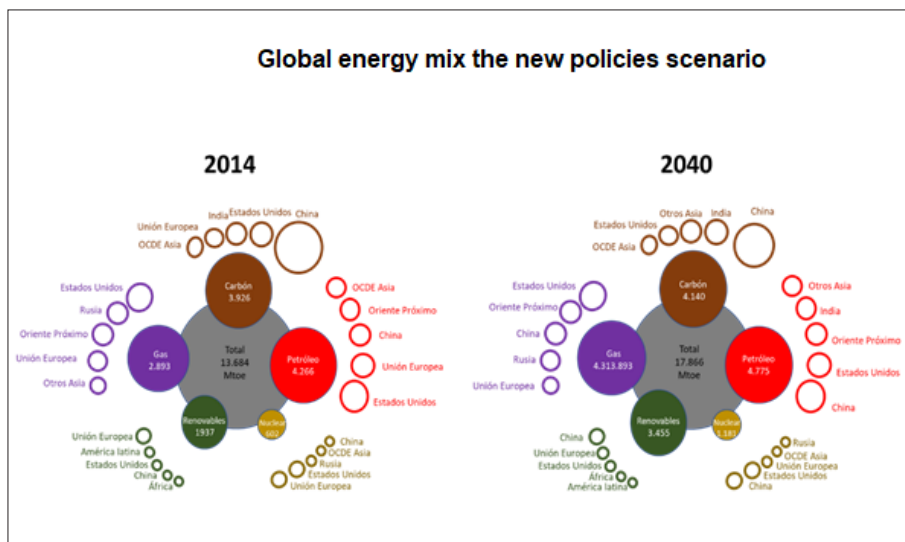


Image 9. Renewable energies followed by natural gas are the main winners in 2040. World Energy Outlook 2016

Trying to synthesise the global energy scenario in just a few pages is an impossible task, but it is a good idea to select some recent indicators (2017 and 2018) relevant to our study of the Gulf of Guinea, bearing in mind the fact that oil and gas are the essential energy elements.

The world is developing a new energy system, but some deficiencies are clear:

Affordability: the cost of photovoltaic solar energy and wind energy are still decreasing, but oil prices rose to more than \$ 80 per barrel in 2018 for the first time in four years.

Reliability: the risks involved in oil and gas supplies are still there¹⁸, and one out of every eight of the world's inhabitants has no access to electricity.

Sustainability: the global emissions of carbon dioxide (CO₂) attributable to energy increased by 1.6% in 2017 and the initial data suggest a growth in 2018 that is not compatible with the climate goals. Pollution caused by energy is still causing millions of early deaths¹⁹.

¹⁸ As can be seen from the downward spiral in Venezuela

¹⁹ WEO. *World Energy Outlook 2018*. Paris: OECD/IEA, 2018.

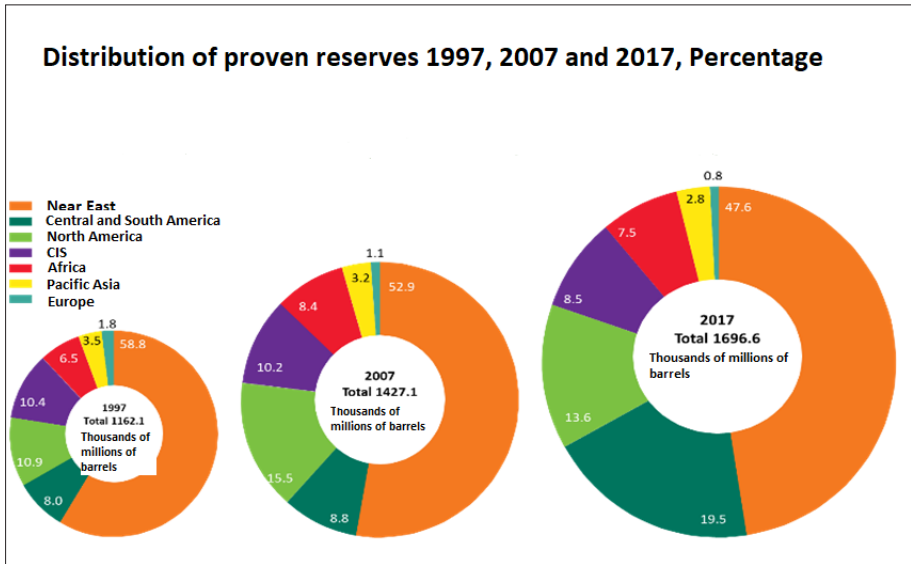


Image 10

Electricity is the energy of choice for economies based on digital technologies, lighter industrial sectors and services. The growing use of photovoltaic solar energy and wind energy give unprecedented importance to the flexible operation of electricity systems. Although coal consumption recovered in 2017, decisions to invest in new coal power plants were much fewer than in recent years.²⁰

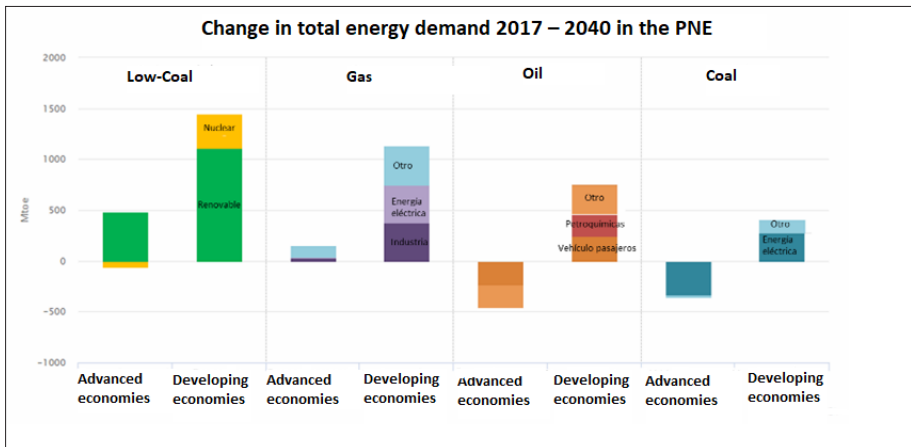


Image 11

²⁰ WEO. World Energy Outlook 2018, *Op. cit.*, p. 2-4.

In a scenario consistent with the new policies, global energy requirements will grow at a slower rate, but will amount to a 30% rise until 2040. The main energy trends are:

- A rapid development and a reduction in the cost of clean energy technologies
- A growing electrification of energy.
- A move towards an economy more service-oriented and a cleaner energy mix in China.
- The resilience of shale oils and gas in the USA.
- The demand for natural gas will grow until it accounts for one quarter of the total energy demand²¹.

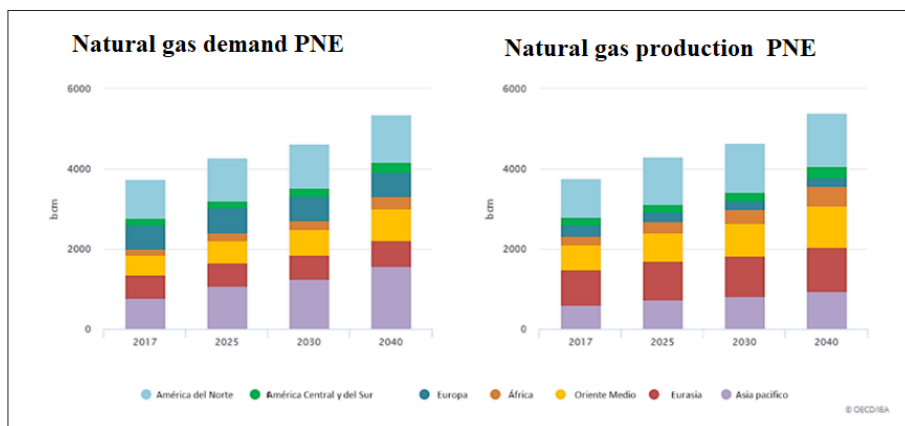


Image 12

An increase in the world gas trade, enhanced by the shale revolution in the USA, and an increase in the availability of liquid natural gas (LNG) continues to transform the gas markets. In recent years, the policies aimed at combating air pollution have been a key factor in the growth in demand for natural gas, which is increasing rapidly in China, which indicates a political effort to improve air quality. The developing economies in Asia account for half the total growth in demand until 2040.

The United States is responsible for 40% of the growth in the total gas production until 2025, but the sources of growth become more diversified as shale gas production in the USA levels off while it increases in other regions.

Applying the new policies will affect oil in the following ways:

- Production of conventional oil will fall slightly until 2040, because the newly discovered deposits will not be able to make up for the losses made on the

²¹ WEO. World Energy Outlook 2017, *Op. cit.*, p. 23.

current deposits. Growing importance is attached to obtaining oil extracted from below deep and very-deep waters, whose growth is expected to reach 50% in the next 25 years. Brazil will provide amount half the production in 2040.

- In spite of Canada's contributions, the political uncertainty and the negative investment climate in Venezuela will reduce the growth of the total production of very-heavy oil and bitumen.
- The main change will affect the production of tight oil in the United States, which will peak in around 2025, before declining until 2040. The uncertainty in the long-term revolves around how much tight oil production can increase and how long it can sustain high production levels.²²

Regarding the main actors in the Gulf of Guinea, it is expected that Angolan production will fall from 1.8 million barrels/day in 2016, to 1.5 in 2040, a reduction of 0.7%, whereas Nigerian production is expected to rise from 1.9 million barrels/day in 2016 to 2.5 in 2040, an increase of 1.1%²³.

Energy efficiency. The use of energy on the one hand and economic development, on the other hand, are becoming disengaged on a global level. The economy's energy intensity²⁴ decreased globally by 34% between 1990 and 2016. In China, energy intensity was reduced by 70% during this period²⁵.

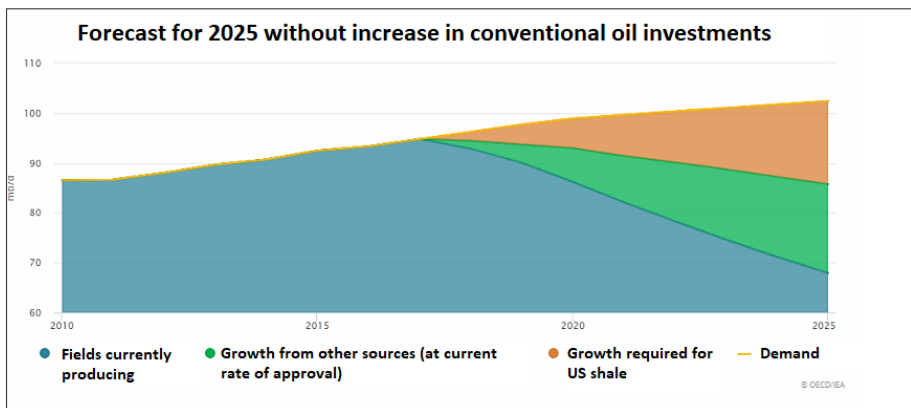


Image 13

The transport sector as a whole accounted for the greatest proportion of the final consumption of energy in 2016 (36%), followed by the manufacturing industry (23%) and the residential sector. Energy consumption for transport is

²² WEO. World Energy Outlook 2017 *Op. cit.*, p. 182-5.

²³ *Ibid.*, p. 189.

²⁴ Quantity of energy used to generate one unit of GDP (TPES / PIB)

²⁵ IEA. *Energy Efficiency Indicators Highlights*, 2018, Paris: OECD/IEA.

dominated by road vehicles (89%), air transporting accounting for 7%. Energy consumption for maritime and rail transport together comes to approximately 4%²⁶.

Global investment in energy came to 1.8 billion dollars 2017, 1.9% of the world's GDP.

For the third year running, investment in real terms fell by 2%²⁷, mainly as a consequence of stagnation in the investment of fossil fuels and coal, hydroelectric and nuclear power plants. The electricity sector was the main receiver of energy investment for the second year running, an indicator of the electrification of the world economy, backed by a solid investment in renewable energy²⁸.

The cost per unit of solar photovoltaic energy, 8% of global energy investment, was reduced by nearly 15% owing to a reduction in the prices of the modules and the movement of production to cheaper regions, especially in China, encouraged by the growing supply of electricity, low-carbon networks and energy efficiency²⁹.

However, the flow of new upstream projects would seem to be oriented towards an imminent slowdown in the demand for fossil fuels which could lead to a supply crisis, with a deficit in supply and a greater escalation in prices, especially oil prices. The new conventional unrefined oil projects approved in the past three years would only cater for half the requirements to balance the market until 2025³⁰.

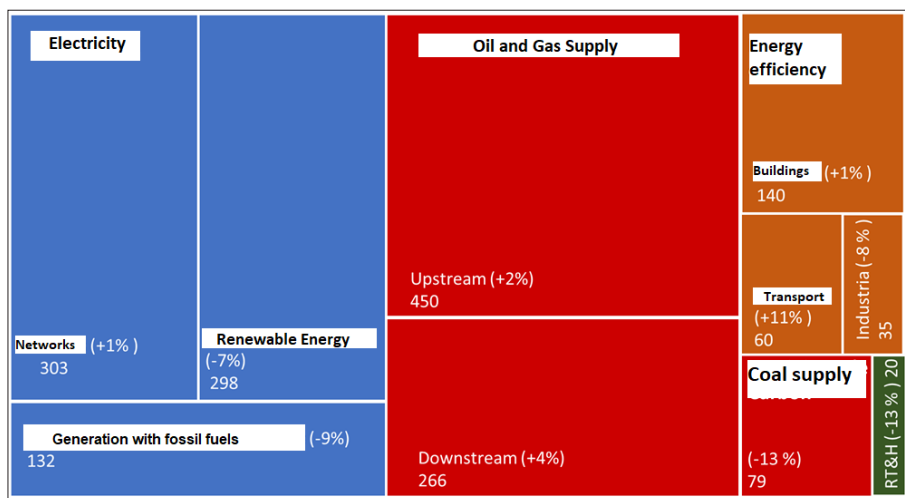


Image 14. Distribution of the energy investments (14 pág. 23)

²⁶ Ibid.

²⁷ Compared to 2016

²⁸ IEA, *World Energy Investment 2018*, 2018, Paris: International Energy Agency, p. 11.

²⁹ Ibid.

³⁰ WEO. *World Energy Outlook 2018*, *Op. cit.*, p. 6.

Investments associated with improvements in energy efficiency remained stable. However, the increase in 2017 was favoured by expenditure in central heating, refrigeration and building lighting efficiency, helped by the standardisation of projects compatible with different building types³¹.

The use of petroleum for passenger vehicles began to stagnate or decline in industrialised countries, whereas its utilisation for road haulage vehicles carried on increasing³².

The manufacture of petrochemical products and their by-products accounted for roughly 14% of oil and 8% of gas. The use of air-conditioners and fans currently amounts to 20% of the total electricity consumed in buildings all over the world. This trend will increase as the global economic and demographic growth takes place in countries with hotter climates³³.

The major powers' energy strategies

Energy policies are the main factor that determines growth in energy demand³⁴. Although it is not essential, the Gulf of Guinea (GoG) is important for the major powers' energy and security strategies, especially for the EU, USA, France, China, India, Russia and Brazil. Their interests are different, and they vary to the extent that they rely on importing energy, and the same applies to their strategies. The first defining element is the growing influence of China, in its competition with the USA.

Asia is the main regional consumer of oil, coal, renewable energy and hydroelectricity, whereas North America is the leader in nuclear energy and natural gas. Asia dominates world coal consumption, which amounts to almost three quarters of the world consumption (74.5%). Asia's share of the coal market has been steadily increasing since 1965, when it only accounted for 17% of coal consumption. It passed the 50% mark in 2001³⁵.

In 2010, Freedom C. Onuoha³⁶, researcher for the *African Centre for Strategic Research and Studies*, of the *National Defence College* in Nigeria, stated that, in recent times, the GoG had borne witness to the influx of US oil companies in search of light crude oil. Washington considered that African oil was a vital opportunity to diversify its supply. US oil companies such as ExxonMobil, ChevronTexaco, Amerada Hess, Noble Energy, Kellogg Brown & Root and Kerr McGee increased their

³¹ IEA, *World Energy Investment*, Ibid, p. 12.

³² OECD/IEA. *The Future of Trucks*, 2017, Paris: IEA,

³³ OECD/IEA. *The Future of Cooling*. 2018, Paris: IEA.

³⁴ WEO. *World Energy Outlook 2017*, *Op. cit.*, p. 33.

³⁵ BP. *BP Statistical Review of World Energy 2018*. London: BP Statistical Review of World Energy, 2018, p. 11.

³⁶ Onuoha, Freedom C. *The Geo-strategy of Oil in the Gulf of Guinea: Implications for Regional Stability*. 2010, *Journal of Asian and African Studies* 45(3), pp. 369–384.

investment in the region. The need to protect these investments and guarantee supply to the USA, led to the establishment of the AFRICOM.

Apart from the largest North American oil companies, European and Asian oil companies are also competing for the exploration rights and the GoG oil blocks. The media and the academic literature have come to refer to this as the “Third Scramble for Africa”: Europe depends on the natural resources of other parts of the world for its energy requirements and the major oil companies of Asia –especially China– are competing for a strong profile in the region³⁷.

Baqués Quesada³⁸ considers that China and Russia are key States for geopolitics in the next decades. They are different from each other, their relations are fraught with tensions and they both have complex relations with the United States. Russian policy towards suffered after the “dissolution” of the Soviet Union, but then the situation gradually began to improve, which can be seen in its activities³⁹. Russian aspirations in Africa include recovering the influence enjoyed by the Soviet Union, re-establishing its presence and constructing new links. In June 2009, Dmitry Medvedev, accompanied by a delegation of 300 businessmen, toured the region, including Nigeria and Angola, indicating Moscow’s wish to encourage investment and participate in the region via a visible sponsorship of the government⁴⁰.

One major difference between Russia and China lies in the fact that China’s sphere of economic influence goes far beyond Russia’s. In recent times, China has embarked upon a hitherto unprecedented strategy in Africa, devised to guarantee long-term access to the vast areas of the continent, its wealth of raw materials, especially oil, including the search for natural resources, trading opportunities, diplomatic initiatives and strategic associations. China’s oil diplomacy in Africa pays out large sums in aid, trading rights, soft commercial loans and oil-for-arms agreements⁴¹.

US, British and French oil companies had dominated the Nigerian oil industry, which Washington considered to be an asset belonging to the major Anglo-American oil companies (ExxonMobil, Shell and Chevron), but this myth dissipated in the face of the progress made by Chinese oil companies. China had granted Nigeria a loan of 2.5 billion dollars for infrastructure and development in 2006, and planned to invest 7 billion dollars in different sectors⁴².

As Fared Zakaria pointed out in *The Washington Post*,

³⁷ Ibid.

³⁸ BAQUÉS QUESADA, Josep, Josep, *La relación estratégica entre Rusia y China una mirada geopolítica*. 2018, Revista general de marina, Vol. 274, MES 4, Pages 721-730. ISSN 0034-9569.

³⁹ Shubin, Vladimir. *Russia’s policy towards Africa*. Milan: ISPI - Analysis, 2013.

⁴⁰ Giles, Keir. *Russian Interests in Sub-Saharan Africa*, 2013, Carlisle: Strategic Studies Institute and U.S. Army War College Press.

⁴¹ Onuoha, Freedom C., Op. cit.

⁴² Ibid.

“The Trump Administration’s idea of cutting itself off from the world is a god-send for China. Look at the budget proposed by Trump, which would reduce expenditure in «soft power⁴³» by 28%. In contrast, Beijing has quadrupled its Ministry of Foreign Affairs budget in the past decade”⁴⁴

David Shambaugh of the George Washington University estimates the total expenditure at 1.4 trillion dollars⁴⁵. The Trump administration wants a better army, but China is not trying to compete with US power in that way. Chinese leaders consider that the Soviet Cold War strategy was a miserable failure. The corollary is: let Washington waste resources, whereas Beijing concentrates them on the economy, technology and soft power⁴⁶.

What is more, energy dependence is different. The USA treads firmly along road from self-sufficiency to export, thanks to the shale revolution, whereas Chinese dependency –it has been the world’s main energy consumer since 2009– is enormous, so it is essential for its economic model to evolve separately from the current one, whose production is mainly oriented towards heavy industry, infrastructures and manufacturing goods, driven by coal, which covers more than two-thirds of the country’s energy requirements⁴⁷.

China published its Energy Production and Consumption Revolution Strategy (2016-2030), with plans for coal, oil, gas electricity, shale gas, coal layer methane, nuclear, hydroelectric power, solar, wind, biomass, geothermal and energy technological innovation. Although Africa is important for the State-owned Unipet and other Chinese companies for the purchase of oil and LNG, the continent is still low priority for exploration/production. The energy transition has major implications for China and for the world in general. It is expected that by 2040, China’s energy growth will proceed mainly from natural gas and technologies low in coal⁴⁸.

The USA, which has demonstrated the good efficiency-cost relationship of the new resources, is a net exporter of gas and by the end of the 2020s, it will also be an oil exporter, making it the main additional source of oil for the international market. However, its energy policies have undergone a sudden change. An executive order in March 2017 stressed the importance of its energy resources for economic growth and domestic use. The order included a review of the Clean Power Plan, in fact, the United States announced its decision to withdraw from the Paris Agreements on Climate change⁴⁹.

⁴³ Diplomacy, foreign aid, international organisations.

⁴⁴ Zakaria, Fareed. Trump prepares to pass the world leadership baton to China. *The Washington Post*. 6/3/2017.

⁴⁵ The Marshall Plan would cost about 100 billion in today’s dollars

⁴⁶ Ibid.

⁴⁷ WEO. World Energy Outlook 2017, *Op. cit.*, p. 72.

⁴⁸ Ibid, p. 74.

⁴⁹ Ibid, p.24.

India published a national energy policy draft that proposed coordinated energy to achieve national and sectorial goals, with universal access to electricity by 2022, as well as a reduction in oil imports (Will they be replaced by coal?) and an increase in the capacity of the renewable energies.

Geographical scenario: the Gulf of Guinea

The GoG lies along the Africa's Atlantic Coast, contains abundant fishing, mining, forestry and hydrocarbon (oil and gas) resources and is a transit zone for the main sea routes of Western and Central Africa.

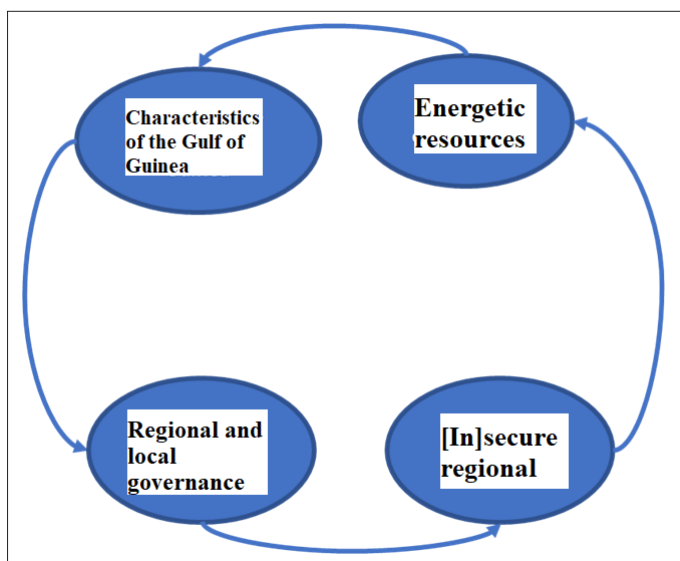


Image 15

The two main river systems in Sub-Saharan Africa flow into the Gulf, namely the Rivers Niger and Congo, essential trade routes for the countries through which the two rivers flow. The main seaports lie on the western shore, which is where large volumes of good are loaded and unloaded, including the exports from and imports to landlocked countries, such as Burkina Faso, Mali, Niger, Chad or the Central African Republic⁵⁰.

Geographically, it runs from Cape Palmas, on the frontier between Liberia and the Ivory Coast to Cape Lopez in Gabon, and encompasses the coasts of Liberia, the Ivory Coast, Ghana, Benin, Togo, Nigeria, Cameroon, Sao Tome and Principe, Equatorial Guinea and Gabon; it contains two inner gulfs: the Gulf of Benin, to the west, and the Gulf of Biafra, to the east.

⁵⁰ Silverio González, Yoslán *El Golfo de Guinea: ¿Futuro Golfo Pérsico Africano??* 2016, Revista Brasileira de Estudos Africanos v.1, n.1, Pages 111-129.

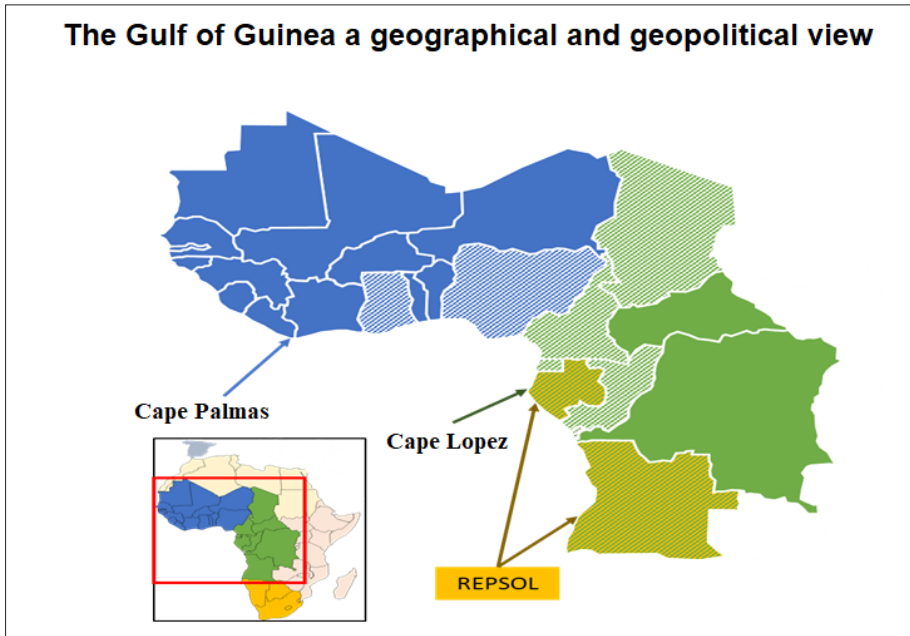


Image 16. The Gulf of Guinea a geographical and geopolitical view

From a geopolitical perspective, the GoG forms part of two of the African sub-regions defined by the UN: West and Central Africa. That is what is included in the treaty that established the GoG Commission, signed in Libreville in 2001, when it indicates that the members of the Commission will be "Sovereign States bordering the GoG party to this Treaty, i.e. Angola, Cameroon, Republic of the Congo, Democratic Republic of the Congo, Gabon, Equatorial Guinea, Nigeria and Sao Tome and Principe"⁵¹.

The definition of the GoG, that envisaging the European Union's 2014 Strategy, essential for analysing the threats and weaknesses of the region:

...includes the 6,000 km of coastline from Senegal to Angola, includes the islands of Cape Verde and Sao Tome and Principe, which forms two geographical, political and economic regions: the Economic Community of West African States (ECOWAS) and the Economic Community of Central African States (ECCAS), not members of the Gulf of Guinea Commission (GGC) and the African Union (AU)⁵².

⁵¹ Gulf of Guinea Commission. Treaty Establishing the Gulf of Guinea Commission. *Treaty*. Libreville, Gabon: s.n., 3/7/2001.

⁵² Council of the European Union, EU Strategy on the Gulf of Guinea, *European External Action Service*. [Online] 17/3/2014. https://eeas.europa.eu/sites/eeas/files/eu_strategy_on_the_gulf_of_guinea_7.pdf.

Regional Governance

Governance in the Gulf of Guinea

The first indicator we are going to analyse to study governance is the Fragile States Index in the developing world⁵³. Since 11th September 2001, the United States Government and others have stated that the threats to peace and security often come from the weakest States in the world, which are victims of and can also cause a large number of transnational security threats, including terrorism, arms proliferation, organised crime, infectious diseases, environmental degradation and civil conflicts that spill over their frontiers⁵⁴.

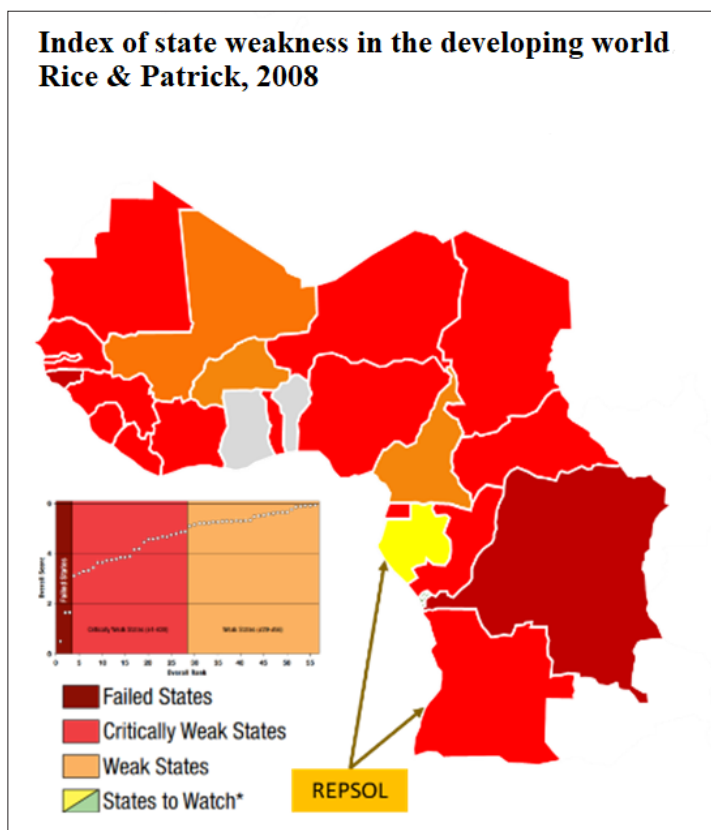


Image 17

⁵³ Rice, Susan E. y Patrick, Stewart, *Index of State Weakness in the Developing World*, 2008, Washington: The Brookings Institution.

⁵⁴ It takes into account the security apparatuses, fractional elites, collective grievances, economic and ownership decline, uneven economic development, human exodus and the brain drain, legitimacy of the State, public services, human rights and the rule of Law., demographic pressures, refugees and internal displacement, foreign intervention.

Sub-Saharan Africa is the world region with the largest concentration of fragile and failed states. In this respect, the most positive states in the GoG region are Ghana, Benin and, to a lesser extent, Gabon. They are the most stable States, whereas Cameroon is regarded as a “fragile State”, and the rest of the countries in the region “critically fragile”. The Democratic Republic of the Congo is defined as a “failed State”.

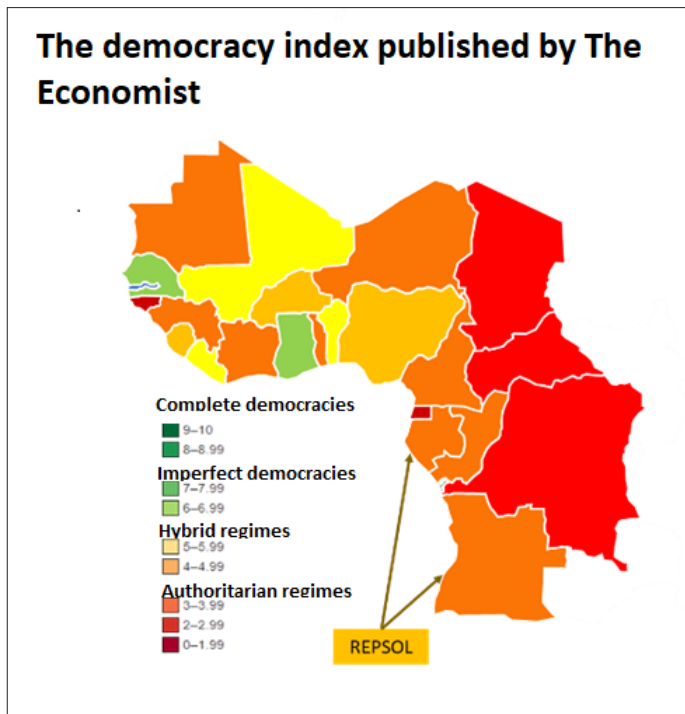


Image 18

According to the democracy index published by The Economist, there is only one country in the zone defined as an imperfect democracy (Ghana), four of them as hybrid regimes (Liberia, Sierra Leone, Nigeria and Gambia), whereas all the others fall into the category of authoritarian regimes (Ivory Coast, Angola, Gabon, Cameroon, Republic of the Congo and, especially, the Democratic Republic of the Congo and Equatorial Guinea).

With regard to corruption, the Corruptions Perception Index, of International Transparency, Africa obtains the worst results. However, in countries like the Ivory Coast, where the communities are strongly affected by corruption, the government is making great progress in reducing it.

The countries with the worst results are the ones there are conflicts or wars, because the fragility of the governments in these situations is a real challenge when it comes to making significant changes. Other countries have leaders that

have taken a stand against corruption as a means for achieving power, but have not fulfilled their promises. In Liberia, the mandate of the ex-President Sirleaf Johnson was tarnished by accusations of nepotism, illegal contracts and impunity for her Cabinet Ministers.

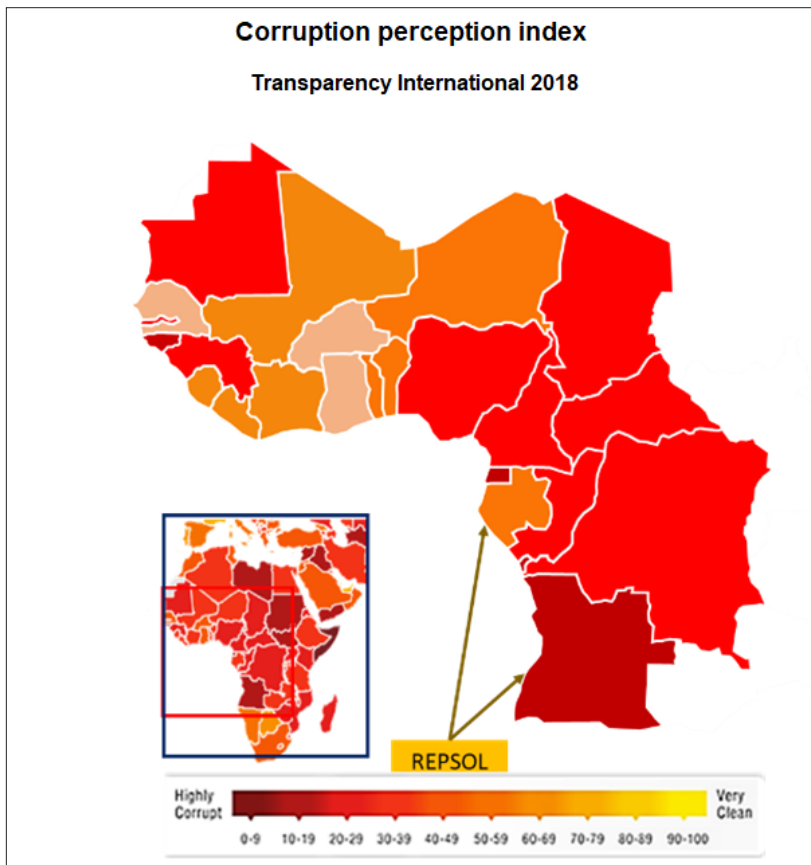


Image 19

The Fragile States Index map for 2018 from *The Fund For Peace*⁵⁵, shows how, despite the limited democratic space in Togo, civil society and the political opposition have managed to position themselves as an influential force. In 2005, President Gnassingbé Eyadéma died after governing the country for nearly four decades. To succeed him, the army installed the deceased president's son, Gnassingbé Faure, which caused public outrage and sanctions from the Economic Community of West African States (ECOWAS) and the African Union, and elections were required to be held in April of that same year.

⁵⁵ FFP. Fragile States Index. *The Fund for Peace*. [Online] 2018. <http://fundforpeace.org/fsi/analytics/fsi-heat-map/>.

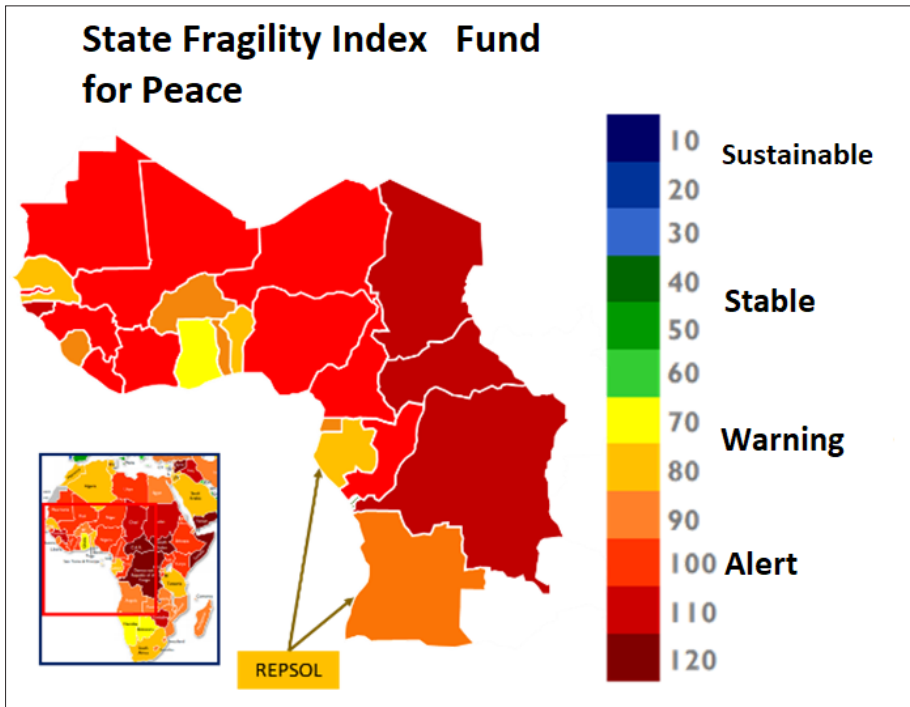


Image 20

Political tension grew during the 2010 and 2015 Elections, when Faure was re-elected. These rises in pressure were clearly reflected in the annual trends published in the Fragile States Index (FSI).

The OECD's Fragile States Index for 2018⁵⁶ analyses the environmental, political, societal, economic and security fragility. The DRC, the Congo, Liberia, Gambia, Guinea, Guinea Bissau, Cameroon, Sierra Leone, Nigeria, Angola and Equatorial Guinea are –in that order, among the most fragile states⁵⁷.

We can conclude from analysing the above indicators, that except for the cases of Ghana and Benin, the region is characterised by weak democratic governance, a high level of corruption and fragility and weakness of the States, all of which clearly affects the regional (in)security situation, which is covered in our next section.

The region has a long tradition of internal wars, which began during the Cold War, such as the Nigeria Civil War, known as the Biafra War (6th July 1967 to 13th January 1970), or the Angolan Civil War (1975-2002), Africa's longest conflict. After the Cold War, civil wars broke out such as the «Blood Diamonds» in Sierra

⁵⁶ OECD (2018), *States of Fragility 2018*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264302075-en>.

⁵⁷ Ibid.

Leone, (1991, 2002), or the First (1989-1996) and Second (1999-2003) Liberian Civil Wars. More recently, the Ivory Coast suffered two civil wars, the first in 2002 and the second in 2011 when there was fighting between the forces loyal to the President Elect and the De facto President in the west of the country.

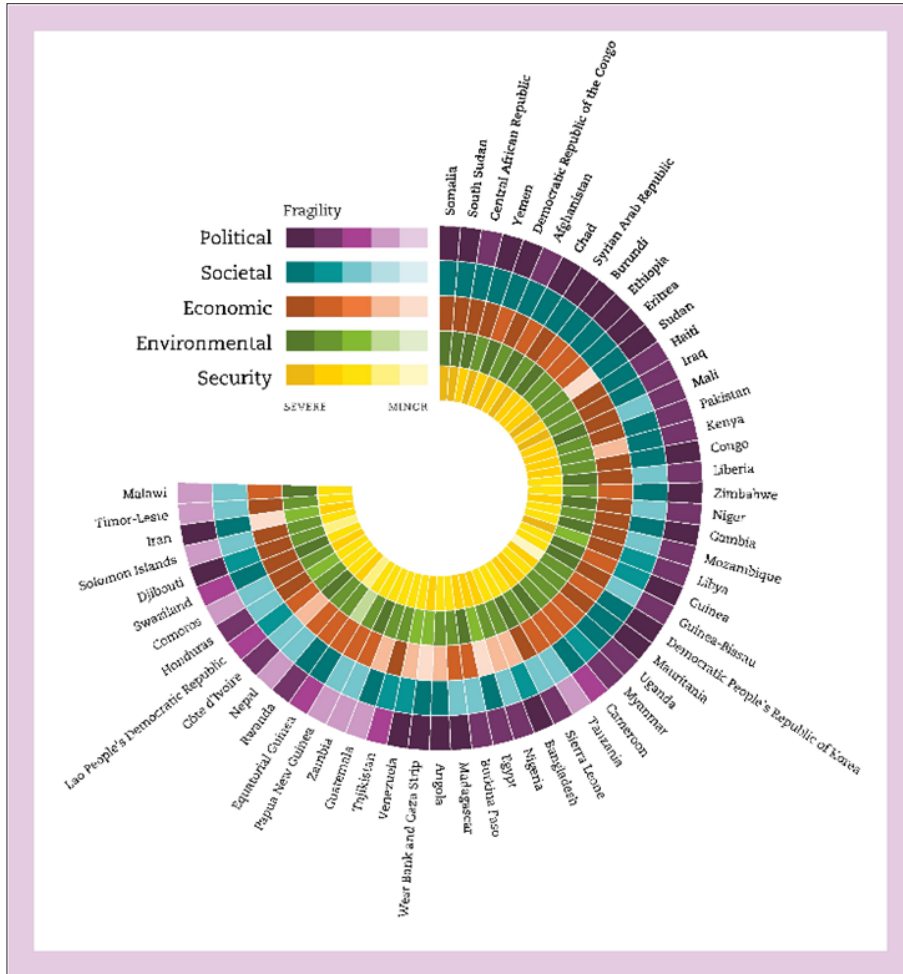


Image 21

Current security situation

The presence of a powerful State can have an impact that is either cooperative, or conducive to stability within a region, or conflictive.

However, Nigeria, despite its status as the largest economy in Africa, cannot be regarded as a regional hegemonic power. Nigeria, a military giant in Africa, ful-

films many of the requirements for achieving hegemonic status, but its domestic problems put it in a precarious position, because of its poor governance and its chronic dependence on oil. It is a “giant with feet of clay”⁵⁸

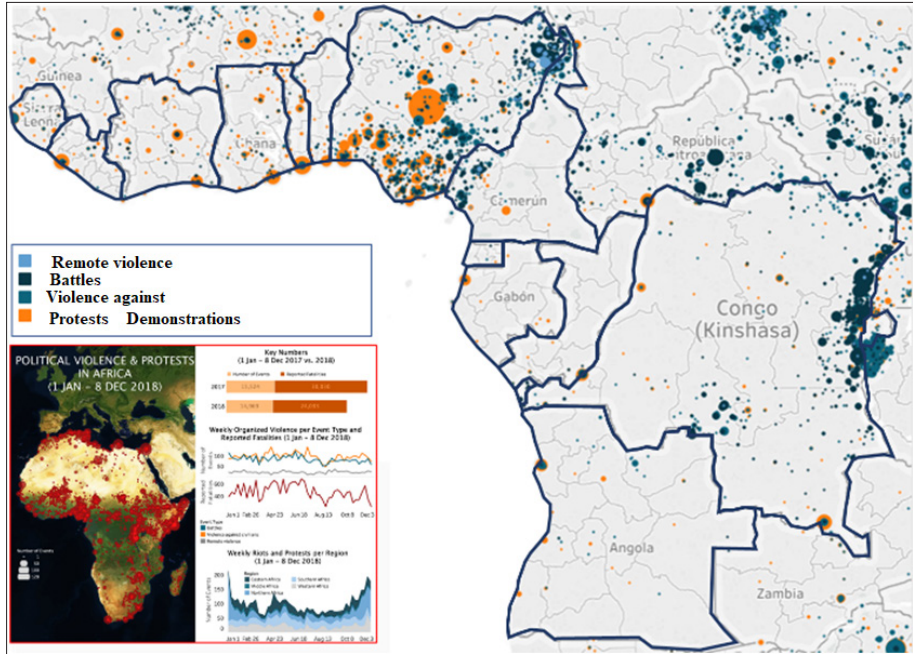


Image 22

The African concept of security has traditionally been dominated by its land conflicts, little attention being paid to maritime threats and protection of the environment⁵⁹. The main land threat is focused on the countries in the Gulf of Benin, to the west and the Gulf of Biafra, especially in Nigeria and Cameroon, where Boko Haram, has been the main actor, but not the only one.

Nigeria

Recent events highlighted the fragile coexistence between groups with different identities, which adds further instability to the existing unstable situation. As Velasco states⁶⁰, any attempt to successfully stabilise the region makes it neces-

⁵⁸ Ogunnubi, Olusola & Okeke-Uzodike, Ufo. *Can Nigeria be Africa's hegemon?* 2016, African Security Review, 25:2., pages 110-128.

⁵⁹ Brits, Pieter & Nel, Michelle, *African Maritime Security and the Lomé Charter: Reality or dream?* 30/11/2018, African Security Review.

⁶⁰ Velasco González-Calvo, José Félix, *La estrategia energética española en el Golfo de Guinea.* *ieee.es.* [Online] 19/12/2017. http://www.ieee.es/Galerias/fichero/docs_opinion/2017/DIEEO127-2017_Estrategia_Energetica_GolfoGuinea_JFelixVelasco.pdf.

sary to first solve the domestic conflicts in Nigeria, the main economy in the zone. The conflict between the different ethnic groups in the Niger Delta, the Nigerian Government and the oil companies still persists in the south. In the north, the conflicts are of a religious nature, especially as a consequence of the appearance of armed Islamic groups (Boko Haram), which have forced a large percentage of the population to move to other parts of the country.

The systematic use of the armed forces against Boko Haram has reduced the zones under their control in Nigeria and sparked off their internal disputes. The joint Nigeria-Cameroon operation since 2016, had managed to put Boko Haram on the defensive, losing a large part of the territory they controlled in Nigeria, and limiting their activities to their camps around Lake Chad. Between January and June 2018, Boko Haram moved their operations to the northern regions of Cameroon and to Diffa, in Niger, so their activities in the central Nigerian States became much less frequent⁶¹.

However, the Nigerian Army began to suffer from another problem, which became increasingly widespread: violent incursions of the Fulani militias, nomads seeking land. From January to June 2018, the rate of Fulani attacks exceeded that of Boko Haram and has spread throughout the country, whereas Boko Haram's attacks occurred mainly in the States of Eastern Borno and Adamawa to the north east⁶².

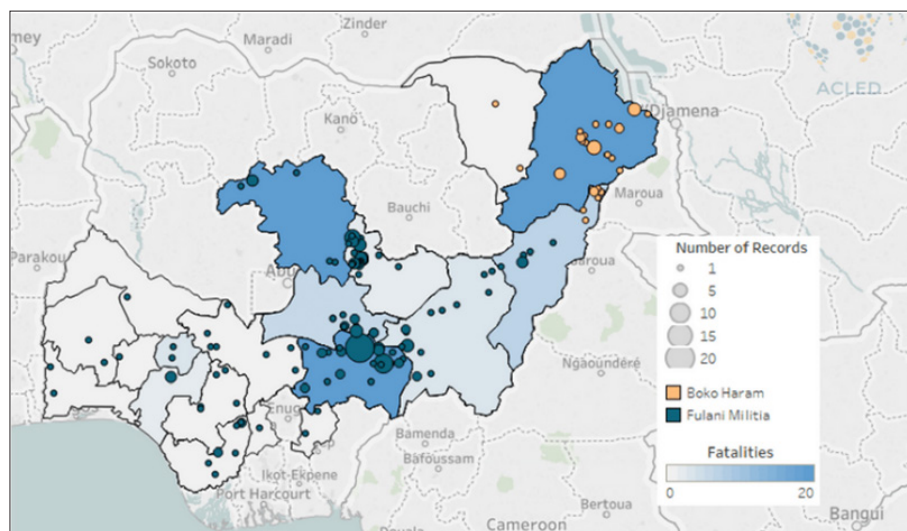


Image 23

⁶¹ Vannice, Charles, Can Boko Haram Effectively Function Despite Current Limitations? *ACLED*. [Online] 31/8/2018.

⁶² Vannice, Charles, Will The Military's Focus on The Fulani Threat Allow for a Resurgence of Boko Haram? *Aclcd*. [Online] 6/7/2018. <https://www.aclcddata.com/2018/07/06/will-the-militarys-focus-on-the-fulani-threat-allow-for-a-resurgence-of-boko-haram/>.

At the beginning of 2018, the Government prematurely declared the total defeat of Boko Haram in the north east, initiating a phase of post-conflict stabilisation. Yet despite their great losses, Boko Haram still kept up the offensives, and an attack in July 2018 against a military base in Jillli (State of Borno), was the group's first success since April 2018⁶³. The faction backed by the Islamic State of Boko Haram has claimed responsibility for over 20 attacks against military bases since midway through June, in which dozens of soldiers were killed. On 7th December, the military forced Boko Haram to retreat in an advanced operations base in the City of Bama, about 70 kilometres to the south east of the in Maiduguri, the capital of the State of Borno.

The reallocation of resources to combat the Fulani in the centre of the country could bring about the unwanted effect of enabling Boko Haram to recover its operating capacity⁶⁴. However, with Presidential Elections of February 2019 just around the corner, the Nigeria Government is finding itself under pressure to improve the country's security, and at the end of 2018, the security forces embarked on new operations against "bandits" and "livestock camps" in the forest of Mahanga in the State of Zamfara⁶⁵.

Another matter that affects security in Nigeria was the announcement by the Coalition of Niger Delta Agitators that they were resuming hostilities in the Delta, because the international oil companies have not established their headquarters in the State, and in view of the fact that the President refused to sign the Petroleum Industry Governance Bill.

The fact that the Nigerian Government is devoting almost all its time to combating these threats, causes other weakness to rear their head, such as illegal fishing, an increase in the activities carried out by organised crime, such as contraband, human trafficking, drugs, arms, etc⁶⁶.

Cameroon

Boko Haram is the greatest challenge to security in the north of Cameroon. The Islamic terrorist group has drastically reduced its attacks in recent months, thanks to the success of the multinational coalition headed by Nigeria. Nevertheless, the soldiers of Cameroon have been accused of abuses and the violation of human rights by Amnesty International⁶⁷.

The Cameroon Government refuses to give way to the demands of the separatists, who have been confronting the Cameroon Security Forces in a guerrilla

⁶³ Vannice, Charles, Can Boko Haram, Ibid.

⁶⁴ Vannice, Charles, Will The Military's Focus, Ibid

⁶⁵ Pinaud, Margaux, Regional Overview – Africa 4th December 2018. *ACLEDD*. [Online] 4/12/2018. <https://www.acleddata.com/2018/12/04/regional-overview-africa-4-december-2018/>.

⁶⁶ Velasco González-Calvo, *Op. cit.*

⁶⁷ African Military Blog. African Conflict Map 2018 – A comprehensive guide. *African Military Blog*. [Online] 21 de 07 de 2018. <https://www.africanmilitaryblog.com/>.

war. The reprisal attacks have caused thousands of people to flee to Nigeria. Ambazonia, the English-speaking region in south-west Cameroon, declared itself independent in 2016. It is a territory held in Trust by the United Nations for the South of Cameroon, administered by the United Kingdom from 1922 until 1961. In 1961, it voted to join the French-speaking part of the Republic of Cameroon⁶⁸.

The English-speaking population, 20% of the country's inhabitants, who feel socially excluded, have demanded a return to the federal model that existed between 1961 and 1972. Since 2016, the Cameroon Government has been restricting liberties, limiting access to the Internet and illegally arresting the leaders of the independence movement, manipulating trading laws to sabotage their economy and modifying the education system in the region⁶⁹.

Both the Cameroon Government and the armed separatists are using violence to protect or punish certain civilian populations for ostensibly supporting their opponents. In the 7th October Elections, the 84-year old Paul Biya, the oldest and most long-lasting president in Africa, was re-elected. For several weeks before the election, there was an increase in violence from the English-speaking separatist movement in the north-west and south-west of the country. Ever since, violence against civilians has been utilised systematically by the armed separatists⁷⁰.

Democratic Republic of the Congo

In spite of being foreign groups, the Allied Democratic Forces (ADF), the Resistance for the Rule of Law in Burundi (RED-TABARA) and the Front for Democracy in Burundi (FRODEBU) still pose major threats to security. The Allied Democratic Forces (ADF) are carrying on with their attacks in and around Beni, causing riots in the towns, whose inhabitants criticise the government's inability to protect them. At present, the joint operations taking place involving the Congolese and the MONUSCO against rebels of the Allied Democratic Forces (ADF) in North Kivu, are still finding themselves up against strong resistance⁷¹.

The continued deterioration in matters concerning security, constitutes a serious threat to the attempts to cope with the serious outbreak of Ebola affecting the country and to hold elections at the end of December. The response to the outbreak of Ebola in North Kivu is still facing major problems. On 20th October, the Mai Mai militia killed two health officials who were treating the epidemic in

⁶⁸ African Military Blog, *Ibid*.

⁶⁹ Pinaud, Margaux, Regional Overview – Africa 4th December 2018, *Op. cit*.

⁷⁰ Matfess, Hilary. Continued Clashes Between the Government and Anglophone Separatists in Cameroon Put Civilians at Risk. *ACLEDD*. [Online] 8/11/2018. <https://www.acleddata.com/2018/11/08/continued-clashes-between-the-government-and-anglophone-separatists-in-cameroon-put-civilians-at-risk/>.

⁷¹ Pinaud, Margaux, Regional Overview – Africa 4th December 2018, *Op. cit*

Butembo. Although health workers had already been victims of numerous attacks since the start of the response to Ebola, these were the first mortalities⁷².

Since the crisis in the 1960s, under President Mobutu, the country has experienced its worst moments of corruption, and its divisive tactics caused the ethnic violence in the country, and one of the worst humanitarian crises since the Second World War: six million people have died in the conflict⁷³. The causes of the violence are complex, and include control over the country's unexploited mineral resources, valued at 24 trillion dollars. The armed groups have begun to operate like organised criminals, taking advantage of their military power to control the mineral deposits⁷⁴.

One of the cruellest aspects of the conflict is the rape and mutilation of women, these crimes being committed not only by the Armed Forces and the National Congolese Police Force, but also by rebel groups. The situation has been further aggravated by former members of the militia joining the regular armed forces. The United Nations Organisation Stabilisation Mission in the Congo (MONUSCO) has been accused by Human Rights Watch (HRW) of being accomplices to the atrocities against civilians⁷⁵.

Angola

Intimidation by the authorities is still going on in the diamond-rich Province of North Lunda. On 24th November, military forces and the police carried out house-to-house raids in the City of Cafunfo⁷⁶. The security operations against illegal diamond extraction since the end of September, gave way to violence at the beginning of October and, as a result, the forced repatriation or fleeing of over 400,000 people, mostly from the DRC. The round-ups occurred after the resurgence of the movement for the protectorate of Lunda-Chokwe, whose members are demanding autonomy for the "Kingdom of Lunda". The authorities responded violently to the protests, shooting and hitting the demonstrators⁷⁷.

Piracy

The oceans contain immense natural resources. From fish to hydrocarbons, they are a source of income, and provide food and employment for millions of people the world over. They are also the main trade routes and connect nations and cultures. However, the security of the sea routes can be jeopardised by many

⁷² Pinaud, Margaux. Regional Overview – Africa 30th October 2018. *ACLEDA*. [Online] 30/10/2018. <https://www.acleddata.com/2018/10/30/regional-overview-africa-30-october-2018/>.

⁷³ African Military Blog, *Op. cit.*

⁷⁴ *Ibid.*

⁷⁵ *Ibid.*

⁷⁶ A village in the north-east of Angola dominated by the informal and formal extraction of diamonds.

⁷⁷ Pinaud, Margaux, 4th December 2018, *Op. cit.*

hazards, interrupt the sustainable development of the maritime resources, put international stability at risk and generated insecurity with long-term consequences to health, wealth, the creation of employment and flows of migrants.⁷⁸

In 2013, Chatham House, stated that maritime security was an emerging problem in the GoG region. Energy security and trade depended upon maritime transport, and the region provides approximately 5.4 million barrels of oil per day (B/D). In 2011, the region's oil supply was equivalent to 29% of the USA's total oil consumption. Angola and Nigeria, respectively, account for 34% and 47% of the region's total oil supply⁷⁹.

Maritime security is the international community's greatest concern, because of the dangers involved in a temporary interruption of the oil supplies that pass through the GoG. It is hardly surprising that most of the international cooperation with the coastal States has been devoted to improving the resources given over to this⁸⁰.

The rapid escalation of piracy has forced the African Union (AU) to develop a joint strategy to tackle the problem, which has led to the 2050 Africa's Integrated Maritime Strategy, signed in 2014, and to adopt a binding maritime safety & security charter in Lomé in 2016. The Lomé Charter must focus on the general provisions of the strategy so that Africa, as a continent, can take on the responsibility for safety and security and the economic empowerment of the African Maritime Domain (AMD)⁸¹

Florentine Adenike, Executive Secretary of the Gulf of Guinea Commission, when referring to the strategies that the countries could adopt, stated at a meeting in April 2018 that:

*"We have maritime crime, illegal fishing, drug and human trafficking, immigration and deterioration of the environment, which are all serious problems that affect the region. Therefore, we want to involve the Member States in the process of revitalisation. We don't want them to be decisions taken exclusively by the Gulf of Guinea Commission. Our plan is to use the successes of other countries to face up to these challenges. For example, if we see that one country is being successful in its fight against pollution, we just approach that country and ask what its strategies are, and we exchange them with the Member States to adopt the same method"*⁸²

The GoG is a geopolitical bottleneck not only for the maritime transport of oil extracted from the Niger Delta, but also for the products travel to and from Cen-

⁷⁸ G7 GG, *G7 High Level Meeting on Maritime Security*, 2017, Rome: Italian G7 Presidency 2017.

⁷⁹ Chatham House. *Maritime Security in the Gulf of Guinea March 2013, 6th December 2012*. London: Chatham House, 2013. ISBN 978-1-86203-283-5.

⁸⁰ Velasco González-Calvo, *Op. cit.*

⁸¹ Brits, Pieter & Nel, Michelle, *Op. cit.*

⁸² Amabo, Eulalia, Central Africa: Gulf of Guinea Security - Consultations On Common Strategies. *AllAfrica*. [Online] 9/4/2018. <https://allafrica.com/stories/201804100190.html>.

tral and Southern Africa. In 2017, there were 81 attacks on ships, of which 42 were associated with piracy and 39 were armed robberies, and 32 sailors were kidnapped for a ransom.⁸³

Boarding vessels with intent to commit crimes can be summarised into three categories:

- Theft: the perpetrators attack vessels while they are anchored or moored, generally during the hours of darkness.
 - They look for a ship with no physical security measures and without any visible presence of surveillance.
 - The perpetrators are usually low-level local criminals that take whatever they easily.
 - If they have access to the crew, they steal their personal belongings, such as clothing, cash, jewellery, laptops, mobile phones and portable electrical devices.
- Seizing the vessel to steal the cargo: between 2011 and 2014, there were a series of incidents in the GoG involving the seizure of tankers, with a view to stealing some or all of the vessels' cargos, generally petrol or diesel. In January 2018 there were two incidents of this type, when the oil tankers Barrett and Marine Express were seized in Cotonou, Benin, while anchored and awaiting entry into the port to unload.
 - It is a highly-organised piracy model, involving multiple actors who collaborate to attack an oil tanker, and transfer part of its cargo to a second oil tanker, and then sell the stolen cargo on the black market.
 - This risk increases when the price of refined products increases in the local markets.
- Kidnapping for a ransom: kidnapping sailors for a ransom is the most serious form of piracy in the GoG.
 - So far, this has only happened in Nigerian waters, and especially in the Niger Delta.
 - Their targets are deck officers and engineering officers.
 - The attacks are quick and violent, perpetrated by groups of pirates who operate from small and rapid launches.
 - The victims are held in camps in the Delta States until the negotiations are completed and they receive a ransom in return for their release⁸⁴.

⁸³ EEAS. EU Maritime Security Factsheet: The Gulf of Guinea. *European External Action Service*. [Online] 29/10/2018. https://eeas.europa.eu/headquarters/headquarters-homepage/52490/eu-maritime-security-factsheet-gulf-guinea_en.

⁸⁴ Wilkes, James. THE MANY FACES OF PIRACY IN THE GULF OF GUINEA. *GrayPage*. [Online] 11/6/2018. <https://www.graypage.com/thought-leadership/the-many-faces-of-piracy-in-the-gulf-of-guinea/>.

The pirates in the GoG are successful, as in other parts of the world, because many ships are easy prey. The figures published by the International Maritime Bureau (IMB) for the first three months of 2018 suggested that the frequency of the attacks was growing.

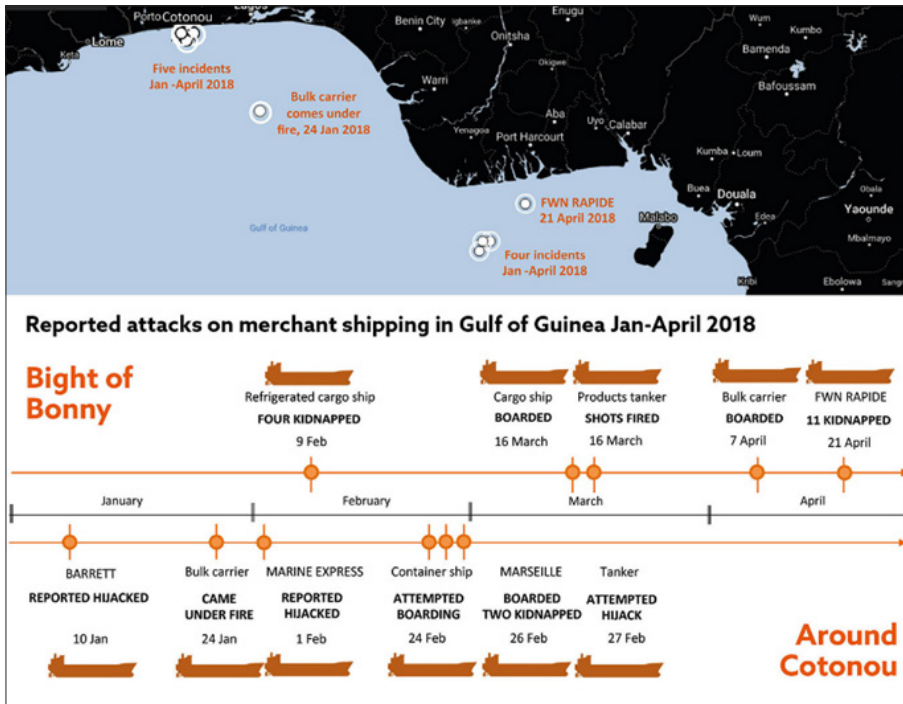


Image 24

There were at least 29 incidents, including the apparent seizure of two cargo-carrying tankers off Cotonu, Benin⁸⁵.

In April, during one of the most serious attacks to date, a group of pirates boarded the FWN Rapide (a 10,609 tonne general cargo vessel), while it was preparing to dock in Port Harcourt, in Nigeria, and kidnapped 11 crew members. In spite of the seriousness of the IMB statistics, the actual situation is even worse, given that the IMB data do not include attacks against fishing boats or ferries, and according to certain estimates, about 60% of the incidents go unrecorded⁸⁶.

The waters close to Nigeria are clearly dangerous, and although the Nigerian Authorities have undertaken to combat piracy and are developing regional initiatives, establishing an effective regional policy and response mechanisms

⁸⁵ Ibid.

⁸⁶ Ibid.

against piracy in the GoG is a complicated task, because it requires many coastal countries to come to an agreement⁸⁷.

The Gulf of Guinea as a geoenergetic region

The GoG's main resource is oil, located in the deep waters of the Gulf and in certain coastal zones such as the Niger Delta. The GoG is the largest zone of hydrocarbon reserves in Africa and its main oil production and commercialisation region.

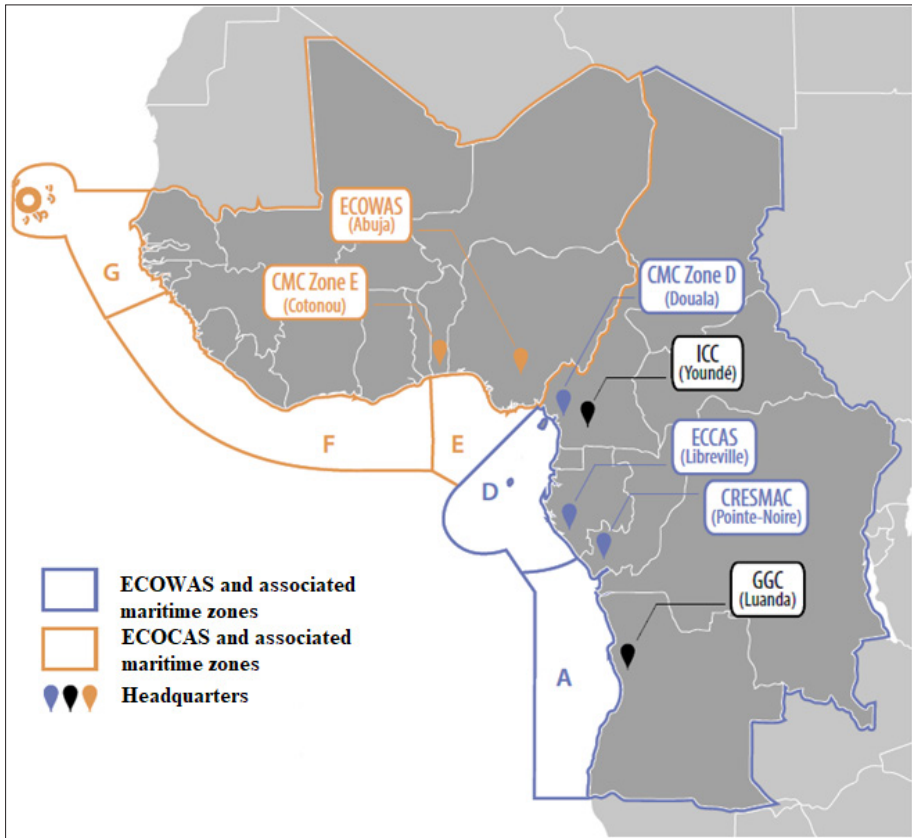


Image 25

Oil production in this area began in the 1970s along the coasts of Nigeria, Angola and the Republic of the Congo. Nigeria has always been the biggest producer – exporter. Since the final decade of the 20th Century, Nigeria has been joined by such countries as Cameroon and Gabon. Thanks to the development of technol-

⁸⁷ Ibid.

ogies for prospecting in deep waters, other nations like Equatorial Guinea and Cameroon have been able to join the former; Cameroon also serves as a route for exporting oil to Chad. The relative importance of Ghana as an oil producer on the western coast has been on the increase⁸⁸.

Further south lies Angola, the third biggest oil exporter in Africa. If we include Angola and the oil for Chad exported via Cameroon, a geostrategic zone emerges that exceeds the geographical bounds of the GoG⁸⁹.

Central and West Africa in general, and particularly the GoG⁹⁰, have become zones of great interest for the energy security of hydrocarbon-importing countries for a variety of reasons; these are contained in a 2011 report issued by Spain's Economic and Commercial Bureau in Malabo:

- The quality of African oil and its low sulphur-content;
- The potential of the gas extraction industry;
- The reserves of oil and gas;
- The security and easiness that make offshore supply possible;
- The proximity of western markets without straits or other geographically limiting factors;
- Its importance as a world production centre for Liquid Natural gas (LNG);
- Its proven capacity to increase production; and the relative security and political stability in the zone.

However, the "relative security and political stability in the zone", is only true if one compares it with the Persian Gulf, and the offshore supply security is only true if one compares it to the supply within the Niger Delta. The truth of the matter is that these factors have encouraged foreign investment, which could continue to finance new prospectations if the global energy panorama evolves favourably⁹¹.

The GoG is of great strategic importance to Spain, owing to its shorter overall distance than the Persian Gulf, because it is a provider of LNG, which is vital for our energy security and due to its increase in the market share and its contribution to the diversification of supply sources, which forms the basis of Spain's energy security⁹².

⁸⁸ Silverio González, Yoslán, *Op. cit.*

⁸⁹ *Ibid.*

⁹⁰ The following countries are considered for the purposes of this article: Angola, Cameroon, Chad, Gabon, Ghana, Equatorial Guinea, Nigeria, Republic of the Congo (Brazzaville), and Sao Tome and Principe

⁹¹ Oficina Económica y Comercial de España en Malabo, *Petróleo y gas en África Central y Occidental. The Gulf of Guinea*. 2011, Economic bulletin issued by ICE nº 3011, Pages 17-34.

⁹² *Ibid.*

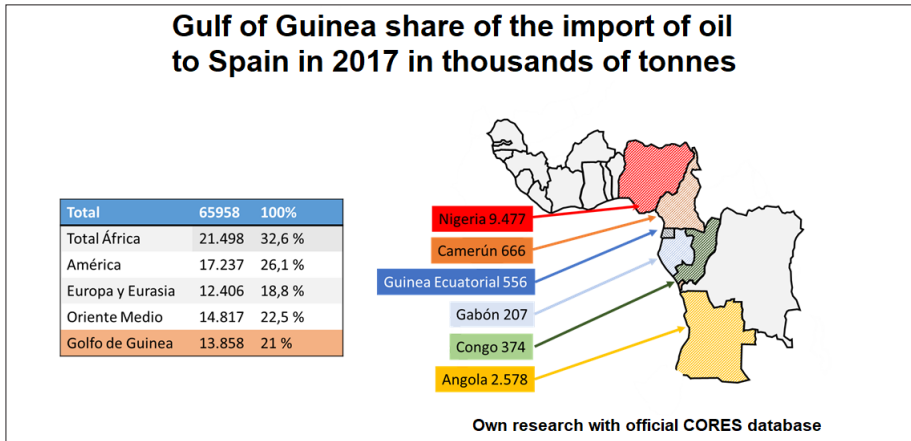


Image 26

	Primer year of production	Production (million B/D 2017)	Reserves (billions of barrels) 2016
NIGERIA (Shell, Total, Chevron, ExxonMobil, ENI, Oando)	1958	1.53 (1.47 in 2016)	37.2
ANGOLA (Total, Chevron, ExxonMobil, ENI, BP)	1959	1.64 (1.7 in 2016 and 1.8 in 2015)	11.6
EQUATORIAL GUINEA (Exxon-Mobil, Marathon, Noble Energy)	1992	0.13 (0.14 in 2016)	1.1
REPUBLICA DEL CONGO (Total, ENI, Chevron, Perenco)	1967	0.24 2016 figure (0.26 in 2014 and 0.25 in 2015)	1.6
GABON (Perenco, Total, Shell)	1957	0.20 (0.23 in 2016)	2.0
CHAD (ExxonMobil, Petronas, CNPC)	2003	0.073 2016 figures (0.082 in 2015 and 0.073 in 2014)	1.5
GHANA (Tullow Oil, Anadarko, Kosmos Energy)	2010	0.17 (0.1 in 2016 and 2015)	2.0
CAMEROON (Perenco)	1977	0.076	0.5
IVORY COAST (Bouygues, Tullow Oil, CNR International)	1995/	0.027	0.5
DRC (Perenco)	1976	0.023 (stable)	0.5

Table 1

The GoG Coast has become a hive of oil activities, mainly as a result of the offshore oil discoveries. Less than three decades ago, only a few countries in the GoG were either net exporters or had found major offshore oil resources. Yet the situation has changed significantly, and almost all the Coastal States have marine oil reserves. This could have prompted the International Energy Agency (IEA) to predict that oil outside territorial waters in West Africa and the GoG would be vital for meeting the world's future energy requirements. The GoG has even been nicknamed the "New Gulf", in reference to its enormous offshore oil potential⁹³.

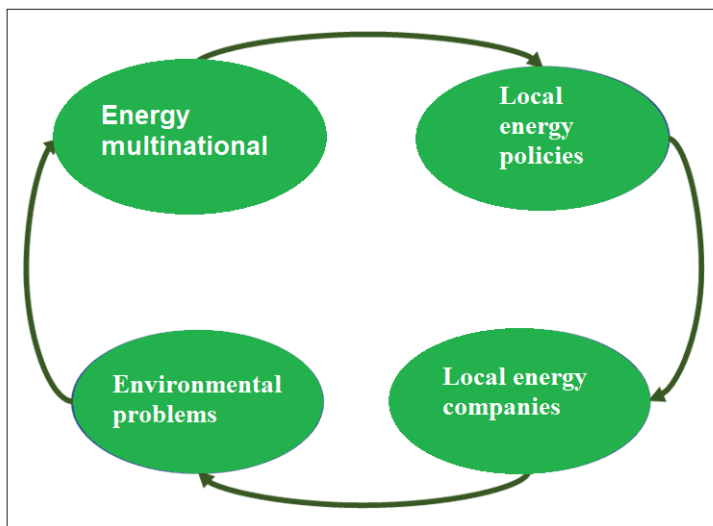


Image 27

The multinationals and other major energy companies

The multinationals and other major energy companies are facing a new dilemma, maximise the volume or maximise the value, and are concentrating on high-value prospections, while at the same time re-assessing the designs for new projects. Many projects, especially in the recent deep-water discoveries are undergoing cost reduction, even at the cost of the total volume of oil that is going to be obtained or reducing the maximum production peak. It is a factor to be borne in mind in a region like the GoG, where offshore prospections abound and the cost involved could rise sharply, in a framework of uncertainty regarding prices and a new investment scenario.

⁹³ Atanga Ayamdo, Nelson, *Protecting the Gulf of Guinea in an oil boom: regulating offshore petroleum pollution in a divided world*. 2016, *Journal of World Energy Law and Business*, 9, Pages 219–232.

The deep-and very-deep water projects require a greater initial outlay, whose recoupment will take longer. Four countries account for more than 90% of the deep- and very deep-water production, Angola, Brazil, Nigeria and the United States. The activity in both Nigeria and Angola has suffered disproportionately, with companies being reluctant to invest in the light of local requirements, the insecurity in Nigeria, and the widespread cost deflation all over the world⁹⁴.

The crisis, which began in autumn 2014 with the drop in oil prices, has not re-defined the geography of African production, whose main giants -in terms of reserves- will still be Nigeria, Angola, Algeria and Libya, but it did have a significant effect on the strategies of the main players in the oil industry. New zones have emerged, and so have stakeholders backed by powerful investment funds⁹⁵.

Africa, just like any other oil exploration and extraction zones, was affected by the drop in oil prices that began in 2014 and was followed by a period of relatively low prices (between 30 and 50 dollars per barrel) in 2015 and 2016, with a slight upturn in 2017. This level, which was acceptable for the oil industry at the beginning of the 21st Century, has become a challenge, because of the cost of the unconventional resources in difficult zones (very-deep waters, isolated basins, bituminous shale). Pressures exerted on service companies and technical improvements have enabled companies to reduce development costs and offer a degree of flexibility⁹⁶.

The energy panorama in the GoG is dominated by a series of stakeholders: major western private companies, State-owned Asian companies (mostly Chinese), Russian (Gazprom and Rosneft) Latin American firms (Petrobras), and new and smaller players.

The major western private companies have adopted widely-varying strategies since 2014. Thus ConocoPhillips, has pulled out completely from the GoG and in 2014, it sold its assets in Nigeria to the Nigerian firm Oando. Shell and Chevron, sold a large quantity of onshore licences, and surface offshore licences in Nigeria as from 2011 (Shell) and 2013 (Chevron). All the licences were purchased by Nigerian companies. Shell and Chevron did not pull out of the country; Shell concentrated on deep offshore fields, more secure and less vulnerable to the theft of crude oil than on the mainland (several hundred thousands of B/D) and in 2017, Shell also sold its licences in Gabon to the American Carlyle Group⁹⁷. Chevron, operates in Nigeria where it exploits the huge Agbami oilfield, has kept its blocks in Angola, where it is one of the biggest operators and in the Republic of the Congo, but has few new exploration blocks.

⁹⁴ WEO. World Energy Outlook 2017, *Op. cit.*, p. 184.

⁹⁵ Augé, Benjamin, *Oil Exploration and Production in Africa since 2014: Evolution of the Key Players and their Strategies*. Paris: Notes from l'Ifri, Ifri, 2018.

⁹⁶ Ibid.

⁹⁷ A US private equity multinational that also manages alternative assets and financial services, akin to the neocons.



Image 28

Some major western companies such as BP took on new risks during the crisis, in spite of the catastrophic effects of Horizonte/Macondo in 2010. Apart from its shares in offshore operations in Angola, it has entered the territorial waters of Sao Tome and Principe. ExxonMobil has recently taken on some risks, and without leaving its comfort zone (Nigeria and Angola), entered Ghana in 2018. It has also drilled in the Ivory Coast and Liberia, which it left after the results proved rather unsatisfactory.

The two leaders in the oil industry in Africa, Total and ENI (in Total's case, Nigeria, Angola, Republic of the Congo, Gabon, and ENI's case, Angola, Egypt, Libya, Republic of the Congo, Tunisia), improved their positions during the crisis. In addition to the, both companies expanded their investments. Total, acquired new

blocks in the Democratic Republic of the Congo, and in 2017, in Angola. ENI also invested during the crisis, and increased its developments in Angola and Ghana. Total and ENI, are the two oil companies that have invested in alternative energy in Africa, albeit on a small scale.

The Chinese companies, other Asian ones and the Russian companies and the Brazilian Petrobras are among the State-owned firms with a high profile. CNOOC, the only Chinese company with major development projects, is involved in a joint venture with Nigeria Total to develop the huge Egina oilfield, which will come into production in 2018. In 2014, the Malayan firm Petronas, purchased a licence in deep waters in Gabon and in February 2018, it acquired offshore blocks in Gambia. The Indonesian company Pertamina, took over the French company Maurel & Prom in 2017, which entitled it to production licences in Gabon and Nigeria.

The two Russian State-owned companies, Gazprom and Rosneft, have invested relatively little in Africa. Despite its agreements with Nigeria, Gazprom only has a few exploration licences in Angola, whereas Rosneft has just invested in Egypt and Mozambique, but not in the GoG. The private Russian company Lukoil, revoked its licences in Ivory Coast, Ghana and Sierra Leone in 2016, but still has assets in Cameroon, where it plans to drill in 2018, and has also shown interest in buying assets from Petrobras in Nigeria.

Petrobras was involved in the biggest exit from the zone. Active in Africa since the 1990s, Petrobras holds a host of licences in Angola and Nigeria, which it started to sell in 2017. Its major assets are in Nigeria, where the firm operates with Total and Chevron.

Environmental problems

We will highlight the environmental regions whose consequences could increase instability throughout the region, where we could include present questions, pollution, locally and in the future, climate change globally (already dealt with), but with local consequences. Pollution affects not only the land, with serious problems that have induced multinationals like Shell, to leave the onshore fields and concentrate their business offshore. However, maritime pollution, together with overfishing and illegal fishing are having devastating effects on society in the GoG countries.

According to the World Health Organisation⁹⁸, the most frequent risk factors caused by human activity are deforestation, loss of biodiversity, vector-borne disease transmission, drought, marine pollution, inappropriate management of

⁹⁸ WHO. Continental Challenges & Change. Environmental Determinants of Health in Africa. *World Health Organisation*. [Online] January 2015. http://apps.who.int/iris/bitstream/handle/10665/177155/Synt_R_4.pdf.

hazardous and non-hazardous waste, air pollution and floods, all of which affect both rural and urban areas.

Population growth along the coastal zones will increase the vulnerability of coastal ecosystems when the sea level increases. 40% of the population of West Africa lives in coastal cities. A complete section of West Africa, between Accra and the Niger Delta is expected to become one continuous megacity by 2020. As the sea level rises, increased salinity in the groundwater could affect access to drinking water and farming production. Floods and the destruction of the infrastructure and the food-producing areas is a likely consequence of a rising sea level in the GoG⁹⁹.

Pollution

A secondary effect of the intensive exploitation of gas and oil in the GoG will turn this zone into one of those affected by pollution at a global level. The lack of modern technology means that a substantial part of the gas extracted is burnt, which amounts to losses that Nigeria's Senate calculates at 2.5 trillion dollars. One particularly serious case is Ogoniland, a zone within the Niger Delta, famous for its biodiversity, but also well-known for being one of the worst affected by the pollution caused by oil spillage and toxic gases¹⁰⁰.

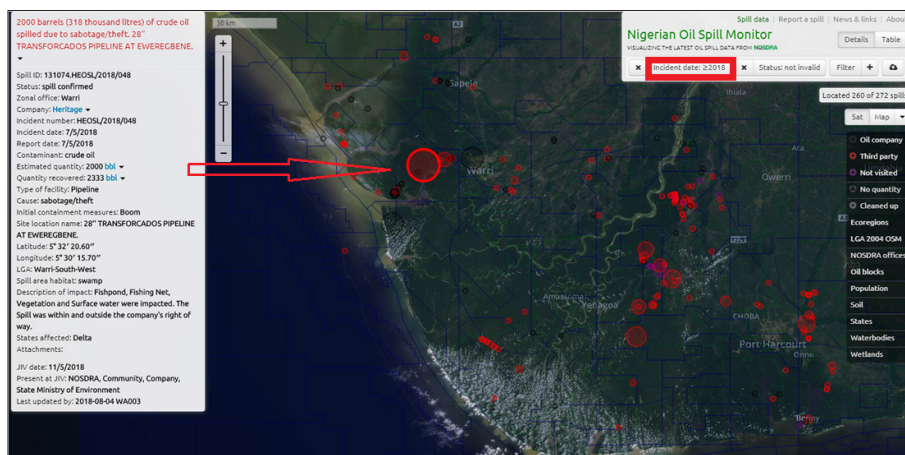


Image 29

Two hundred people die every month as a result of toxic gas emissions, the burning of which also causes millions of dollars' worth of losses for Nigeria. In 2016, the Nigerian Government embarked on a project to restore Ogoniland, after seeing the conclusions of independent research work conducted by the Unit-

⁹⁹ Ibid.

¹⁰⁰ Velasco González-Calvo, *Op. cit.*

ed Nations Environment Programme. As a result of the report, a Bill was drawn up “that prohibits the burning of natural gas in Nigeria amongst other matters”, to stop the burning of excess gases produced by oil exploitation¹⁰¹.

The environmental restoration of Ogoniland could prove to be the most extensive and long-lasting oil cleaning process in the world, and includes the recovery of drinking water, land, the streams and the mangroves. An independent assessment, conducted by the United Nations Environment Programme, has demonstrated that after 50 years of oil operations in the region, the pollution has spread further and has filtered more deeply than was at first thought.



Image 30

In some areas, where the surface is apparently unaffected, the subsoil is heavily contaminated. In 10 Ogoni communities, families drink water from wells that are polluted with benzene, a well-known carcinogen, at levels more than 900 times greater than the maximum levels recommended by the World Health Organisation¹⁰².

The Report estimates that counteracting the pollution and contamination and promoting a sustainable recovery in Ogoniland could take between 25 and 30 years, utilising modern technology to clean up the contaminated land and polluted water, together with better monitoring and control, environmental regulation and collaboration between the Government, the Ogoni people and the oil industry.

¹⁰¹ Ibid.

¹⁰² UNEP. *Environmental Assessment of Ogoniland*. Nairobi, KENYA: United Nations Environment Programme, 2011. ISBN: 978-92-807-3130-9.

To quote the Brazilian Achim Steiner, who was UNEP's Executive Director (2006–2016):

*"The oil industry has been a key sector in the Nigerian economy for over 50 years, but many Nigerians have paid a high price, as stressed in this assessment" ... "The clean-up of Ogoniland will not only have to deal with a tragic legacy, but also constitutes a major ecological restoration task with manifold positive effects that include bringing together the various stakeholders into one single cause working towards achieving long-lasting improvements for the Ogoni people"*¹⁰³

The tension is currently mounting in the Niger Delta owing to the delay in the - of the oil-producing region of Ogoni planned by the Federal Government.



Image 31

The aforementioned delay could degenerate into hostilities towards the oil infrastructure, which would affect the country's economy¹⁰⁴.

The current political tension and the preparations for the 2019 General Elections could hinder the planned cleaning process. The environmental activists in

¹⁰³ UNEP. Environmental Assessment of Ogoniland, *Op. cit.*

¹⁰⁴ Kingsley, Jeremiah & Essen, Cornelius, Niger Delta leaders, stakeholders decry slow pace of Ogoni cleanup. *The Guardian*. [Online] 6/8/2018. <https://guardian.ng/news/niger-delta-leaders-stakeholders-decry-slow-pace-of-ogoni-cleanup/>.

the Niger Delta view the Federal Government's announcement about the start of the project¹⁰⁵ as no more than "pie in the sky"¹⁰⁶.

Should the Government fail to fulfil its commitments, the population will take actions against the oil installations. According to Eric Omare, Chairman of the Ijaw Youth Council, the Government's commitments are not worth the paper they are written on.

*"The Government's failure to clean up Ogoni shows that it is not interested in recovering the contaminated region... There are communities that are moving away from the area because the water is polluted, the soil is contaminated and the people can no longer live in communities. Hostile actions may be taken against the oil installations"*¹⁰⁷

Maritime pollution

The great Guinea marine ecosystem covers the marine areas in the West, Central and South Regions of Africa, from Mauritania in the north to South Africa in the south.

Fishing helps to improve food security as a source of proteins –and it is sometimes the only source of animal protein– or as a source of income for the coastal communities in the GoG, who depend on fishing for their subsistence, especially in times of shortage and on earning money to buy food. The fishing sector employs 9 million people in West Africa alone, and their subsistence is threatened by the effects of climate change, contamination and unsustainable fishing practices that destroy the marine environment.

The poorest 40% of the population in the region depends on fishing as a vital part of their diet. Illegal, undeclared and non-regulatory fishing by both African and non-African vessels is a serious problem. If this activity persists it will affect the world fishing markets as stocks run out. This global aspect increases the incentive to reach a global solution.

Although the oil boom in the GoG offers prospects of economic growth and development for the "Petro-states" of the region, it also has a negative impact on the health of the marine environment. Assessments of the pollution in the GoG have already demonstrated that oil exploitation and drilling activities in Nigeria only contribute to the severe pollution in the GoG.

Fishermen and farmers complain that the unloading, discharges and emissions during oil operations on the high seas have had a negative effect on them and have polluted the environment.

¹⁰⁵ March 2016

¹⁰⁶ Kingsley, Jeremiah & Essen, Cornelius, Ibid.

¹⁰⁷ Ibid.

- In 2010, oil seeped out of the Cameroon-Chad oil pipeline operated by Cameroon's national oil company, COTCO.
- Between 2009 and 2011, the oil operators offshore from Ghana spilt large quantities of low-toxicity oil and sludge; these spillages have been linked to the death of whales.

Without proper regulation in the development of oil resources, the oil boom in the GoG could make the already worrying pollution level even worse. In spite of everything, the entire marine environment is at risk, and no international agreement has yet been ratified about the matter (44)¹⁰⁸.

Local energy policies: energy and development

Local energy policies have been influenced by a series of factors such as a growing population, an increase in the number of people living in the cities, and a critical dependence on income coming from oil. Nigeria's economy is at a crossroads. For decades, it was based mainly on oil extraction to encourage growth and income. With the exception of oil and gas, no sectors have been developed that can be commercialised, which leads to a weak structural transformation and limited employment opportunities¹⁰⁹.

Population in West and Central Africa	
Total population in millions in 2018:	436
Mean annual rate of change in population, in percentage, 2010-2018:	2.7
Population from 10 to 24 years, in percentage, 2018:	32
Population from 0 to 14 years, in percentage, 2018:	44
Population from 15 to 64 years, in percentage, 2018:	54
Population 65 years and older, in percentage, 2018:	3
Dependence rate, 2016:	87.2
Total population aged 10, women, in thousands:	5.361
Total fertility rate, per woman, 2015-2020	5.1

Table 2

It has been calculated that more than half the world's population growth between now and 2050 will take place in Africa. Africa has the highest population

¹⁰⁸ Atanga Ayamdoo, *Op. cit.*

¹⁰⁹ The World Bank, *From Oil to Cities Nigeria's Next Transformation*. Washington: International Bank for Reconstruction and Development / The World Bank, 2016. ISBN (paper): 978-1-4648-0792-3, p.1.

growth rate in the main areas, where the increase was 2.55% per year between 2010 and 2015. A rapid population rise is expected in Africa even if there is a substantial reduction in the fertility levels in the near future. Regardless of the uncertainty surrounding future fertility trends in Africa, most young people that are currently living there, and who will be adults in the next few years and have their own children, guarantee that the region will play a central role in determining the size and distribution of the world population in the coming decades¹¹⁰.

In Nigeria, the biggest economy in the regional, from 1980 to 2010, the income from oil came to more than three-quarters of the Federal Government's income, and accounted for almost 97% of the total exports and 35% of the gross domestic product (GDP), but with unsustainable growth. The income per capita from oil has grown tenfold since midway through the 1970s, but the GDP per capita –which actually reflects purchasing power- only reached that decade's levels 2008¹¹¹.

Dependence on oil, has caused other sources of income to become underdeveloped and has prevented improvements in governability. In 2012, oil's contribution towards the national budget was 75%, and the Governments of the states obtained more than 63% of their income from oil. This transfer of funds from the oil of the subnational governments offers very few incentives to boost the collection of local funds, and it also weakens urban planning and financing. The developing countries with "Dutch disease" are usually fraught with deficient governance and the rule of law is often not applied¹¹².

85 million Nigerians, half the total population, live in urban settlements. A working urban system is required to support that growth and to increase Nigerian productivity, which also benefits rural areas. Although the urban development is associated with manufacturing and services, the efficiency of agricultural production is linked to the urban system. Small cities are necessary for connecting farmers to the incoming and outgoing markets, and for obtaining added value for the market¹¹³.

After two decades of economic stagnation, in the past 10 years Nigeria, with an annual GDP growth rate of more than 7%, is one of the most dynamic countries in Sub-Saharan Africa. However, growth and unemployment are out of step with each other. Employment is a basic term for young people, who consider unemployment to be the biggest problem of all, more important than poverty, electricity, crime, the infrastructure or corruption¹¹⁴.

Furthermore, managing the urban development well is essential for enabling a low-income country to evolve into an average-income country. With a gross do-

¹¹⁰ United Nations, Population. *UNITED NATIONS*. [Online] 14th December 2018. <http://www.un.org/en/sections/issues-depth/population/>.

¹¹¹ The World Bank, *Op. cit.*, p. 1.

¹¹² *Ibid*, p. 1-2.

¹¹³ *Ibid*, p. 4-5.

¹¹⁴ *Ibid*, p. 8-9.

mestic income (GDI) per capita of 1,450 dollars in 2013, The Ivory Coast is trying a development strategy that will allow it to reach the average-income bracket. Only an annual growth rate of 10% for 13 years will permit the country to reach a GDI per capita of 4,100 dollars. According to a World Bank Report, the Ivory Coast would have to:

- Reduce extreme poverty from 24 to 17%.
- Raise the proportion of the population with access to electricity from 59 to 92%.
- Keep the proportion of the urban population with access to water at 97%.
- Increase the proportion of the rural population with access to water from 74 to 80%.
- Almost double the urban population with access to sanitation services from 46 to 87%.
- More than double the proportion of the rural population with access to sanitation services from 29 to 65%¹¹⁵.

Yet properly managing the urban development within a framework of population growth means devoting a greater part of the oil and gas production to domestic consumption, with the consequent drop in income.

The international community has, with limited success, made an effort to help the continent to overcome certain impediments: the countries depending on aid are now less capable of escaping from poverty than they were 30 years ago. Perhaps the biggest barrier to the success of these efforts is the fact that they are devised from afar, by donating nations and institutions with a limited understanding of the receiving countries and the way they operate¹¹⁶.

Many African nations have some of the best global concentrations of natural resources within their land frontiers and in territorial waters. These resources are extracted and used to boost the biggest economies in the world. Ironically, it would seem to be the case that the more resources a country has, the worse its situation is¹¹⁷.

These days, the gas and oil industries account for most of many African economies, but they appear to make very little contribution to broader social development. The oil price crisis in the 1980s in Nigeria, the decade of hyperinflation in Angola, the civil wars in the two Congos and the devastation of the Libyan economy after the collapse of Gadhafi's Regime, have shown the calamitous consequences of an excessive dependence on natural In these and many other

¹¹⁵ The World Bank, *Côte d'Ivoire Urbanization Review Diversified Urbanization*. Washington: The World Bank, 2015.

¹¹⁶ Ayuk, Nj & Marques, João Gaspar. *Big Barrels: African Oil and Gas and the Quest for Prosperity*. London, New York: Clink Street Publishing, 2017. ISBN-10: 9781911525592.

¹¹⁷ Ibid.

cases, that reality is undeniable. The value we allocate to natural resources has served to jointly form the root of the tensions throughout the continent, as in many other parts of the world¹¹⁸.

The external perception is that the African nations are unable to efficiently administrate their natural resources and use them to improve their citizens' lives. Some analysts suggest that the governments ought to stop developing their natural resources completely and concentrate exclusively on other sectors such as tourism, agriculture and fishing, suggestions that ignore the transforming role that energy can play in a nation¹¹⁹.

One example of good practice is Ghana. The discovery of oil in Ghana aroused great expectations in young people employed in farming, fishing and a variety of sectors who were expectantly awaiting their share in the imminent potential of wealth being generated by the "black gold". Nevertheless, this enthusiasm for the emerging sector was also a source of fear, on both an international and national scale, that poor management could have a negative effect on the economy. The unsatisfied expectations of a population in such circumstances could lead to social tension.

At the beginning of the first decade of the millennium, the international community regarded Ghana as a model country and an example for its neighbours in the region to follow. Its stable democracy, freedom of the press and an active civil society, were proof that African countries had a future and that armed conflict and economies in crisis were not the only options. When it was announced that oil had been discovered on the coast of Ghana in 2007, the alarm bells began ringing in the face of the possibility of another African country falling victim to a dependence of resources.

Let's call it the "curse of the resources", "Dutch disease" or "paradox of abundance", many States in Africa, were better off before major resources were found. In many ways, Ghana was not prepared. Three years after announcing the discovery of Jubilee, the legislation was still awaiting parliamentary approval. The Ghanaians, lacking in skills and technical knowledge, were unable to find employment in the oil industry, or an effective understanding of the sector.

However, the country does have something that sets it apart from other oil producers in the region. The Press described as "free" by international entities such as Freedom House, and the country's dynamic civil society, make concerted efforts to control the politicians. Since 1992, when the first democratic elections were held after a prolonged period of military government, Ghana has had peaceful changes of government, adhering to the limit of two mandates for the presidents. Accountability, a rare phenomenon in the region, is applied by the political arena in Ghana.

¹¹⁸ Ibid.

¹¹⁹ Ibid.

In this scenario of political and social integrity and stable economic development, the discovery of oil in Ghana is more of a blessing than a curse. The way in which the State progresses in its extraction industry will be a point of reference for Sub-Saharan Africa. If Ghana falls victim of the "resource curse", it will be difficult to send a message to any other country in the region. Furthermore, if it manages to become a major oil producer and still protect its domestic market, utilising the income from the oil industry to improve the population's general standard of living, it could become to be a model for African development in the future.

The African energy companies

Most African State-owned companies were already in crisis before 2014, and the lower oil price made their already critical financial situation even worse. The Algerian Sonatrach, has not ceased its activities. With licences in Niger, Mali and Mauritania, Sonatrach hardly made any investments in these blocks during the crisis, which paralysed the Nigerian NNPC, which was supported by joint ventures with the major multinationals (Total, Eni, Shell, Chevron and ExxonMobil). The crisis also hit the Angolan Sonangol, which uses shared production contracts in which its shareholding is financed by the associated private companies¹²⁰.

Nigeria is the only country on the continent that has succeeded in developing an ecosystem able to tempt local investors to opt for the oil sector, the most important one being Oando. The firm that specialised in commercialising and distributing petroleum products, purchased ConocoPhillips' Nigerian assets in 2013. Thanks to these assets, it produces around 40,000 B/D. Other traders, such as Sahara Energy, Aiteo and Taleveras, purchased licences from Shell Chevron¹²¹.

Although the financial situation is more difficult owing to the drop in prices, none of them have sold their assets. These companies could have entered exploration / production after building up significant capital thanks to the distribution of gas in a large market (180 million inhabitants), and taken advantage of the exchange programme, which operated between 2010 and 2015 enabling Sahara Energy, Aiteo and Taleveras to supply Nigeria with petroleum by-products in exchange for State crude oil, due to Nigeria's chronic liquidity problems¹²².

These firms prospered rapidly, and had guaranteed up to 90,000 B/D of crude oil for sale on the international market. The Nigerian banks facilitated access to the loans taking on risks. Some of these firms have purchased licences outside Nigeria, such as Taleveras and Sahara Energy in Ivory Coast or Taleveras in Equatorial Guinea¹²³.

¹²⁰ Augé, *Op. cit.*

¹²¹ *Ibid.*

¹²² *Ibid.*

¹²³ *Ibid.*

Thanks to the personal skills of its President, Arthur Eze, Oranto managed to obtain licences in at least ten countries, including Liberia, Sao Tome and Principe, Nigeria, Benin and Ghana. Oranto's strategy –which has proved fruitful so far– is based upon maintaining sound relations with the political authorities at the highest level, permitting them to invest as little as possible in their blocks, waiting for one of the big ones to become an operator¹²⁴.

Conclusions

The GoG as an open energy system is of major geostrategic importance, very sensitive to geopolitical factors and to the strategies of the major powers, particularly regarding their attitude to climate change. It is also of major geonegetic importance to the European market given that it is relatively safe and secure when compared to the Near East, because of the quality of its oil and its relative proximity to Europe.

Initially dominated by European and North American companies, the appearance on the scene of Asian firms –mainly Chinese– and the emergence of new companies, including the Nigerian firms, has changed the GoG's general energy panorama. The strategies of China, India and Russia seek a growing influence in the zone.

The price crisis that commenced in 2014 has had a major effect on most of the countries in the region, whose economy is heavily dependent on exporting oil and gas. The effects of the so-called "resource curse" are clear in most of the countries in the region, which have not used the income from energy to encourage sustainable development.

Governance in the Gulf Region –with the occasional exception like Ghana– is very deficient. All the indicators, such as democracy and perception of corruption or the fragility of the States rank the GoG Region among the worst in the world, and in line with the general situation in Africa.

Although the security situation is good when compared to the Persian Gulf, it leaves a lot to be desired, especially on the mainland, with the presence of Boko Haram and other groups in the River Niger Delta. However, the maritime zone is also affected, being fraught with piracy, kidnapping and illegal fishing, which all affect the perception of security and safety and force the exploring firms to take strategic decisions. This insecurity is affecting the image of the main economies in the zone, especially Nigeria, which will have to deal with these problems to prevent greater evils.

Climate change has caused countries to reconsider their energy mix, opting for electrification, renewable energies and gas. Although there will not be a reduction in oil consumption and the reserves are sufficient, a reduction is

¹²⁴ Ibid.

being detected in investments in new explorations, and the production of conventional oil could be insufficient by 2040. The production situation in such countries as Libya or Venezuela will aggravate the situation. Global climate change, with the sea level rise, could flood large tracts of the coastal strip, when many of the oilfields are located.

Pollution affects both land and sea, and the extent of soil and subsoil contamination in certain parts of Nigeria after 50 years of operations, plus the need to recover an ecosystem of great value on a global level, together with the security situation, have caused several multinationals to dispense with their onshore rights and opt for offshore exploration in deep- and very-deep waters.

The poorest 40% of the regional population depends on fish as a vital component of their diet. Illegal, undeclared and uncontrolled fishing carried out by African and non-African vessels is currently a serious problem. The fishing sector employs 9 million people in West Africa alone, but its subsistence is being threatened by the impact of climate change, contamination and unsustainable fishing practices that are destroying the marine environment.

Although the oil boom in the GoG offers prospects of economic growth and development for the «Petro-states» in the region, it also has negative consequences for health and the marine environment. The pollution assessments already conducted in the GoG show that oil exploitation and the drilling and exploring activities in Nigeria only make the pollution situation worse in the GoG.

Population growth, raising the population's standard of living and greater urban development, all mean increased domestic oil consumption, and a reduction in income for the oil companies, until the present time critical for the region's economy. A diversification of the economy is vital so that it will be less dependent on hydrocarbon exports.

However, the GoG will still be a region of critical importance for energy supply, especially when US production begins to wane. The region's geostrategic importance, far from declining, will increase in the eyes of all the major powers, and especially where the European Union is concerned, because the latter does not want to depend heavily on Russia for its energy.

The emergence of new local private firms, particularly in Nigeria, which are obtaining rights in other zones in the region is a phenomenon that is enhanced by national needs and the reduction in income, which could be beneficial to the national economy. Yet their purchases in zones abandoned by the multinationals and subjected to serious environmental damage that will have to be rectified, and where the security situation of their facilities are threatened by numerous risks, reveals their fragility and their dependence on government policies, where there is great potential for corruption.

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Chapter IV

The Changing context for the Geopolitics of Energy: A European View on How Climate Change

Christian Egenhofer and Milan Elkerbout

Abstract

This chapter identifies and sketches out the contours of the new energy security agenda for the EU. An agenda that has become more complex, incorporating to the traditional perspective, new elements such as those related to development, cyber security, financial regulation, electrification and digitalisation. It briefly discusses how the global energy security agenda has evolved, especially within the last two decades, thereby attempting to highlight principal drivers and the responses and initiatives that the European Union has given. It also discusses the present energy security situation, divided into 'traditional' and 'new' challenges. A separate section deals with the impact of climate change mitigation policies on energy security. The chapter finalises with some conclusions and general policy recommendations, and calls attention to the need for a more thorough look at the energy - climate interface and its implications for the energy security agenda.

Key Words

Energy, energy security, security of supply, geopolitic, geoeconomy, climate change, European Union, policy.

Introduction

Traditionally the geopolitics of energy has been closely related to security studies. This goes back to the early 20th century with the motorisation of war, starting with the UK decision to switch its navy from coal, available both domestically and abundantly across the globe to oil. Oil was more concentrated, requiring sophisticated supply chains, often out of area. As a result, periodically there were worries about 'running out of oil', the impact of decolonialisation, subsequent nationalisation of oil industries and political instability in producing countries, most evidently, following the oil crises of the 1970s and the creation of the International Energy Agency. Energy security in essence has focused on security of supply, meaning uninterrupted supply of energy sources at affordable prices.

Most of the time, interest of policy and academia in energy security were a function of oil prices and political tensions. Europe was no different. Following the stabilisation of oil prices in the late 1980s and the 90s, security of supply and energy security in general, has attracted only limited interest. Awareness increased with the revival of OPEC around the turn of the century, higher crude oil prices and international political instability, for example in the aftermath of the terrorist attacks of 11 September and the wars in Afghanistan and Iraq.

Since the turn of the century, the energy security agenda has moved from the traditional perspective of 'ensuring stable supply of cheap oil' to embrace a broader set of issues, for example including rising demand in Asia, financialisation and the risk of price manipulations of commodity markets including energy, following the 'China boom'. Access to energy to vulnerable countries and populations as well as the implications of mitigation to climate change has now also become part of the energy security agenda. The most recent addition has been the consequences of digitisation of energy, notably electricity and the risk of cyber-attacks on the energy system. The traditional geopolitics of energy have been complemented by what is often described as geo-economics.

The rise of autocratic regimes such as Russia, Turkey or China have brought back on the agenda traditional perceptions of energy security risks and threats. Europe has seen for the first time supply physical disruption – of natural gas – as a result of political tensions in its neighbourhood. The latest addition to an already overcrowded agenda has been in 2017 the change of paradigm of the US administration to the concept of energy dominance.

While traditionally energy security has been a domain of either security experts or energy market analysts. The former generally were preoccupied with identifying risks and vulnerabilities and putting in place of measures to address those. The latter were trying to establish the limits of markets as a tool to ensure security of supply. The new energy security agenda is becoming ever more complex; in addition to the traditional expertise, the study of energy security requires attention to development issues, digital and cyber security questions, financial regulation, the better understanding of the electricity sector as a result

of increasing electrification as well as the pre-occupation with supply chains of mineral raw materials, which are essential for electricity generation from renewables, digitisation and more generally, electrification.

This chapter will identify and sketch out the contours of the new energy security agenda for the EU in this changing global context. It will briefly discuss how the global energy security agenda has evolved, especially within the last two decades, thereby attempting to highlight principal drivers. It will then discuss present energy security situation, divided into 'traditional' and 'new' challenges. A separate chapter will deal with the impact of climate change mitigation on energy security. The final chapter will conclude and provide an outlook of how these perspectives may play. It will also formulate a number of general policy recommendations.

The emerging concept of energy security

Attention to energy security goes back to the beginning of the 20th century when governments worried about the supply of oil, which by then became the basis of the capability to conduct war. Navies, tanks and other motorised vehicles, all fuelled by oil gradually replaced railways and horses as the backbone of logistics. With the need to supply oil for armies, energy security as a policy problem was born (cf Cherp and Jewell 2014)¹. With mass motorisation in the US and then in other parts of the world, as early as the 1920s, there were periodic worries to 'run out of oil' (Yergin 191: 201²), especially in times of little new oil discoveries or demand surges. The peak oil theory was born 1956 when M King Hubbert presented his by now famous paper to the American Petroleum Institute where he noted that the rate of consumption of these fuels was greater than the rate at which new reserves were being recovered. With the cold war, also academia started to reflect on energy security. The world-wide trend towards increased use of oil made Western Europe, a large net importer, vulnerable to interruption of supplies, especially if compared to the US and the Soviet Union (e.g. Lubell 1961)³.

Worries about security of supply were reinforced by the growing independence movement and the subsequent nationalisation of oil industries in the Arab world, OPEC creation in 1960, the 1973 Arab oil embargo and the resulting oil shocks, witness the increasing importance of security of oil supplies. Ultimately, this led to the establishment of the International Energy Agency (IEA) in 1974 and a first step to some sort of regional, if not global energy governance.

¹ Cherp, Aleh and Jessica Jewell, 'The concept of energy security: Beyond the four As', *Energy Policy* 75 (2014) 415-421.

² Yergin, Daniel, 'The Prize: The Epic Quest for Oil, Money, and Power', Simon & Schuster, New York.

³ Lubell, Harold, 'Security of supply and energy policy in Western Europe', *World Politics*, 13(3) (1961), 400-422.

Although firmly established as a policy issue and an area for academic occupation, attention to security of energy supply or energy security had its cycles mainly as a function of oil prices and political tensions. Attention receded with the stabilisation of oil prices in the late 1980s and the 90s, and faded with the end of the cold war and a focus on regional and global security architectures building following the end of the Soviet Union.

Security of supply made a comeback around the turn of the century. Several events and developments were responsible.

Liberalisation of network market, i.e. gas and electricity raised the issue of system's stability, which later with the fast integration of renewables into the grid focuses on electricity⁴. The 2000 California electricity crisis leading to black outs and brown outs largely as a result of failed regulation has given prominence to the risks related to the electricity sector beyond Europe⁵. This led to a broadening of the energy security literature; the almost sole focus on oil gradually gives way to a widening and a more sector-specific analysis including natural gas – notably transportation risks⁶ – and then to systems stability, government regulation and the emergence of geo-economics⁷. In addition, market liberalisation introduced the notion of market-based policy responses and economic evaluations of security of supply risks⁸.

While for most of the 1990s oil prices were low and in 1999 actually falling below \$20 per barrel, the situation reversed in the first decade of the 21st century with a record price of more than \$147 in 2008. This was a multiple of what has been expected as a price band. High oil and other commodity prices raised fears of a revival of OPEC and the increasing assertiveness of petro states. The period was also associated with increasing political instability in the Gulf region, spilling over into global instability, the terrorist attacks of 11 September, followed by the wars in Afghanistan and Iraq. This was where the term of geo-economics was coined as an analytical approach as well as foreign policy practice⁹.

⁴ cf Arnold, S et al, 'Electricity Supply Externalities: Energy Security', in: Markandya, A, Bigano, A and Porchia, R (eds), *The Social Cost of Electricity*. Edward Elgar 2010.

⁵ Weare, Christopher, *The California Electricity Crisis; Causes and Policy Options*, Public Policy Institute of California 2003, Pages 140.

⁶ Stern, Jonathan, 'Security of European Natural Gas Supplies. The Impact of Import Dependence and Liberalization', The Royal institute of International Affairs, London, 2002.

⁷ Checchi, Arianna et al, 'Long-term energy security risks for Europe: a sector-specific approach'. CEPS Working Document No. 309, January 2009.

⁸ Egenhofer, Christian et al, 'Market-based Options for Security of Energy Supply', Nota di Lavoro, 117.2004, Fondazione Eni Enrico Mattei (FEEM); Jansen, J.C., Seebregts, A.J. (2009), 'Long-term energy service security: What is it and how can it be measured and valued?' *Energy Policy* 38, 1654-1664.

⁹ Sören Scholvin & Mikael Wigell, "Geo-economics as concept and practice in international relations – Surveying the state of the art," FIIA Working Paper 102, 2018 (April), The Finnish Institute for International Affairs, Helsinki.

Geo-politics describe the view that economic means have become more important to state power while military means seem to matter increasingly less. Examples of such power politics include for example China's One Belt, One Road strategy, Venezuela's petro-diplomacy during the era of Hugo Chávez and Western sanctions against Iran and Russia (Box 2.x).

The same period also saw a super cycle for physical commodities such as food, oil, metals, coffee etc., following a period of low or even depressed commodity prices throughout much of the 1980s and 90s. This boom was largely due to rising demand from China and other emerging economies. There was sharp down-turn in the aftermath of the 2008 financial crisis but demand recovered from 2009 to the middle of the second decade. High crude prices appear to have reinforced the commodity cycle by higher input costs, e.g. transport, fertilizers or direct government action, for example by supporting crop-based biofuels (Valiante and Egenhofer 2013)¹⁰.

Fears of a supply crunch, competition for resources, the rise of petro states never disappeared altogether, even if they are retreating. More generally, China is seen as using of what is sometimes called geo-economic instruments such as trade and investment policy, notably related to energy and commodities. By investing in infrastructure, agriculture or resources for example in Africa, China attempts to increase its influence worldwide. This period saw a debate on the motivation of overseas investment of Chinese National Oil companies (cf IEA 2011)¹¹. While aid and investment have traditionally been a tool to increase influence, new instruments like cyber operate differently. Russia has been using its energy resources to advance strategic objectives (cf Poussenkova 2010, Casier 2011)¹².

Also, the US is using geo-economic tools increasingly. For example, it has been leading international efforts to influence Iran's nuclear policies through sanctions, and does not shy away from using the importance of the US dollar and the US financial system to impose its policy. More recently, the Trump administration has developed its 'energy dominance' concept. Defined in the National Security Strategy document, in December 2017, as "America's central position in the global energy system as a leading producer, consumer, and innovator", it can be seen as a political and economic enforcement of the "America First"¹³ principle in the field of energy and a departure from a multilateral approach. An energy-dominant US would mean self-reliance, thereby increasing foreign

¹⁰ Valiante, Diego and Christian Egenhofer, Price formation in commodities markets: financialisation and beyond', Brussels: Centre for European Policy Studies, 2013, pp. 372.

¹¹ IEA, 'Overseas investments by Chinese National Oil Companies', Information Paper, Paris, 2011.

¹² Poussenkova, Nina, "The Global Expansion of Russia's Energy Giants", Journal of International Affairs, vol. 63, no. 2, 2010, pp. 103-124; Casier, T. (2011), 'Russia's Energy Leverage over the EU: Myth or Reality?' in: Perspectives on European Politics and Society, 12(4) 493-508

¹³ Anderson et al. (2017): The America First energy policy of the Trump Administration. Journal of Energy & Natural Resources Law, Vol. 35 (3), pp. 221-270.

policy optionality and make the country less vulnerable to exporters, including possible attempts by to use energy as a weapon. At the same time, it would allow the US to export markets to increase influence (see Bordoff 2017)¹⁴.

Box 2.x: What is geo-economics?

“The term geoeconomics has become popular but it lacks an agreed definition. Most commonly, it is understood as the use of economic tools to advance geopolitical objectives. Other definitions reverse the ends and means, emphasizing how flexing geopolitical muscle is used for economic results. Broadly, one can think of geoeconomics as the interplay of international economics, geopolitics and strategy.

Geoeconomics entered the lexicon in 1990 with an article by Edward Luttwak, which argued that following the Cold War, the importance of military power was giving way to geoeconomic power.

One reason the term is more commonly used now is the rise of China, which is increasingly using economic tools to project power. Two other factors are also relevant: the revival of state capitalism and state-owned enterprises means that states have more economic resources at their disposal; and the deep integration of global trade links and financial markets has made geoeconomic tools more powerful.”

See Marianne Schneider-Petsinger, Geoeconomics Fellow, US and the Americas Programme, Chatham House.

At the same time, global commodities markets, including energy commodities saw higher volatility, compared to pre-financial crisis. While this can partly be explained for some commodities by global trade liberalisation, there have been signs that the growing interconnections between financial and non-financial markets – described as ‘financialisation’ – has contributed to increased volatility (Valiante and Egenhofer 2013). This has led a new drive to increase transparency of methodologies and governance so as to avoid market manipulation, e.g. the Joint Organisations Data Initiative (JODI) and the International Energy Forum.

Today, the number of people without access to electricity still amounts to 1.1 billion mainly in sub-Saharan Africa and developing Asia. Energy access increasingly is recognized as a precondition not only for human development and economic growth, for example to alleviate poverty but also environmental sustainability. Modern clean energy is less polluting and emitting than traditional energy, e.g. biomass or coal-based. While access to electricity has

¹⁴ Bordoff, Jason, “The American Energy Superpower: Why Dominance is about more than Just production”, *Foreign Affairs*, 6 July 2017.

seen major improvements, most recently in India, access to clean cooking facilities has not been holding pace. According to the IEA 2017 (Energy Access Outlook 2017)¹⁵, “an estimated 2.8 billion do not have access to clean cooking facilities”. The IEA also reckons that 2.5 billion or a third of the world’s population continue to rely on traditional solid biomass for cooking, which is responsible for a great number of premature deaths. Internationally, this has led to the adoption of the Sustainable Development Goals in 2015, and the adoption of goal 7, to ensure access to affordable, reliable, and modern energy for all by 2030, which has established a new level of political recognition for energy’s central role in development. Mass migration has created a new dynamic with regard to the discussions on SDGs.

Since the 1990s, the energy security debate has gradually become influenced by the implications of global as well as national climate change policy. The interface of energy security and climate change is has many different facets features including Goldthau, Keim and Westphal 2018¹⁶):global environmental and energy governance, the various implications of decreasing fossil fuel production and use and local energy production, let alone direct and indirect impacts of climate change. Goldthau, Keim and Westphal (2018)¹⁷ have identified the following potential systemic changes of the global energy system:

The transformation of industrial value chains whereby rents from fossil fuels decline to the advantage of energy conversion technologies including the management, i.e. production, trade, recycling and reprocessing of mineral raw materials;

The destruction of old and the creation of new energy spaces built around new infrastructures, production chains and industrial clusters, e.g. links to large wind parks, hydrogen and carbon capture and storage infrastructure, mineral raw materials reprocessing facilities will reconfigure the energy space;

The reconfiguration of the energy space will reinforced by the breakdown of individual energy production (e.g. electricity, natural gas, oil) and consumption spheres (e.g. households, industry) where sectors will be integrating, focusing on location-specific competitive advantages.

An important element of this will be the implications of the implementation of the 2015 Paris Agreement, i. e. how fast and notably in which regions and which pathway. The interactions energy security and climate change are discussed in details in a separate chapter 5.

¹⁵ IEA, ‘World Access Energy Outlook’, 2017.

¹⁶ Goldthau, Andreas, Martin Keim and Kirsten Westphal, ‘The Geopolitics of Energy Transformation. Governing the Shift: Transformation Dividends, Systemic Risks and New Uncertainties’, *SWP Comment* No. 42, October 2018, Stiftung Wissenschaft und Politik, Berlin.

¹⁷ Goldthau, Andreas, Martin Keim and Kirsten Westphal, ‘The Geopolitics of Energy Transformation. Governing the Shift: Transformation Dividends, Systemic Risks and New Uncertainties’, *SWP Comment* No. 42, October 2018, Stiftung Wissenschaft und Politik, Berlin.

Box: The evolving concept of security of supply and energy security in the 21st century

"Energy supply security must be geared to ensuring ... the proper functioning of the economy, the uninterrupted physical availability ... at a price which is affordable ... while respecting environmental concerns.... Security of supply does not seek to maximise energy self-sufficiency or to minimise dependence, but aims to reduce the risks linked to such dependence". European Commission, 2000.

"Technological developments will affect the choice and cost of future energy systems but the pace and direction of change is highly uncertain. Governments will ... have an important role to play in reducing the risk of supply disruptions. Regulatory and market reforms ... will also affect supply." International Energy Agency, 2001.

"Being dependent on imports is neither necessarily a bad thing nor economically inefficient provided the sources are diverse, no one supplier is dominant and we can produce sufficient goods and services to pay for them." European Parliament, 2001.

"For the last 40 years, energy security in the United States has focused on decreasing the Nation's dependence on foreign oil. ... Energy security concerns facing the United States have evolved to encompass oil, natural gas, and electricity and have become significantly more complex. The world's population has grown by almost 20 percent in the last 15 years alone, while global GDP grew by 120 percent. In many parts of the world, mechanical and analogue systems traditionally energized by oil-products, are being replaced with automated and networked systems that run on electricity. These changes have made electricity and natural gas, in addition to oil, key enablers of many facets of society and ensured that the modern world is completely dependent on energy." Office of Energy Policy and Systems Analysis (US), 2017.

"An energy-dominant America means a self-reliant and secure nation, free from the geopolitical turmoil of other nations that seek to use energy as an economic weapon." "an energy-dominant America will export to markets around the world, increasing our global leadership and influence". Trump administration, 2017.

A recent study by the IEA (2017)¹⁸ highlights the implications of digital energy. Digital technologies will make energy systems globally more connected. Major past and future advances in data, analytics and connectivity are enabling new services and also the energy transition to renewable energy. Most expect digitalization to create new interconnected energy systems, including breaking down traditional boundaries between demand and supply. At the same time,

¹⁸ IEA (2017), 'Digitalization of Energy', IEA : Paris, 2017.

the energy systems become more vulnerable, for example to cyber-attacks. Cyber-attacks are becoming easier and cheaper to organise, and with bigger interconnectivity, the potential damage increases. The relentless growth of the Internet of Things is facilitating cyberattacks.

Experience with cyberattacks show that full prevention is impossible. Yet impacts can be limited if governments and the industry take precautionary measures. International efforts would help reducing risks and associated costs. One of the challenges will be to increase international co-operation and the one from different organisations.

As this short review shows, the new energy security agenda might become more complex; in addition to the traditional expertise, the study of energy security requires attention to climate change – adaptation and mitigation – development issues, digital and cyber security questions, financial regulation, the better understanding of the electricity sector as a result of increasing electrification as well as the pre-occupation with supply chains of mineral raw materials, which are essential for electricity generation from renewables, digitisation and more generally, electrification. The traditional security of (oil) supply approach has by now given way to a new agenda, which no longer is solely focused on security of (oil) supply. As a result, the traditional concept of security of supply, typically understood as 'un-interrupted availability of energy sources at an affordable price'¹⁹ has given way to a new concept of energy security. Although not defined for example as security of supply is, energy security as concept enlarges the notion of energy from energy commodities such as oil and gas to include all natural and technological resources to produce and consume energy, e.g. mineral raw materials, technology, data etc. At the same time energy security establishes a link to national security. Still open is the question of the hierarchy between the two, i.e. energy and security. This however raises the question on whether energy security or national security is the main objective. Those who see national security being the overriding objective, risk that energy will be used as a tool or even weapon for foreign policy. An embargo would be such an example; an embargo reduces the security of supply by making reducing availability and increasing prices. If, however energy security is the political objective, energy policy will be less ambitious: it will require compatibility with national security interests. This latter thinking has been developed in the concept, or some say theory of securization. Securization describes the notion that something and here in our case, security of supply constitutes an existential threat and justifies "urgent and exceptional measures to deal with the threat"²⁰. While from time to time the notion of securization has been evoked rhetorically, in practice it remained largely an analytical concept.

¹⁹ Cf International Energy Agency (IEA).

²⁰ Buzan, B. and O. Wæver. 2003. *Regions and powers: A guide to the global security order*. Cambridge: Cambridge University Press. P. 491.

EU policy responses

EU energy policy has largely been confined to the narrow fields of coal and nuclear energy for decades, deriving its authority from the treaties on the European Atomic Community (Euratom) and on the European Coal and Steel Community (ECSC), which has expired in 2002. Periodic attempts to extend the EU's jurisdiction in times of real or perceived threats to energy supplies remained largely unsuccessful. As consequence, EU energy policy has been contained to a series of broad horizontal policy objectives, such as promoting the rational use of energy and reducing Europe's oil import dependency. For decades, member states have been reluctant to accept an energy chapter in the EU's Treaty. By and large, reasons have been differences in interests between producer and non-producer countries as well as the different structures of national energy sectors, best exemplified in the organisation of network energy industries. For the same reason, the creation of a single energy market was originally neither part of the European Commission's 1995 White Paper on the internal market nor of the Single European Act (SEA), the treaty revision of 1986 that led to the implementation of the EU (then EC) internal market. These anomalies were, however, gradually rectified in 1988 by including energy in the internal market programme and finally with the Lisbon Treaty in 2009, which in Art. 194 included an energy chapter. This new chapter essentially reconfirmed the already existing competences in the field of the internal energy market, energy efficiency & renewables, infrastructure while adding a reference to security of supply and solidarity. From a legal perspective, implications of the new chapter remained limited because Art. 194 II reiterated that the energy mix remained a member state competence. This means that all major energy policy decisions continue to require unanimity²¹.

Turning point market integration and climate change policy

Nevertheless, the change constitutes an important turn-around in the EU. For many years the European Commission had been making the case that European energy policy lacks coherence due to the fragmentation of its legal basis into different areas such as regulation, competition and environmental and foreign policy. Yet prior to the Lisbon Treaty, member states had denied the need for a meaningful EU energy policy.²²

The situation changed only since around 2000. On the one hand, this was mainly due to the changed geopolitics or the perception thereof, i.e. increasing import dependence on a number of politically unstable and/or hostile countries with

²¹ Samuel Schubert, Johannes Pollak & Maren Kreutler, Energy policy of the European Union, Chapter 3, Pages 85-126, The European Union Series, Palgrave 2016.

²² Reasons included differences of interests between energy producing and non-producing member states, different political choices for the energy mix or diversity as regards market regulation.

growing government intervention in the energy sector in producing countries. Increasing energy market integration with the gradual completion of the internal energy market and finally, the need for an EU response to global climate change,²³ has been the second important driver on the other hand. The accession of central and eastern European member states, which strongly depend on Russian supply has further added a desire for more EU energy policy and more EU energy security policy. As a result, member state saw an added-value of EU internal and external in energy policy. This has offered the EU the possibility to further deepen energy co-operation and put in place new external energy partnerships in recent years but also start co-ordinating the various Intergovernmental Agreements, which govern energy imports. Over time, energy security has gradually become part of foreign policy, even if a small or sometimes, marginal one. However, this integration did not go beyond the traditional notion that the EU's internal market constitutes the basis of Europe's external projection and influence²⁴ or that the market increases resilience and therefore security of supply.²⁵ While fostering markets outside of the EU presented a useful foundation from which a more effective energy security strategy can be coordinated, the question on whether there is a need for a more government-led approach to energy security in the context of the external strategy remained unanswered²⁶.

Energy Union

The Energy Union concept – among other driving forces – has also been an attempt to bring about a more government-led energy policy. Originally proposed by then Polish Prime Minister Donald Tusk in 2014 as a call for Europe to unite to 'end Russia's energy stranglehold'²⁷, 'Energy Union and climate – making energy more secure, affordable and sustainable', so the official title – has been identified as one of the President's ten priority projects²⁸. The European Commission

²³ Egenhofer, C & A Behrens, 'Resource politics: the rapidly shifting EU energy policy agenda', in Paul Heywood, Erik Jones, Martin Rhodes & Ulrich Sedelmeier (eds.), *Developments in European Politics*, 2nd edn., Palgrave Macmillan, Chapter 13, pp. 241-261.

²⁴ Umbach, Frank, "Global Energy Security and the Implications for the EU", *Energy Policy*, vol. 38, no. 3, March 2010, pp. 1229–1240; Dreyer, Iana & Gerald Stang, "Energy moves and power shifts; EU foreign policy and global energy security", *ISS Report*, no. 18, Paris, EU Institute for Security Studies, February 2014.

²⁵ For example, exemplified by Noël, Pierre, "Beyond Dependence: How to deal with Russian gas", ECFR Policy Brief, no. 9, London, European Council on Foreign Relations, November 2008.

²⁶ Buschle, Dirk, "Exporting the internal market – Panacea or Nemesis for the European Neighbourhood policy. Lessons from the European Energy Community", *EU Diplomacy Papers*, no. 02/2014, Bruges, College of Europe, 2014.

²⁷ Donald Tusk, "A united Europe can end Russia's energy stranglehold", FT 21.04.2014. Although Donald Tusk referred mainly to natural gas, many Central and Eastern European countries also depend on Russia oil and therefore are vulnerable to pipeline conflicts such as between Russia and Belarus. In addition, the three Baltic republics' electricity grids continue to be fully integrated into ('synchronised' with) the Russian power grid.

²⁸ See 10 Commission priorities 2015-2019.

acknowledged that energy matters for many areas such as the economy, security, the environment, social cohesion, local development and therefore should also be an area for 'European solidarity'.

The original Tusk proposal has been driven by security concerns and domestic considerations, e.g. 'doing something for coal'. The credit of the Juncker Commission is to having seized the opportunity by elevating Energy Union alongside other "unions" to become an element of the EU Mission Statement. Thereby, the European Commission – with support from the European Parliament and mainly but not only Central and Eastern European member states – was for the first time taking a political and strategic perspective on energy. This was in contrast to the previously largely market-driven approach²⁹. In addition, the change in approach has allowed the Juncker Commission to forge a new consensus on climate change after the previous compromise has broken down following the failure to reach a global climate change agreement in 2009 in Copenhagen. This new consensus could be achieved by linking the agendas of internal energy market and climate change to security of supply, solidarity, infrastructure and innovation. The choice of issues is partly a reflection of competences under the TFEU but also attempts to mirror member state political and security priorities. Energy security is high on the agenda of Central and Eastern European as well as to a somewhat lower degree, peripheral member states. The construction of interconnectors and gas and electricity, which increases energy security, yet also fosters market integration had long been demanded by many peripheral member states. Climate change, innovation and markets have long been at the heart of the EU's agenda and promoted by those members, which see economic opportunity therein³⁰.

The consensus could be maintained by the Energy Union pursuing a project-driven, practical hands-on approach. The Juncker Commission has pursued a number of strategic political actions, often to directly accommodate member states interests. Examples include the Baltic synchronisation of the electricity system of the EU, the France-Spain electricity interconnector, the proposal on Nord Stream 2 to align the framework for import pipelines with the internal gas market, the screening of foreign investment, the European Battery Alliance or the Central and South East European Connectivity Initiative (CESEC). Many of the projects have been ongoing before. But now they have been presented as part of a bigger strategic master plan.

An interesting innovation has been the Vice President's Energy Union Tour where he visited all member states twice to discuss with national stake-

²⁹ Goldthau, Andreas and Nick Sitter, Regulatory or Market Power Europe? EU Leadership Models for International Energy Governance, in: Jakub M. Godzimirski (ed), *New Political Economy of Energy in Europe*. Palgrave MacMillan, International Political Economy Series, 2019, Chapter 2, Pages 49-71.

³⁰ Christian Egenhofer & Milan Elkerbout, *Energy Union: Looking back and ahead* (working title, forthcoming), CEPS, 2019).

holders' energy policy priorities, cross-border questions and to increase, in the Commission's own words, 'ownership by all parts of society'. While the political impact of the Energy Union Tours is difficult to judge, it has contributed to raising the profile for energy and climate issues such as integration of renewables, interconnectors, security of supply or long-term implications of the transition to the low-carbon economy.

All this may have contributed to the fact that in the beginning of 2018, after long hesitation by member states, the European Commission managed to obtain a mandate by the European Council to propose a "strategic long-term vision"³¹ for a climate-neutral economy, with a view to 2050. While the long-term greenhouse gas emission strategy is partly an update of the original 2011 'low-carbon 'roadmap' towards a low-carbon economy, it has also kicked-off an EU discussion on possible pathways to reach the EU's mid-century climate objectives. Such an update has become necessary in light of the 2015 Paris Agreement but also because of dramatically fallen technology costs for example for renewables and batteries. Finally, it constitutes the legacy of Juncker Commission, which the incoming legislature will 'inherit'.

That legacy consists of a largely integrated energy, climate, economic and industry policy. While for many years, climate policy in the EU has been driven by the international climate change negotiations, focus of energy policy has been predominantly the completion of the internal market for electricity and gas, including infrastructure and the security of the electricity and gas systems. Industrial policy on, the other hand was concerned with the competitiveness of various industry sectors and their growth and jobs. After the Juncker Commission, the three policy areas are knitted together. At the same time, it is fair to say that some seeds for better integration have been sown by the Barroso Commission, for example through the May 2014 European Energy Security Strategy, the Green Paper on the 2030 climate and energy framework, or for example several energy prices and costs studies to improve evidence for the energy sector. This should however not decry the improvements that the Juncker Commission has achieved by a focus on strategic issues.

The publication of the EU long-term strategy for climate and energy at the end of November 2018 will ensure that attention to longer-term strategic issues will be kept. It also gives concrete meaning to and identifies practical steps towards a modern, competitive and clean – meaning both low-carbon and low-emission – economy embedded in a European industrial strategy. Energy security has now become part of the industrial and economic growth strategy, no longer separated in its different elements.

³¹ European Commission, A Clean Planet for all – COM(2018) 773 final.

The new energy geopolitics and economics

Throughout most of the 1990s, the EU was in a rather comfortable energy supply situation. Domestic oil and gas resources from the UK, the Netherlands, Denmark as well as many other member states and quasi-domestic ones from Norway enabled the EU to limit import dependency. Oil markets generally were efficient and liquid with some but not excessive government interference. Oil has been abundantly available and the IEA crisis mechanisms a comfortable buffer in case of supply problems. Even more assuring has been the fact that the crisis mechanisms never had to be used. As to natural gas, possibly perceived by some as the most risky source due to rigidities in transportation, a very large part of the world's gas reserves were in an economically transportable distance from Europe. In addition, the EU enjoyed a near monopsony with Russia, home to the world's largest gas resources. Other supplies such as those from Northern Africa were also considered secure as these countries depend in many cases exclusively on oil and gas for export revenues. Furthermore, massive investments in nuclear energy in the 1970s and 1980s allowed nuclear power to play an important role in the energy mix, with a positive effect on overall import dependence (albeit associated with other security of supply risks). The EU thus generally enjoyed a healthy diversification as regards both energy sources and geographical origin, except Finland, Spain or Portugal.

This has gradually given way in the early 2000s. With the Asia and China demand shock, there was a feeling that European energy demand is increasingly rivalled by demand from emerging economies, turning the attention the need for supply-side developments, i.e. investment. This is also the period where energy industries in supplier countries became increasingly subject to extensive government interference, thereby raising the fear of undermining or muting the functioning of competitive global oil markets. The fact that energy production and export companies increasingly became state-owned or state-controlled added to fears that energy will increasingly be used as a political weapon as was highlighted for example by the 2008 IEA World Energy Outlook.³² Government-regulated investment policies also raised doubts about the level of future investments and their effects on production and price levels. In the past, many supplier countries with strong government roles have proven unable to increase production. This was also the first time that the climate change policy – notably ahead of the Copenhagen climate negotiations in 2009 – was starting to add uncertainty for investors.

The 2006 gas crises where Russian gas supplies were interrupted due a transit conflict with Ukraine can be seen as a turning point of EU's approach to security of supply. Prior to 2006, supply disruptions has internal causes, e.g. the UK coal miners' strike of the mid-1980s, the fuel strike protests of 2000 and several black and brown outs in the power sector in different regions. The gas

³² IEA, World Energy Outlook, 2008.

crisis in 2006, later repeated in 2008 and notably 2009 suddenly brought home the message that supply disruptions are real. It challenged the previous belief that imports – if well diversified – are secure as they were even at the height of the Cold War. The EU reacted with a mixture of internal and external measures, which to date still forms the basis of EU security of supply policy.

Security of supply after the 2006 gas crisis

Features and challenges of Europe's security of energy supply were first addressed by the European Commission in the 2000 Green Paper on "Security of Energy Supply"³³, thereby highlighting three vulnerabilities: high dependence on energy imports; limited influence of the EU on the supply side; and difficulties in meeting the requirements of the Kyoto Protocol. This analysis was followed-up by the European Commission in March 2006 by another Green Paper on "A European Strategy for Sustainable, Competitive and Secure Energy"³⁴, later to lead to the 20-20 energy and climate change package³⁵. Already taking into account the gas crisis, it put identified six priority areas:

- The completion of the internal European electricity and gas markets;
- Solidarity among member states;
- A sustainable, efficient and diverse energy mix;
- An integrated approach to tackling climate change;
- A strategic energy technology plan;
- A common European external energy policy.

Box 3.x: Energy and climate policy taking shape: the 20-20 energy and climate package

At the European Council of 8 & 9 March 2007, the EU heads of state and governments large endorsed the European Commission's strategy.

A binding absolute emissions reduction commitment of 30% by 2020 compared to 1990 conditional on a global agreement³⁶, and a "firm independent commitment" to achieve at least a 20% reduction by 2020. At the same time, the EU advocated that industrialised countries reduce their emissions collec-

³³ European Commission, Towards a European Strategy for the Security of Energy Supply. Green Paper. COM (2000) 769.

³⁴ European Commission, A European Strategy for Sustainable, Competitive and Secure Energy, COM(2006) 317.

³⁵ European Commission, An Energy Policy for Europe, COM(2007) 1.

³⁶ Provided that other developed countries commit themselves to "comparable" reductions and economically more advanced countries to contributing "adequately" according to responsibility and capabilities.

tively by 60% to 80% by 2050 compared to 1990. The European Parliament in its resolution has insisted that the EU should unilaterally commit to 30%.

1. A 20% reduction of primary energy consumption by 2020 compared to projections;
2. A binding target of 20% of renewable energy in total energy consumption by 2020;
3. A binding minimum target of 10% biofuels of all transport fuels by 2020;
4. The development of a European Strategic Energy Technology Plan;
5. An endorsement of the European Commission's carbon capture and sequestration policy.

This was followed by the 2030 framework for climate and energy, which was adopted by the European Council in October 2014.³⁷ It set new headline targets for greenhouse gas emissions reductions, renewables, and energy efficiency, some of which were later strengthened by the EU legislators:

1. "At least 40%" in greenhouse gas emissions reductions by 2030, compared to 1990.
2. To achieve the overall EU emissions target, EU ETS sectors should reduce emissions by 43% compared to 2005 levels, while non-ETS sectors should reduce emissions by 30% compared to 2005.
3. A binding EU target of "at least 27%" for renewable energy in total energy consumption by 2030. This has later been increased to 32% by the EU legislators. Unlike with the 2020 targets, the renewables targets will not be binding at member state level, only at the EU level.
4. A 27% target for energy efficiency, which was later increased by the EU legislators to 32.5%.

External energy policy

The 2006 Green Paper identified a "coherent external energy policy" as one of the six EU energy policy pillars. It is interesting to note, however that the European Commission proposed to go beyond the existing policies and prescriptions – e.g. energy partnerships, producer-consumer dialogue, integrating energy into other external policies or support for energy markets – by calling ambitiously for a "clear policy on securing and diversifying energy supplies" and an effective crisis response mechanism, to which the European Council of 7/8 March 2007 did not agree.. Effectively, the European Council stripped the European Commission of its more ambitious aspirations beyond better coordination. A somewhat in-between solution has been found when the June 2006 European Council – i.e. already ahead of the crucial 2007 Spring European Council – adopted a legal framework for the external energy policy on the basis of the joint paper

³⁷ See EUCO 169/14 <http://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/en/pdf>.

by the European Commission and the High Representative³⁸. Amongst others, it foresaw the creation of a network of energy correspondents (consisting of representatives by member states and the General Secretariats of both the Commission and the Council) to set up an early-warning system and to improve the reaction in case of a crisis. Nevertheless, this could be seen as the beginning of a EU security of supply policy.

European Energy Security Strategy

A more explicit approach to energy security has been taken in the 2014 European Energy Security Strategy³⁹, which systematically takes stock of short-, medium and long-term security of supply and energy security situation, i.e. the security aspects of energy. Notable is the switch from the concept of 'security of supply', which very much associates with the market-driven energy policy up to the 2010s function to 'energy security', which has a far stronger 'security', i.e. political connotation. It is also where rhetoric of 'securization' appear, very much resonating the language of some central and eastern European member states and countries from the European Neighbourhood.

To an extent the strategy has been driven by the realization that integration of Russia into a strategic energy partnership is very unlikely. Despite an institutionalised energy dialogue (since 2000) and some foreign investments in the Russian energy sector, the strategy aimed at opening the Russian market to European and other western enterprises and thus to gain large scale access to Russian.

Main items have been improving resilience, new infrastructure and co-operation with neighbouring countries, e.g. ENP via for example the Energy Community in the short term, which then later was followed up by legislation. The long-term strategy leaving nuances away by and large has been a re-iteration of previous positions: integrated energy market and more interconnections, gas diversification, e.g. Norway, Southern Corridor, Southern Mediterranean), energy transition and low-carbon and more co-ordination between member states. In short, in addition to the Gas Stress test and emergency measures, the European Energy Security Strategy largely relied on ongoing policies: market, efficiency, diversification (regions, fuels), solidarity mechanisms (interconnectors) and better co-ordination (speaking with one voice).

As so often, the Commission's European Energy Security Strategy has formalised what has already been ongoing for some time. While the European Energy Security Strategy is a major step towards a more formal EU security of supply or energy security strategy, it would be wrong to argue that nothing has been done

³⁸ Joint paper by the Commission and Secretary-General/High Representative (doc. 9971/06).

³⁹ European Commission, European Energy Security Strategy, COM(2014) 330.

in the past. Already in 2010, the Security of Gas Supply Regulation⁴⁰ has given meaning to solidarity between member states. Similarly, in 2008, the European Fund for Economic Recovery has spent some EUR 1 billion to support interconnectors, meaning that the gas crisis of 2008 notably in South East Europe would not repeat itself. Further infrastructure construction is supported by the EU projects of common interest (PCI) and projects of Community interests (PECI), respectively in the case of Energy Community countries. First results could be seen in the winter of 2012 when on 4 February when the EU gas system proved resilient towards a gas shortage. EU infrastructure allows that Ukraine can now be supplied entirely through EU gas, entering the country from the west. EU member states are also gradually accepting increasing scrutiny towards their Intergovernmental Agreements governing energy and notably gas imports. Both gas and electricity markets are fast integrating, judging from price convergence⁴¹. Regional bottlenecks are detected by the (gas) stress tests and addressed by regional initiatives such as CESEC and BMIP.

EU external energy policy for long has been criticised by the literature as ineffective⁴². Judging from the above, one would conclude that EU external energy policy has been successful⁴³. The gas stress tests have identified weak links, notably the Baltics and South East Europe. Regional initiatives are trying to address this in addition to infrastructure. EU infrastructure has been strengthened and integrated. The transition to a low carbon economy will reinforce this trend. The third Energy Package – although somewhat slow to be implemented – and notably market coupling⁴⁴ of increasingly all member states electricity but also gas market integration has increased resilience of EU energy markets. At the same time, the Third Energy Package has allowed the European Commission to impose conditions on the South Stream project so as to avoid a monopoly of Russian gas in South East Europe and the Western Balkan, which would also have made nearly impossible all new imports from the Caspian. The Gazprom probe has successfully forced Gazprom to change its alleged anti-competitive practices in the EU⁴⁵. In the long run, investment in renewable energy sourc-

⁴⁰ Regulation No 994/2010/EU, OJ L/295 1-22 of 12.11.2010, revised by Regulation (EU) 2017/1938, OJ L 280 1-56 of 28.10.2017.

⁴¹ ACER Market Monitoring Report 2017 – Gas Wholesale Markets Volume, 3 October 2018; ACER/CEER - Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2017 - Electricity Wholesale Markets Volume, 22 October 2018.

⁴² Youngs, Richard, *Europe's External Energy Policy: Between Geopolitics and the Market* (November 20, 2007). CEPS Working Documents No. 278; Youngs, Richard, *Energy Security: Europe's New Foreign Policy Challenge*, Routledge 2009.

⁴³ Boersma, Tim & Michael E. O'Hanlon, "Why Europe's Energy Policy Has Been a Strategic Success Story", Brookings Institution, 2 May 2016, Blog post, retrieved 21 September 2018, <https://www.brookings.edu/blog/order-from-chaos/2016/05/02/why-europes-energy-policy-has-been-a-strategic-success-story/>.

⁴⁴ Glachant, Jean-Michel, *The achievement of the EU electricity internal market through market coupling*, EUI Working Papers, RSCAS 2010/87.

⁴⁵ Riley, Alan, *Commission v. Gazprom: The antitrust clash of the decade?* CEPS Policy Brief No. 285, 31 October 2012; Siddi, Marco, *The antitrust dispute between the European Commis-*

es; promoting carbon capture and storage techniques; and, for those member states that so choose, investment in nuclear energy will reduce dependence on third countries and possibly can smooth the impacts of super cycles, typical for international commodity markets. The renewable energy will increasingly substitute imports policy and provide technological independence. The substitution of fossils combined with renewables may reduce pricing power by importers. And the introduction of the EU Emissions Trading Scheme (and national carbon taxes) will effectively retain some of the economic rents from producer countries, including Russia. Finally, to offset the higher prices both for industry and domestic customer, energy efficiency is a central element of the policy, certainly for a transition period until new technologies and new fuels become available at scale. Reducing consumption while prices increase gives a reasonable prospect of keeping energy bills constant. The question is whether this strategy will continue to be adequate in addressing future challenges.

Electrification of the energy system and new value chains

Any credible greenhouse gas emissions reduction pathway in line with a net-zero carbon⁴⁶ economy, electricity's share in total final energy demand will at least double or possibly triple from today's share, which is around 25% for the EU and 20% globally⁴⁷. Most of this electricity will come from renewable sources such as wind and solar, whose production will be varying very strongly across the time of the day and seasons. This will require adaptation to the way the electricity system is managed and market organisation⁴⁸. The EU has started to address this by the 2017 Clean Energy Package with further initiatives been expected.

Attention is turning to new challenges, notably the increasing demand for mineral raw materials driven by the twin development of the unfolding digital revolution and the transition to the low- carbon economy. This transformation is affecting and transforming the value chain of mineral raw materials industries from the upstream to the downstream⁴⁹.

sion and Gazprom: Towards an amicable deal, FIIA Comment No 9, 2017, Finnish Institute for International Affairs.

⁴⁶ With a net-zero greenhouse gas emissions target, any remaining emissions should be balanced by carbon removal, e.g. carbon sinks such as forests which absorb carbon dioxide from the atmosphere.

⁴⁷ European Commission, A Clean Planet for All, COM(2018) 773, Energy Transitions Commission, Mission Possible - Reaching, net-zero carbon emissions from harder-to-abate sectors by mid-century, Nov 2018.

⁴⁸ Cf Climate Policy Initiative, Flexibility: the path to low-carbon low cost electricity grids. Energy Transitions Commission, April 2017; IEA, Re-powering market: Market design and regulation during the transition to low-carbon power systems.

⁴⁹ Faure, A, C Egenhofer, M Elkerbout, Value chains based on mineral raw material –challenges for European industry and policy, CEPS Policy Insight 2018/07, February.

Resources intensity of the economy will remain significantly high and possibly increase. Increasing quantities of mineral raw materials – some of them described as “critical raw material” – will be required to ensure the transformation to the low-carbon economy, both in the EU and globally and to meet growing market demand⁵⁰. It is estimated that close to 60% of the demand for critical raw materials could be associated with high-growth industries⁵¹.

Concepts like carbon footprinting or lifecycle product responsibility are increasingly being operationalised in order to guarantee (end) consumers that end products meet environmental, ethical and other standards. This will create an additional layer of constraint to energy security.

Already in 2009, the EU launched the Raw Materials Initiative with the objective of fostering diversification of and access to raw materials used in its industries. Its strategy involves i) assessing the risk of shortage in the supply of critical raw materials, with a view to promoting diversification of the sources and imports of raw materials; ii) supporting R&D in products ‘and processes’ substitution efforts and iii) formulating European policy proposals in the framework of the European 2020 industrial and knowledge base economy. It applies the ‘criticality’ concept⁵², which focuses on both the scarcity of the geological resource in terms of its abundance and an assessment of the value chain’s self-sufficiency and vulnerabilities, including transport, and the potential for finding effective alternatives in production processes or recycling.

Digitalisation

Electrification will be accompanied by digitalisation. Digitalization has already blurred the lines between generation and consumption facilitating the integration of renewables, distributed generation, smart demand response or the large-scale deployment of electric vehicles. At the same time, energy systems will become more vulnerable, for example to cyber-attacks, which become easier and cheaper to undertake organise. The growth of the Internet of Things (IoT) is increasing the potential “cyber-attack surface” in energy systems⁵³. This will call for new government policies while at the same time new forms of international co-operation, which ultimately might lead to institutional adaptation.

⁵⁰ Cf World Bank, “The Growing Role of Minerals and Metals for a Low Carbon Future”, Washington, D.C., June 2017.

⁵¹ See Stephen Freiman, “Minerals, Critical Minerals and the US Economy”, testimony before the House Science and Technology Committee, Subcommittee on Investigations and Oversight, Hearing on Rare Earth Minerals and 21st Century Industry, US Congress, 16 March 2010; and Joint Research Centre (JRC), “Critical Metals in the Path towards the decarbonisation of the EU Energy Sector: Assessing Rare Metals as Supply-Chain Bottlenecks in Low- Carbon Energy Technologies”, European Commission, 2013.

⁵² M. Frenzel, J. Kullik, M.A. Reuter and J. Gutzmer, “Raw material ‘criticality’—sense or non-sense?” *Journal of Physics D: Applied Physics*, Vol. 50, No. 12, 2017.

⁵³ IEA (2017), ‘Digitalization of Energy’, IEA : Paris, 2017.

A new energy security policy for the next decade?

The answer to the question on what security of supply policy for the EU goes to the heart of a long-standing EU debate⁵⁴. On the one hand there are those that see the EU as a 'normative power' which recommend that the EU focus on influencing international norms and standards and organisations. On the other stand those that see the EU's influence and 'actorness' as leverage of its market power. A third group suggests a better combination of its long-preferred strategies of building international regimes modelled on its own normative approach' with 'assertive use of regulation' to pursue its objectives⁵⁵. Among the options that Goldthau and Sitter (2019) propose is also that low politics become a function of high politics, i.e. that energy becomes a function of foreign and security policy.

Much will depend on how the EU might see its security situation evolve. While the European Security Strategy of 2003 concluded that "Europe has never been so prosperous, so secure nor so free", the Global Strategy of 2016 has reversed this assessment: "Our Union is under threat. Our European project, which has brought unprecedented peace, prosperity and democracy, is being questioned." This has and will affect energy policy. It certainly poses geopolitical questions and in particular whether and if so, how much the EU in the future will be able to rely on global markets for its energy security or whether it will need to bring security related policies been into operation as for example discussed in the May 2014 European Energy Security Strategy. The European Commission's response to the Nord Stream 2 pipeline project is a case in point; although Russian gas both has been secure historically while cheap at the same time, the European Commission, on grounds of security concerns, has argued and proposed legislation as an attempt to block Nord Stream 2. This constitutes a willingness to accept possibly higher gas prices⁵⁶ in return for a political signal.

A major security element will be related to climate change and notably climate change mitigation. Energy related emissions account for about 80% of all greenhouse gas emissions in the EU. The vision of a long-term decarbonisation of the EU and the global economy will require profound changes in European energy systems. Climate change thus plays an important role in energy policy making and the value of considering interactions between global warming and energy security is increasingly recognised.

⁵⁴ Andreas Goldthau and Nick Sitter, Regulatory or Market Power Europe? EU Leadership Models for International Energy Governance, in: Jakub M. Godzimirski (ed), *New Political Economy of Energy in Europe*. Palgrave MacMillan, International Political Economy Series, 2019, Chapter 2, Pages 49-71 – recent EU energy policy – quote pp. 28-29.

⁵⁵ Andreas Goldthau and Nick Sitter, op cit; pp. 28-29.

⁵⁶ EWI (Energiewirtschaftliches Institut), Nord Stream 2 and its effects on European wholesale power prices. Study commissioned by Nord Stream 2 AG, Final Report, October 2018.

The roots of coordinated multilateral action to mitigate climate change go back to the Earth Summit in 1992 and the United Nations Framework Convention on Climate Change (UNFCCC) that was signed in that year with the Kyoto Protocol of 1997 being the first – later neglected – attempt at global climate governance. The ultimate aim of the UNFCCC is to stabilise greenhouse gas concentrations to prevent “dangerous ... interference with the climate system”. The failure of a new binding global climate agreement to emerge in Copenhagen in 2009 ended attempts to have a top-down governance in global climate policy, with binding objectives for all countries. In 2015, the Paris Agreement⁵⁷ on climate was signed, representing bottom-up governance instead. Countries are free to determine their own “Nationally Determined Contributions”. Only the process of updating these national plans, and the associated accounting rules will be binding.

The impact of climate change mitigation on energy security

The Paris Agreement establishes a process for increasingly higher ambition climate change mitigation policy by the objective of limiting global warming to “well below 2°C and to pursue efforts to limit the temperature increase to 1.5°C”. The Intergovernmental Panel on Climate Change (IPCC) released a report in the autumn of 2018 to analyse the significance of the 1.5°C temperature target and how to achieve it⁵⁸. In order to reach either temperature target, global greenhouse gas emissions need to be reduced nearly completely over the course of the century with steep cuts in the making, notably in developed countries. There is also a general expectation that developed countries should cut emissions at a faster pace than developing countries. This would reflect to some extent historical contributions to the stock of carbon dioxide in the atmosphere, but also a core UNFCCC principle, of “common but differentiated responsibilities and respective capabilities”.

Increasingly, global climate change policy influences the energy security debate. The interface of energy security and climate change is multifaceted, involving areas as diverse as global environmental and energy governance, implications of decreasing and ultimately phasing out of fossil fuel production and use, the implications of renewable energy on military operations, the implications of increasingly local energy production but also climate change impacts and adaptation and security aspects of climate change such as migration. While climate change impacts would likely intensify from 2030 and beyond, climate change policy, notably in OECD countries and China are already under way. The renewables revolution whereby electricity generation by renewable energy sources has become cost-competitive with con-

⁵⁷ Paris Agreement at the UNFCCC: see https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

⁵⁸ See IPCC at: <https://www.ipcc.ch/sr15/>.

ventional sources is a first sign; many expect that electrical vehicles soon will be at cost-parity with cars using internal combustion engines. Carbon pricing is gradually developing in different regions of the world, although to date most emissions are reduced by regulatory means such as efficiency standards or technology mandates. This global effort is already showing its first effects with a 12% energy efficiency improvement since 2000 (see IEA 2018)⁵⁹. In order to stabilise concentration of greenhouse gases in line with the ultimate objective of the UNFCCC, a doubling to tripling of the rate of improvement (i.e. emissions reductions) is required.

This has implications for global supply and demand, trade flows but also technology, competitiveness. The supply and demand of energy will be affected primarily by the radical reduction in producing and consuming fossil fuels, and its substitution with renewable sources. Trade flows will be affected not only with regard to energy trade, but even more so with regard to trade in energy-intensive materials and manufactured goods with high embedded emissions. Low-carbon technologies will need to be scaled-up to address this. Both the technology and trade issues are linked to the competitiveness of energy-intensive industry, through the costs enacted on industry by climate policies.

In any case, the bulk of emissions cuts would befall on industrialised countries, including the EU – even if it's share of global emissions is about 9% and shrinking. 4/5th of those emissions are related to energy. The remaining one-fifth are related to process emissions and other greenhouse gases, particularly in agriculture. Within the energy share are included all emissions generated for the electricity sector, heating – both low temperature for space heating in buildings as well as high-grade heat for industry – cooling, feedstocks in industry, and fuels in different modes of transport, including road, maritime, and aviation.

Stocks and flows of CO₂: energy should be decarbonised to stop the flows⁶⁰

Any temperature target is intrinsically linked to the concentration of carbon dioxide in the atmosphere; i.e. to the stock⁶¹. For the 2C target, this concentration should not exceed 450 parts per million (ppm). In 2018, the concentration stood at about 412 ppm (parts per million), up from 355 ppm

⁵⁹ IEA, 'Energy Efficiency 2018', IEA: Paris.

⁶⁰ Section 5 of the report "Global Trends to 2035" discusses some additional long-term trends of global emissions and climate policy [http://www.europarl.europa.eu/RegData/etudes/STUD/2018/627126/EPRS_STU\(2018\)627126_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2018/627126/EPRS_STU(2018)627126_EN.pdf).

⁶¹ Carbon dioxide is the most important greenhouse gas in the atmosphere; responsible for about 80% of greenhouse gases. But other gases such as methane and nitrous oxide also play an important role, and have a greater impact per tonne on global warming ("global warming potential").

in 1992 – the year of the UNFCCC adoption – and up from about 280 ppm from pre-industrial times. For this concentration not to reach the critical threshold, greenhouse gas emissions would need to be reduced as quickly as possible across the globe. This effort will have significant implications for energy, as the vast majority of energy consumed today is carbon-intensive. Coal, oil, and gas, all release carbon dioxide upon combustion, with the levels for coal being roughly double those for gas, and oil-based fuels sitting in-between.⁶² The carbon constraints imposed by climate policy will therefore require a significant transformation in all-energy consuming sectors across the economy. This includes coal and gas use in the electricity sector, fossil-based feedstocks in industry, oil-based fuels in transport, and fuels used to heat buildings. While in some cases it may be feasible to capture the CO₂ emitted, by and large existing carbon-intensive energy sources will need to be eliminated in favour of carbon-neutral alternatives.

For example, the EU's long-term strategic vision communication outlines⁶³ what this could entail for energy production and consumption in Europe. The impacts vary with different pathways chosen, each which emphasise different technology groups. These groups include electrification, hydrogen, e-fuels (power-to-X)⁶⁴, energy efficiency, and circular economy. The increase in electricity demand under these scenarios range from 35% if energy efficiency is emphasised, to 150% if e-fuels are maximised. All scenarios also rely on continued deployment of renewables at scale. Additionally, the demand for electricity storage may increase by up to 6 times to deal with the variability that high renewables penetration entails.

Crucially, however, picking just any one of these technology groups results in emissions reductions being limited to 80%. To go beyond 80%, a combination of all technology groups is required. Yet, even this is insufficient to go beyond 90% reductions. To reach net-zero emissions (with carbon sinks balancing any remaining emissions), requires either the use of bio-energy with carbon capture and storage (BECCS) or lifestyle changes that result in reduced demand for greenhouse gas-intensive activities.

A strategy aiming at deep decarbonisation⁶⁵ across the economy would see a radical shift in how energy is produced and consumed in many different sec-

⁶² See also the US Energy Information Administration's website at: <https://www.eia.gov/tools/faqs/faq.php?id=73&t=11>.

⁶³ See "A Clean Planet for All" Communication by the European Commission, chapter 3 - https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf.

⁶⁴ E-fuels are synthetic fuels produced with decarbonized electricity. Power-to-X (or P2X) describes that general process, with the X being either gas or liquids; i.e. Power-to-Gas or Power-to-Liquids.

⁶⁵ "Deep decarbonisation" here is used as shorthand for emissions reductions in line with the Paris Agreement temperature targets. The World Economic Forum describes 'deep carbonisation as follows. It "requires not natural gas and fuel-efficient vehicles, but zero-carbon

tors. Industrial processes would be electrified where feasible (and efficient), transport (electric vehicles) and buildings (heat pumps) would likewise see increased electrification. Where direct electrification is not feasible, hydrogen could play a role, particularly in industry. This requires either additional large-scale availability of low-carbon electricity to produce hydrogen via electrolysis or carbon capture if natural gas is used for hydrogen production. E-gas and E-fuels might be necessary in cases where hydrogen use is not possible. Additionally, there would be a general trend towards increased energy efficiency, recycling and material substitution, to limit the extent to which zero-carbon energy and technology is required⁶⁶.

These developments are still ahead of us. Global greenhouse gas emissions, however, have not yet started a downward trajectory yet, even if they have in some industrialised regions such as the EU and the US. With over 37 gigatonnes of carbon dioxide emissions in 2018, emissions reached a new all-time high. Adding the other greenhouse gases, total global emissions stand at about 50 GT in CO₂-equivalent.

Although the stock of greenhouse gases is the main problem, it is abetting the flow of emissions that will mitigate climate change. These flows adding to the existing stock are still growing. According to the IPCC's 1.5°C Special Report, global emissions should come down to 25 – 30 GT annually by 2030 for the temperature goal to be feasible. Yet, with current trends 52 – 58 GT per year is more likely, leading to a temperature increase of more than 3°C by the end of the century. With temperature increases beyond 2°C, climate impacts may become self-reinforcing and lead to irreversible damage to ecosystems, biodiversity and livelihoods.⁶⁷

The increasing concentration of greenhouse gases has already led to about 1°C degree of warming on average compared to pre-industrial levels. This temperature increase, in turn, has resulted in some climate impacts already, with the effects being more pronounced in certain regions. Extreme weather events have increased in intensity, which is partially attributed to climate change (e.g. higher precipitation levels during hurricanes). Agricultural yields would be impacted by temperate and weather extremes in either direction, e.g. droughts or hail storms. Public health would be impacted by

electricity and electric vehicles charged on the zero-carbon electricity grid. This more profound transformation, unlike the low-hanging fruit eyed today by many politicians, offers the only path to climate safety (that is, staying below the 2°C limit). By pursuing coal to gas, or more efficient gas-burning vehicles, we risk putting ourselves into a high-carbon trap". See: <https://www.weforum.org/agenda/2015/12/whats-the-path-to-deep-decarbonization/>.

⁶⁶ See the table on page 56 ("Long-term Strategy Options" of the In-depth Analysis document supporting the Communication of the EC's 2050 strategy - https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf).

⁶⁷ As described in the Communication on the EU long-term strategy. These impacts are additional to impacts that would already take place at 1.5 to 2 degrees warming, as described by the IPCC in its Special Report on the 1.5 degrees target (cf. footnote 54).

certain air-borne diseases that travel easier in higher temperatures. Finally, the stock of greenhouse gases in the atmosphere already now guarantees a further rise in sea level for some time to come.

As direct impacts to the energy sector, we can name risks of cooling of both thermal and nuclear plants and more generally, water use and other resource use. Increasingly more frequent and also more pronounced 'extreme weather' events will jeopardise existing infrastructure such as generation assets and transmission lines. As many electricity generation plants are located close to water, there is a particular risk of flooding.

The energy transition or better described as transformation will also increase uncertainty for example as to investment or as to what infrastructure, thereby creating stranded assets⁶⁸. It also affects hard security for example via regional conflicts or migration.

Mitigation: ramping up emission cuts

The bottom-up governance of the Paris Agreement allows countries to set their own climate commitment. It is the process of revising these commitments during pre-determined review cycles that should lead to increased ambition over time. When the Paris Agreement was concluded, this review process was often referred to as a "ratchet": the direction of change should only be one-way, towards strengthening. To operationalise this, a "rulebook" has been (mostly) completed at COP24 in Katowice in late 2018, prescribing different degrees of binding processes for revising the Nationally Determined Contributions.

Politically, however, the expectation would be that commitment needs to be strengthened so long as an "emissions gap"⁶⁹ exists and further cuts to emissions are required. For the commitments made under the Paris Agreement, developed countries indeed adopted absolute emission reduction targets in their nationally determined contributions. Developing countries, conversely, have adopted relative reduction pathways, measured against a baseline or intensity targets that aim to decouple economic growth from growth in emissions levels.

⁶⁸ See also the report "Too late, too sudden: Transition to a low-carbon economy and systemic risk" from the European Systemic Risk Board at https://www.esrb.europa.eu/pub/pdf/asc/Reports_ASC_6_1602.pdf.

⁶⁹ 'Emissions gap' is also the terminology used by UNEP who analyse global mitigation efforts in an annual report. The latest version can be found here: <https://www.unenvironment.org/resources/emissions-gap-report-2018>.

*How are key sectors doing with cutting emissions?*⁷⁰

Electricity

About one quarter of global emissions can be attributed to the power sector. In particular, the use of lignite and hard coal results in high levels of emissions. Natural gas, while emitting a lot less, is still carbon-intensive.

Renewables are generally seen as the long-term solution to a zero-carbon electricity system and have proliferated strongly over the past decade. Costs of wind and solar have continued to decline as the share of renewables in the electricity mix increased. While initially driven subsidies such as feed-in tariffs, the costs reductions realised by now has led to some renewable projects being delivered without subsidy, thus achieving competitiveness with conventional electricity generation.

In shorter timeframes, however, an increase in the share of renewables should not necessarily be seen as wholly equivalent to achieving emissions reductions. With their variable output, renewables can strongly impact wholesale electricity market prices in case of substantially lower or higher output. With low wholesale prices, expensive generation capacity such as gas can be pushed down the merit order to the benefit of coal, as we have seen in the EU. This will depend on the level of carbon pricing, regulation and after all on demand, i.e. whether there are overcapacities like in the EU or not.

The policy that explicitly targets power sector emissions, is the EU emissions trading system, which puts a price on carbon. Due to oversupply issues in the EU's carbon market, carbon prices have been depressed since 2008, reaching to no more than 4-8 euros. Following a set of reforms passed in 2017, prices have recovered⁷¹—Significant emissions reduction would be achieved only once fuel-switching levels are reached, which would trigger the replacement of coal with natural gas: Countries that have topped up carbon prices by domestic policy intervention have recorded greater reductions in electricity sector emissions (e.g. the UK)⁷².

Energy-intensive industry

Energy-intensive industries such as basic material production (steel, cement, aluminium, glass) and oil refining are also included in the EU ETS and

⁷⁰ This section is partly based on the results of the CARISMA project, in particular deliverable 3.2, which focuses on the technology options across different economic sectors to achieve deep decarbonization. See: <http://carisma-project.eu/LinkClick.aspx?fileticket=SBT4BP4WE4Q%3d&tabid=95&portalid=0&mid=580>.

⁷¹ See this CEPS Commentary for a discussion of the reforms: <http://ceps-ech.eu/publication/strong-revision-eu-ets-future-may-bring-impetus-further-reform>.

⁷² Price floors are discussed more in-depth in the following report: <https://www.ceps.eu/publications/five-myths-about-eu-ets-carbon-price-floor>.

represent just under a quarter of total EU emissions. Compared to 2008, around the time when the ETS moved beyond its pilot phase, emissions in these sectors are notably lower⁷³. This can by and large be attributed to two factors: lower industrial output levels and increased energy efficiency. Emissions in energy-intensive industries dropped significantly from 2009 onwards, with the onset of the financial and economic crises in the EU. While industrial output has increased again since then, it remains well below pre-crisis levels. While this is good from an emissions reductions point of view, reducing emissions by producing less is neither economically sustainable nor politically attractive. Meanwhile, the competitiveness of industry has become such a central element to climate policy deliberation (usually in the context of so-called carbon leakage risk⁷⁴), that climate policy is sometimes seen as a means of pursuing industrial policy⁷⁵.

A second reason for lower emissions in industry are improvements in energy efficiency. While a more positive development, some caveats need to be added. The first is that since 2015, emissions reductions have stagnated, indicating limited continued improvements. Secondly, related to that, there are intrinsic limits to efficiency improvements in industry. It is not possible to linearly keep on reducing the emissions-intensity through efficiency improvements without at some point fundamentally transforming the underlying industrial process. This would be the point where energy demand could increase dramatically⁷⁶.

A number of cross-cutting technologies can contribute to significant emissions cuts across various industries, to achieve deep decarbonisation of industry.

The first of these is using hydrogen as a feedstock, to supply heat and replace natural gas. As hydrogen is merely an energy carrier, the production of hydrogen at scale requires a lot of low-carbon energy in itself. This can be provided either by electricity and electrolysis, or by using natural gas and capturing the emitted carbon dioxide; i.e. combining it with carbon capture and storage (CCS). Hence carbon capture and storage would be a second

⁷³ See the EEA's ETS Data Viewer <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1> - industrial emissions are a combination of fuel combustion and industrial process emissions.

⁷⁴ Carbon leakage would occur, if as a result of climate policy measures in one jurisdiction, production is displaced to regions with laxer climate policy obligations, leading to a net-increase in greenhouse gas emissions. This harms economic competitiveness and the environment alike.

⁷⁵ See also Section 1 of the book "Emissions Trading – Fighting Climate Change with the Market", edited by Hanna Stenegren, found via <http://fores.se/emissions-trading-fighting-climate-change-with-the-market-publikation/>.

⁷⁶ The way steel is currently produced in blast furnaces will always result in some CO₂ emissions – even if modern plants are far more efficient than they used to be. Likewise, some CO₂ emissions are inherent to the production of Portland cement (the most common type).

one. In itself it is an approach to deal with emissions that cannot otherwise be avoided. Direct electrification of industrial processes is attractive wherever it is possible, but in particular in cases where high temperature heat is required, this may be infeasible.

Transport & mobility

Emissions from the transport sector in the EU have been rising for some time, in contrast to emissions from most other sources. The majority of emissions from the transport sector – about three quarter – are from vehicles for road transport. Aviation and maritime transport are smaller, but still significant chunks which are still expected to show even more growth.

Given the long-run objectives of reaching zero emissions, substituting any convention internal combustion engine vehicle with a zero-emission vehicle is more effective than efficiency improvements. It is therefore not surprising that many member states seek to boost the deployment of zero-emission vehicles. Battery-electric vehicles are the most prominent option here, driven in part by the ascendancy of Tesla and the falling costs of batteries. There are other technological options as well, however, such as fuel cell vehicles or by using zero-carbon fuels. The inherent efficiency of electric engines makes EVs an attractive option. But on the infrastructure side, and in some specific use-cases, there may be limits to electrification in mobility. While a shift to electric mobility does not lead to a problematic increase in overall electricity demand⁷⁷ there may yet be grid capacity challenges in dense urban areas, if a great number of vehicles need to charge simultaneously.

For aviation and maritime transport, electrification is not an option in the short to medium term, except for short distances. For these sectors, emission reductions will need to come from the use of biofuels (or other low-carbon fuels), or demand reduction in general.

Buildings

About three quarters of emissions in the buildings sector are for space heating and cooling, with water heating and cooking making up the rest. There has been continued progress in reducing emissions through insulation improvement, due to the general incentive to keep household energy costs low. However, getting to zero emissions in this sectors requires the source of heating and cooling to be emission-free. Such renewable heat can be based on electrification (e.g. heat pumps) or renewable gas. Furthermore, district heating can play an important role, especially if such networks can be combined with using waste heat from industrial sites. Crucially, due to the

⁷⁷ About 24% if all cars were electric, see: https://www.eurelectric.org/media/1925/20032015_paper_on_smart_charging_of_electric_vehicles_finalpsf-2015-2301-0001-01-e.pdf.

high costs associated with renewable sources of heat, further efficiency improvements though building renovation remain essential, to limit the energy that needs to be provided by these sources. This relates to one of the bigger challenges of the buildings sector in general, as it requires updates to, and renovations of the existing building stock.

Agriculture

In the agricultural sector, it is greenhouse gases other than carbon dioxide that are relevant. Specifically, methane from livestock, and nitrous oxide from soil cultivation and fertiliser use account for the vast majority of emissions from the sector. While there is ongoing research into technological options to reduce emissions from these sources, this research is at a less advanced stage than in other sectors. Absent the availability of technological solutions at scale, it may be necessary to offset residual emissions in this sector with negative emissions technology.

Removing carbon: not just to compensate residual emissions

The other side of the coin of greenhouse gas emissions are carbon sinks that absorb (or sequester) carbon dioxide from the atmosphere. The most common carbon sinks are the forests around the world, although oceans also sequester carbon. Removing carbon dioxide can compensate for any residual emissions, but are also necessary in their own right. Without some form of carbon removal, either by growing carbon sinks (i.e. afforestation and reforestation), or through “negative emissions technology”, the temperature goals of the Paris Agreement cannot be reached. This is confirmed both by the IPCC as well as the EU’s updated long-term climate strategy⁷⁸.

Negative emissions technology includes things like bio-energy with carbon capture and storage (BECCS), use of bio-based building materials, or more experimental methods such as direct air capture or enhanced weathering⁷⁹. A key trade-off is that carbon removal and negative emissions are extremely difficult to deliver at scale. There is competition for land and other resources, and some negative emissions technologies are highly energy-intensive in itself. As such, conventional mitigation through emissions reductions should be prioritised to limit the extent to which negative emissions are required.

If negative emissions need to be scaled up significantly, this can have implications for energy security in a low(er) carbon world as well. Especially in scenarios where biofuels are scaled up significantly for use in sectors were

⁷⁸ See the European Commission’s (2018) “A Clean Planet for All” Communication, found at https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf.

⁷⁹ See also this explainer from CarbonBrief, found at <https://www.carbonbrief.org/explainer-10-ways-negative-emissions-could-slow-climate-change>.

carbon capture is not possible (e.g. transport fuels), these biofuels would be in direct competition for land use with trees or crops for BECCS.

When mitigation becomes insufficient, adaptation should increase

In developed countries and industrialised economies, the bulk of climate policy is mitigation policy. Reducing emissions is also in line with the precautionary principle, which in the case of the EU is enshrined in the Treaties⁸⁰. Some climate impacts, however, are unavoidable or are indeed already taking place. Many of the least developed countries in the Global South, moreover, will tend to have fewer tonnes of emissions to cut, and more impacts to deal with. Adaptation is therefore equally important on a global scale. The Paris Agreement too, covers adaptation policy. For every country, there is some trade-off between mitigation and adaptation policy. The less successful emissions reductions are progressing, the more severe the impacts of climate change can be expected to be, and the more adaptation efforts would be required.

If this trade-off is not acknowledged, it may be necessary to change course in a more disruptive manner once climate impacts start to develop more acutely. A disruptive transition would greatly increase the risk of stranded assets, as asset allocation would need to be redirected at speed. Such disruption would add further costs to adaptation, which is already more expensive than mitigation as some damages are unavoidable and thus carry costs as well. It also follows that disruptive adaptation (or indeed mitigation) would threaten security of supply, as low-carbon alternatives may not be ramped up fast enough.

Irrespective of the fate of the Paris Agreement, it is difficult to avoid the conclusion that it is unlikely that an increase in mean temperature of 2°C or even more can be avoided. Calculations (cf UN 2017)⁸¹ show that emission growth would have to change dramatically, going negative already around 2020 even to reach the 2° scenario. However, there is little indication of this happening as the NDC show. Countless studies and high-level groups (for the latest example the Stiglitz Commission Report of 2017) have indicated that a carbon price of at least 50 USD and maybe up to 100 USD (per ton of CO₂) would be needed to achieve these goals. In the absence of stronger policies, adaptation to climate change will move up the policy priority ladder.

Climate policy: pricing carbon is necessary but not sufficient

Policies that target emission reductions can be largely divided into two main groups: pricing and non-pricing policies. Carbon pricing aims to put a price

⁸⁰ Art 192 TFEU.

⁸¹ United Nations (2017) 'The Emissions Gap Report 2017', A UN Environment Synthesis Report.

on every tonne of CO₂ equivalent emitted. This can be done by either taxation or through emissions trading (i.e. carbon markets)⁸² by creating certificates – and capping the supply thereof – that need to be surrendered for compliance. Which of the two approaches to carbon pricing is better is the subject of continuous debate between environmental economists. The key difference between carbon taxation and carbon markets is the part of the policy that is subject to uncertainty. With taxation, the level of the tax (and/or its trajectory) is determined by policy makers, but the outcome in terms of actual emission reductions is uncertain. With emissions trajectories being uncertain, the impact on energy demand is uncertain as well, although carbon taxes can be set at precisely a given level where fuel-switching between for example coal and gas would take place. With emissions trading, the supply of certificates can be capped (and also put on a downward trajectory) giving more certainty about outcomes in emission reductions. With declining caps, such as in the EU ETS, emissions in covered sectors should reach zero at a defined point in the future. A corollary of that is that carbon-intensive energy sources used in capped sectors should likewise reach zero. In carbon markets, however, the price at a given moment in time can fluctuate, resulting in uncertainty about compliance costs. Of course, hybrid models can and have been envisioned, for example by introducing minimum prices in emissions trading systems⁸³.

Carbon markets have proven to be a politically attractive policy, in part because the property rights created by certificates allow for distributional shifts that can help build support. The biggest carbon market is still the EU Emissions Trading System, although China intends to fully launch their own carbon market that would be over double the size of the EU's 1.8 billion tonnes. Just as the increased investment of China in renewables had a huge impact on global prices of photovoltaics and wind power, so too can China's ETS strongly affect demand for coal and gas.

Carbon pricing in itself is not sufficient to achieve deep cuts in emissions⁸⁴. In particular, it is best suited as a disincentive for carbon-intensive technology, rather than as an incentive to bring new low-carbon technology and products to the market. In other words, it works best to drive old technology out of the market, by reducing its profitability. Many of the low-carbon technologies described in the sectoral sections above do not yet exist at scale. As has already been done with renewables, non-pricing policies may be more suitable to support low-carbon investments and reduce emissions through

⁸² For more discussion on carbon markets, see also: Ellerman, A., Convery, F., De Perthuis, C., Alberola, E., Buchner, B., Delbosch, A., Matthes, F. (2010). *Pricing Carbon: The European Union Emissions Trading Scheme*. Cambridge: Cambridge University Press. doi:10.1017/CBO9781139042765.

⁸³ See also this CEPS Policy Insight on the role of price floors in the EU ETS: <https://www.ceps.eu/publications/five-myths-about-eu-ets-carbon-price-floor>.

⁸⁴ See this CEPS paper for further discussion of the role of the ETS price signal <http://ceps-ech.eu/publication/eu-ets-price-may-continue-be-low-foreseeable-future---should-we-care>.

more regulatory approaches. Examples include subsidies in different forms, including contracts for differences, emissions and energy efficiency standards or mandates. The concept of the circular economy is also integrated more and more with climate policy, as the resource and material efficiency it drives can reduce demand for energy and carbon-intensive processes.

Innovation support, moreover, also plays a central role in the development of new low-carbon products. But this support should go beyond regular research and development funding. For low-carbon products to substitute conventional carbon-intensive products, there needs to be a market for them. Higher costs, however, reduce the competitiveness of nascent low-carbon products, which can only be reduced by increasing economies of scale. Public policies that support the demand for low-carbon products can therefore form an essential part of a climate policy mix⁸⁵.

Policy interactions: climate policy is never just about the climate

Efforts to reduce emissions often can (and arguably should) be linked to other policy fields. Emissions from road transport and coal-fired electricity generation have an air quality dimension to it. Air quality issues, furthermore, are a distinctly local matter in contrast to CO₂. This may make it easier to gain support for mitigation measures that also improve air quality and thereby public health more generally. As these issues gain traction, as for example evidenced by the plans of some cities to ban diesel cars from city centres, fuel demand and demand for low-carbon vehicles may likewise be affected.

Many more policies have environmental dimension beyond climate: support for nuclear power generation is strongly affected by how to deal with nuclear waste and associated costs. But phasing out nuclear power quickly leads to a gap in the electricity supply that needs to be filled somehow. This could be a reason to accelerate renewables investment, but can also lead to fossil fuel-generation being extended. Circular economy measures may have overall resource efficiency as their goal, but more efficient use of resources can also lower demand for energy and energy-intensive materials. Recycling will require a lot of energy, which will need to be low-carbon.

Even policies that are directly linked to climate policy have their own rationale. Renewables policies and energy efficiency standards can make emissions cuts easier to achieve. Their main aim, however are increasing renewables deployment (and lowering their costs), and lowering energy demand respectively. While clearly helping to achieve climate objectives, these aims should not be conflated with the separate objective of delivering emissions reductions.

⁸⁵ See also: <http://ceps-ech.eu/publication/tools-boost-investment-low-carbon-technologies>.

Security beyond energy

On the side of the climate impacts and adaptation, there are also linkages to a broad set of security issues. This includes energy security itself, but also food security, water security and traditional hard security issues. In the case of food security, biofuels and the demands on land, or its degradation, in general can strongly affect agricultural yields and food prices. Water security can be affected both in scarcity terms, threatening agriculture, but also in terms of extreme rainfall and flooding. In adapting to these challenges, transboundary water management becomes a more salient issue. Hard security issues may arise as climate impacts can be seen as a 'conflict multiplier'. In the words of Germany at the UN Security Council, climate change "aggravates existing threats to international security"⁸⁶.

The interaction between these security issues can be framed as a climate-security nexus, with multiple order effects⁸⁷. The first order effects would be the direct impacts climate change has on temperature and water levels, thereby threatening a loss of territory in some cases (e.g. small-island states). The second order effect would be threats to security of supply in both energy, food and water terms as agricultural productivity is impacted. This may lead to – as a third order effect – increased migration and displacement of populaces. A possible additional fourth-order effect is then the conflict multiplier, whereby it would be easier for extremists to flourish in a political environment marked by threats to livelihoods and displacement.

Global perspectives: how are the major economies approaching climate policy?

Through the issue of the competitiveness of the traded sector, the policy response to climate change undertaken in foreign jurisdictions is essential. It influences markets for low-carbon products and determines the extent to which carbon leakage safeguards are required. In that context, a brief overview of how the largest economics blocks are doing in terms of climate policy and greenhouse gas emissions is merited. The US contributes around 15% of global GHG emissions; its impact on global reductions is important but not comparable with China, which has been responsible for 30% of global emissions in 2014. The EU contributes just below 10% of global emissions.

The United States, as the world's largest economy and second largest emitter, has played a pivotal role in global climate diplomacy. This has been the case for better and worse. Under the Trump Administration, the announced

⁸⁶ See the German Federal Foreign Office at <https://www.auswaertiges-amt.de/en/aussenpolitik/themen/klima/group-of-friends-on-climate-and-security/2142038>.

⁸⁷ https://www.swp-berlin.org/fileadmin/contents/products/comments/2018C34_dge.pdf.

intend to withdraw from the Paris Agreement has created a perception that the country has abandoned climate action. Beyond the federal government, however, Trump's climate scepticism has galvanised state and local authorities in favour of strong climate mitigation policies to redouble their efforts. Emissions have also been trending downward, helped in part by the competitiveness of shale gas. The shale gas and renewables revolution are fast replacing coal from the US power mix, therefore reducing emissions largely independently from policy. In spite of this, emissions per capita remain some of the highest in the world, and progress outside the electricity and transport sectors remains sparse. In so far as its Paris Agreement commitments are still relevant, the US aims to reduce emissions by 26-28% by 2025 compared to 2005⁸⁸.

In China, the world's biggest emitter and second largest economy, emissions continue to grow even if the rate of emissions growth has dropped considerably. At the same time, China has invested massively in renewables in the 2010s, thereby contributing heavily to cost reductions of which the whole world benefits. It also the frontrunner in some forms of electric mobility, with the public transport systems in some cities making use of large numbers of electric buses. At about 13 billion tonnes in CO₂ equivalent in greenhouse gas emissions (over a quarter of global totals), China's climate policies will continue to be pivotal in determining the global success in reducing emissions. It's nationally determined contribution under the Paris Agreement sets a goal of "peaking carbon dioxide emissions by 2030 at the latest". In terms of carbon intensity, China also committed to reducing the carbon intensity of its economy by 60-65% by 2030⁸⁹.

The European Union, finally, sees itself as the global frontrunner in climate policy. It was the first major economy to implement a comprehensive system of carbon pricing with the EU emissions trading system in 2005. Combined with renewable and energy efficiency targets, the EU's power sector emissions have decreased significantly over the past decades. It has already exceeded its 2020 target of reducing emissions by 20% and is on track to meet its 2030 target (and Paris Agreement commitment) of reaching at least 40% cuts to emissions. In industrial sectors, emissions have likewise been decreasing, although lower output levels following the economic downturn between 2008 and 2015 is largely responsible for this. With the return of economic growth, so too did industrial emissions inch upwards again. Reducing these emissions, as well as those in the buildings and mobility sectors will be the main challenge from the 2020s onwards. The Energy Union is the political endeavour that encapsulates this challenge, with its decarbonisation and energy efficiency dimensions.

⁸⁸ <https://climateactiontracker.org/countries/usa/pledges-and-targets/>.

⁸⁹ <https://climateactiontracker.org/countries/china/pledges-and-targets/>.

Outlook and conclusions

For the most part of the 20th century, focus of security of supply has been 'uninterrupted supply of energy sources at affordable prices'. The attention between physical availability, i.e. uninterrupted supply and price, i.e. affordability kept shifting in line with the global oil markets and geopolitics, for example the Cold War and its different phases or the period of de-colonialization and nationalisation of oil companies.

The security of supply agenda has started to widen in the late 1990s, a development that is still ongoing. The increasing EU imports of natural gas and the projected and by now materialising decline of EU and Norwegian supplies raised issues of economic and security implications of high import dependency if not at EU then at the level of some member states. The accession of central and eastern European member states, which often depend to a very high degree on Russian gas and in some cases on other Russian energy sources, has brought gas supply at centre stage of the EU security of energy supply agenda.

Liberalisation of energy markets in OECD countries with the beginning of the 1990s added another dimension to security of supply; systems security of newly liberalising network energies electricity and gas as well as concerns of investment. The California electricity crisis of 2000 'internationalised' concerns. The new security of supply agenda now included electricity and regulatory risks. Increasingly, governments and academics explored market-based options not only for the environment but also to address security of supply.

The super cycle for physical commodities not only oil but also food, metals and other commodities largely due to the 'China boom' have brought back fears of supply crunch, competition for resources more generally and the rise of petro states. The concept of geo-economics made its entry into the security of supply argument. Petro states or authoritarian countries were seen as investing in oil and gas production, but also infrastructure and agricultural and other resources for example in Africa to increase influence worldwide. While aid and investment have traditionally been a tool to increase influence, the increasing challenge by China and Russia or the so-called BRICSs increased awareness in the US and Europe.

By now attention is also gradually turning to demand for mineral raw materials driven by the unfolding digital revolution and the transition to the low-carbon economy. This transition will transform the value chain of mineral raw materials industries from the upstream to the downstream, while impacting the oil and gas industries worldwide. Separately but related are concerns about cyber security and the protection of critical infrastructure as a result of accelerating electrification combined with the growing digitalisation of the energy sector. More and more security of supply gave way to the broader concept of energy security.

Overseas investment came on the back of a growing awareness of access to energy as a precondition for human development and economic growth but also for reducing to foreign intervention. Concerns of environmental sustainability have also heightened interest in access to energy; modern clean energy is less polluting and emitting than traditional energy, e.g. biomass or coal-based. This led to the adoption of the Sustainable Development Goals in 2015, which has established a new level of political recognition for energy's central role in development. Mass migration has created a new dynamic with regard to the discussions on SDGs.

The EU was largely sticking to its markets approach when it comes to energy security; supporting the functioning of energy markets in the EU and its neighbourhood as well as globally, combined with diversification via the reinforcement of interconnections, the building of redundant infrastructure and focus on import corridors, e.g. the Southern Corridor bringing gas from the Caspian region into Europe. With the new Russian assertiveness, the EU also is considering a more government-led energy security strategy. The examples mentioned are for example the alignment of the legal framework for gas import pipelines with EU internal market rules, the screening of foreign investment or the attempt to create a and South East European energy security framework based on the Central and South East European Connectivity Initiative (CESEC).

Already starting in the 1990s, energy security has become more and more influenced by the implications of global climate change policy. Climate change policy will transform industrial value chains including those from energy industries. It is likely to lead to new infrastructures, production chains and industrial clusters, based on new technologies with integration of different sectors from within energy and outside.

Climate policies create carbon constraints that will increasingly affect both the supply and demand for energy. In attempting to keep the concentration of greenhouse gases in the atmosphere from not exceeding critical thresholds, carbon-intensive fossil-based energy sources will be targeted by more and more policy, both of a pricing and regulatory character, or even investor activism and legal action. The aim is to strongly reduce, if not eliminate their use in those countries that have adopted the most stringent emissions targets. At the same time, low- and zero carbon energy sources will continue to proliferate. The growth in, and cost reductions of wind and PV solar are already evidence of this.

The transformation of the economy from fossil-based energy to carbon-neutral energy will have major implications not just for the upstream energy sector. In energy-intensive industries, production processes will need to be overhauled to allow for electrification, hydrogen, carbon-capture or similar low-carbon approaches. Fossil fuels currently omnipresent in the transport and buildings sectors will likewise need to be substituted. As demand for (zero-carbon) electricity is set to grow, new value chains and business models will be developed around storage, mobility, hydrogen production and CO₂ transport and storage.

Global greenhouse gas emissions have not started to come down yet, even if they have in certain OECD economies. This increases the urgency and the potential speed with which fossil-based energy sources will have to be substituted by carbon-neutral alternatives. So long as global emissions do not start to drop, increases the likelihood that more negative emissions technology will be needed. Such negative emissions can only be delivered at great cost in terms of resources and land-use. To the extent that mitigation policy will be insufficient, more efforts in adaptation to manage the impacts of climate change will be required. This could trigger a more disruptive transition, affecting the profitability of current carbon-intensive assets.

Even at current greenhouse gas concentrations, some climate impacts such as extreme weather events and sea level rises are set to intensify over the coming decades, irrespective of the extent to which climate mitigation policies are pursued. Exacerbating impacts from climate change, especially if global emissions levels remain high, can threaten both energy infrastructures as well as the societal acceptability of carbon-intensive energy production and consumption.

At this stage it is uncertain how fast and how disruptive this transition will be. Major implications for the oil industry may well take until 2030. Nevertheless, the kind of technological progress witnessed in electricity and now in cars may have the potential for disrupting value chains with knock-on effects for the energy sector. Similarly, climate impacts may effect security of supply, first sporadically but over time more widely. It therefore seems time for both policy makers and academics alike to take a more thorough look at the energy climate interface and its implications for the energy security agenda.

Chapter V

Give Peace a Chance: New Opportunities in Saudi Arabia's Geo-economy

Miguel A. Lasheras

Abstract

The document describes the geoeconomic relations between Saudi Arabia's energy policy and the world economy, with special attention to its foreign and domestic energy policy in relation to the most relevant events that have taken place in the strategic energy landscape in recent years.

The effects both of energy transition and of the development of non-conventional hydrocarbon in USA on the geoeconomic position of Saudi Arabia are considered. The threat that these two facts could impose to an economy excessively supported by resources coming from the exports of oil, it could be balanced by an economic diversification and a social transformation targeted to a technical, efficient and sustainable energy consumption in Saudi Arabia. Uncertainties could be transformed in opportunities being the speed of energy transition slow enough as to avoid excessive pressure on the internal transformation profile. The assassination of Khashoggi has happened in the middle of these tensions and has interacted with all of them.

Key Words

Saudi Arabia, oil, gas, fracking, energy transition, Middle East, OPEC, economic diversification, Vision 2030.

Introduction

The price of Brent on the oil market at the beginning of October 2018 was in excess of 80 US\$/bbl and was at its maximum value since 2016. On 2nd October, Jamal Khashoggi, columnist for the Washington Post and critic of the Saudi Government, was murdered in the Saudi Consulate in Istanbul. A few days later, the price of oil began to plummet, and by the end of the month it stood at \$ 50 US B/D, a minimum value that had not been seen on the market since the second half of 2016. The prospects of a slowing up of the world economy and the postponement of the sanctions announced by the USA to be imposed on countries that imported oil from Iran were, according to the analysts, the explanation for the sharp drop in prices during the whole month of October 2018. The macabre assassination of the journalist occurred at the same time as oil market prices peaked, although this was probably a coincidence. However, this coincidence helped Saudi Arabia (SA) to manage its strategy for dealing with the expected political reactions that were about to occur in the ensuing days.

On 26th October, the journal Foreign Policy described the SA panorama as an "Investment Wasteland"¹. During 2017 and 2018, net investments had fallen sharply when compared with the situation observed in 2016. The cost of the Yemen War, around \$US 5 billion/month, constituted a serious threat to Saudi Arabia's capacity to finance and sustain the diversification plans announced by Prince Mohammed bin Salam (known as MBS) in 2015, the same year that his father had come to the throne.

To obtain financing, in the last few days of October 2018 an investors summit had been announced in Riyadh, aimed at top executives of investment funds, banks, family offices and company asset managers from all over the world. However, the representatives of the investors who were going to attend the conference decided to boycott it as a protest against the assassination of Khashoggi. The chain of negative reactions to this murder from the world's main capitals, including the reactions of Saudi Arabia's closest allies, was constant, albeit not very forceful. President Donald Trump merely stated that this death "should never have happened".

Just in case, Riyadh immediately issued a statement mentioning about 30 economic measures that could be taken in the event of sanctions being imposed. These potential response measures, credible because of SA's influence in the economic world, mentioned modifying its oil production, SA being the main oil exporter, and reducing arms imports from the United States, which had been expected to reach \$US 350 billion in the next 10 years, and also to reduce arms imports from the United Kingdom, Germany and France. The country likewise announced that it was reorienting the destinations of other investments of its

¹ HIRSH, Michael: "How Mohammed bin Salam Turned Saudi Arabia Into an Investment Wasteland". Foreign Policy, 26th Oct. 2018. <https://foreignpolicy.com/2018/10/26/how-mohammed-bin-salman-turned-saudi-arabia-into-an-investment-wasteland-khashoggi/#>.

sovereign funds that for \$US 150 billion were being added to the purchase of arms committed to the Trump Administration. If the US President had shown his opposition to oil at \$US 80 B/D at the beginning of October 2018, according to the statement published by Al Arabiya the Arab chain in competition against Al-Yazira, what would the mood be if the price were to reach \$US 100, as in the period 2011-14, or if it were even to reach \$US 200, hitherto unknown².

The statement had its effect. The spokesman for the Trump Administrations' Department of State clarified that, in spite of the information collected so far, including data from the CIA, which involved Saudis at the highest levels in the murder, the US Government had not yet come to a conclusion and would carry on investigating "while maintaining the important strategic relationship between the United States and Saudi Arabia"³. Simultaneously, Trump used tweets and private statements to declare that the USA was interested in a low oil prices policy and that it would oppose any attempt by Riyadh to cut back production in order to raise prices⁴.

During October oil prices plummeted by over 20%. Trump had been making requests to the Saudis asking them to increase their production and thus make up for the falls in Venezuelan and Libyan production and the lower exports coming from Iran, but the drop in prices was probably a market reaction, perhaps an overreaction to the rises in the preceding months⁵. However, at the beginning of November, SA announced for the immediate future a cutback of 500 kbd for what remained of 2018 and of 1 Mbd, to be applied in 2019. The expectations from these cutbacks lasted through November and were reinforced in the conclusions to the OPEC meeting extended in Vienna at the beginning of December 2018. Its final statement contained an agreement to reduce by 1.2 Mbd as a whole during the first half of 2019.

There is no empirical evidence that oil price performance is a direct reflection of the quantity control policies that might be agreed to between oil-producing countries at OPEC meetings⁶. Yet it is also true to say that, even in the absence of this empirical evidence, the US Congress has, for some time, been preparing a Bill curiously entitled NOPEC (No Oil Producing and Exporting Cartels), which enables its Attorney General to impute oil-producing countries for manipulating

² ALDAKHIL, Turki: "OPINION: US Sanctions on Riyadh Would Mean Washington is Stabbing Itself". Al Arabiya English. 14th Oct. 2018.

³ ABC NEWS: "Jamal Khashoggi murder: Trump Administration Denies Reaching Final Conclusion, after Reports CIA Believes Crown Prince is to Blame". 18th Nov. 2018. Available at <https://www.abc.net.au/news/2018-11-18/jamal-khashoggi-murder-trump-administration-denies-final-conclus/10508686>.

⁴ SHEPPARD, D. and E. CROOKS: "OPEC: Why Trump has Saudi Arabia over a Barrel". Financial Times. 9/12/2018.

⁵ SHEPPARD, David: "Brent Crude Enters Bear Market at Below \$70". Financial Times. 11/11/2018.

⁶ HUPPMANN, D. And F. HOLZ: "What About the OPEC Cartel?". Deutsches Institut für Wirtschaftsforschung. 11/3/2015.

prices under the Sherman Antitrust Act, which would jeopardise those countries' investments in the USA. For example, Qatar's investments, which hold most of the capital in the liquefaction terminal for liquid natural gas (LNG) at Golden Pass in Texas, and which walked out of that same meeting in Vienna in December 2018.

This article describes the geo-economic relations between SA's energy policy and the world economy, especially with respect to its foreign and domestic energy policy, the effects felt by the latter caused by the development of oil and gas production using unconventional techniques (tight oil and shale gas) in the USA and by the energy transition towards a decarbonised society.

A first section analyses the impact of the murder of Khashoggi in the complex framework of international relations, especially between the USA and SA, by way of an introduction to a description of SA's role in geo-economy of oil. The second section concerns the energy strategy pursued by SA in response to or as a reaction to the oil market price movements in 2014 and 2016. The third part describes the effects on the oil market and on SA's economic strategies of the least expected and most important energy event in recent years: the appearance of tight oil (shale oil) obtained by fracking techniques in the USA. The fourth section analyses the potential influence that another major event, very different, yet expected and encouraged, could have on SA's energy policy and its economy: the energy transition. Section five considers Saudi Arabia's need to diversify and to break away from dependence on oil, to locate itself in the new panorama of the world geo-economy. The sixth section describes the internal factors that could slow down or speed up this structural change and this new positioning. The final section synthesises and describes the main conclusions to be drawn from this review of SA's geo-economic relations in the current world.

Geo-economy and geo-politics in international strategic relations

International relations cannot be analysed without taking into account the responses that they can cause and that, at the same time are liable to trigger off other actions and reactions in an ongoing process that sometimes ends up exceeding and reacting against the aims originally pursued. When this chain of actions and reactions is economic in nature, it is particularly complex. The consequences and the effectiveness of activities in the economic field occur through the markets that are social institutions which, by definition, operate with a high level of decentralisation and involve micro-decisions and balances that are quite difficult to control and forecast, obviously more than those taking place in institutions with centralised decision-making and operation mechanisms. Military and diplomatic decisions, including intelligence decisions, are general taken by governments or institutions that use centralised decision-making machinery. However, it is also true to say that the world is becoming exposed to new institutional risks under many centralised decisions

are now being taken by local and non-State powers with decentralisation levels more similar to those existing on the markets⁷.

Geo-economy means the use of the resources and the economic institutions of States as tools of power in international political relations⁸. An analysis of the geo-economy, in the academic world, has paved the way for distinct corpus of study within the field of geostrategic analyses as a whole. Geopolitics and geo-economy thus run parallel, they are two sides of the same coin, and included in the field of geostrategy, but with reference to clearly distinct practices.

The potential links between the reactions to the murder of the Saudi journalist and the price of oil, the financing of the Yemen War or the effectiveness of the US economic sanctions imposed on Iran, do not detract in any way from the moral and ethical judgement that this horrible deed deserves, although transforming these values into effective foreign policy decisions regarding the objective pursued is not immediate. Any diplomatic decision must consider the complexity of the interrelations that make up the economic and political framework of today's global and multilateral world.

From a geo-political viewpoint, the not very forceful US reaction to the Saudi Government has been analysed from different perspectives. One first defence refers to the fact that when one does not "pull out all the stops" or "the skin in the game" and it is judged from a distance, a strong reaction against SA could have backfired against those who supported this reaction, as they are necessarily required to live under the Saudi Government's sphere of influence⁹. Another school of thought has pointed out that, given AS's economic and political worth to the world, instead of preparing a package of hard measures against the current Government, it is preferable to increase the private and public pressure on that Government, and especially on MBS, making it crystal clear from the USA's viewpoint, what was necessary and what had to be avoided in relations with that country. What was needed in October 2018 was a concerted effort to put an end to the Yemen War and what should be avoided was that the US Government's "anti-Iranian" position be exploited to provoke a confrontation between the Arab and Non-Arab States forcing certain countries to align themselves with SA, when they would otherwise have shown reticence towards the Saudi Government's behaviour¹⁰.

⁷ FATTOUH, B. "Heightened Geopolitical Risks in the Middle East and Potential Impacts on Oil Markets". Oxford Institute for Energy Studies, 22/2/2018.

⁸ SCHOLVIN, Sorin & Mikael WIGELL: "Geo-economic Power Politics: An Introduction". In "Geo-Economics and Power Politics in the 21st Century: The Revival of Economic Statecraft". Edited by Mikael Wigell, Sören Scholvin & Mija Aaltola. Routledge, July 2018.

⁹ HELLYER, H.A. "Jamal Khashoggi Had Skin in the Game. The Crown Prince's Cheerleaders Didn't". Argument. Foreign Policy. 22/10/2018.

¹⁰ HAASS, Richard N. "The Inconvenient Truth About Saudi Arabia" Project Syndicate. The World's Opinion Page. 20/11/2018.

However, the most vociferous critics of the Trump Administration's ambiguity towards the murder of Khashoggi have consisted of pointing out the provocation of effects contrary to those sought. By preventing the completion of a credible and objective investigation process into the assassination of Khashoggi, Trump would be jeopardising the strategic alliance between the USA and SA and requiring Senators and Congressmen not to stop insisting on knowing a truth that had not been definitively clarified¹¹. By leaving unanswered, the CIA's opinion, which was already stated and known, a long path of potential political and parliamentary debates was opened up in a quest to clear up and establish exactly what happened and what the USA's position was in this respect. In fact, in December 2018, the Senate stated that it was against perpetuating US support for the Yemen War, and several Senators, even Republicans, gave their backing to the information from the CIA that identified the Saudi Crown Prince as being the main person responsible for the murder of Khashoggi¹².

Energy resources, especially oil and natural gas, are not beyond these points of view. They are used most in geo-economic relation. Authoritarian States explicitly and Liberal-Democratic States implicitly trust in the influence that their supplies of primary energy sources have on market prices and on the economies of other countries, as well as on the influence of their investments in extraction installations and on transport facilities in their territories and in other countries. What is sought is to strengthen the cooperation between allies on certain occasions and to defend and impose their geopolitical interests on other occasions. Energy resources and their infrastructures are used "both as a shield and a sword" to fulfil the ambitions and the foreign policy objectives of the governments in power¹³. The gas pipelines, the cargo terminals, the quota cutbacks, the long-term contracts, etc., are at the same time, both economic assets subject to the market laws and political tools at the direct and indirect service of the governments by mean of their influence over exercising the rights that exist to using them.

Saudi Arabia within the OPEC and the OPEC+

SA possesses 18% of the proven reserves of oil in the world (about 266,269 Mbds) and is the biggest exporter or supplier on the world market. In 2017, the country produced around 9,96 Mbds and exported 70%. Moreover, the reserves / production ratio, which is from 8 to 10 years for the oil companies in general, is about 30 years for SA. Its idle capacity is the highest not only in the OPEC but also for all the oil-producing countries as a whole. As it has the lowest marginal

¹¹ KUMAR, Prem G. "Trump Thinks He's Helping the U.S.-Saudi Relationship. He's Hurting It" Argument. Foreign Policy. 21/11/2018.

¹² FINANCIAL TIMES: "Senate Vote to Withdraw Support for Saudi-led Coalition in Yemen". A. WILLIAMS. Washington, Dec. 2018.

¹³ POLICY DEPARTMENT FOR EXTERNAL RELATIONS, Directorate General for External Policies of the Union: "Energy as a Tool of Foreign Policy of Authoritarian States, in Particular Russia". PE 603-868. April 2018.

production cost of all the producers, it can mobilise these reserves ahead of the rest, which means that ever since 1973, SA has played a market swinging role within the OPEC as a whole, varying production rates in order to stabilise the prices. SA's interest in these price movements on the international markets is to obtain a stability that makes it possible to predict a public budget that is 90% dependent upon oil exports. Yet oil production and supply to the consuming markets is insecure and subject to frequent and unforeseeable interruptions. Both supply and demand are particularly unpredictable. As a result, oil exports do not provide stable profits for the producing countries.

The OPEC was established in 1960, at the Baghdad Conference, with a mission to "coordinate and unify the oil policies of its member countries in order to guarantee stable and fair prices for the oil producers; an efficient, economic and uninterrupted supply to the consuming countries and a fair profit for those who invest in the industry"¹⁴. From the outset, it has been debated whether the OPEC, apart from fulfilling these explicit purposes, has or has not behaved like a cartel to control oil prices on the world market and to optimise the incomes of the producing countries to the detriment of the consuming ones. The fact is that despite the many economic works that have been written on the subject, no clear conclusion has emerged about the OPEC's oligopolistic behaviour¹⁵.



Figure 1. Evolution of Brent prices (\$US adjusted due to inflation). Source: Macrotrends. <https://www.macrotrends.net/1369/crude-oil-price-history-chart>

¹⁴ OPEC: "Brief History" available at https://www.opec.org/opec_web/en/about_us/24.htm.

¹⁵ AL-QATHANI, A., E. BALISTRERI & C. DAHL: "Literature Review on Oil Market Modeling and OPEC's Behavior". Division of Economics and Business, Colorado School of Mines. March 29, 2008.

The strategic analysis of AS as an oil producer and exporter has generally used the Hotelling Model¹⁶ for reference purposes ever since the first oil crisis in 1973. According to this model, the decision to extract natural resources, under certain restrictive hypotheses, would depend upon how the price of this resource is expected to evolve. If the expectations were for prices to grow above the interest rates, it would be logical not to extract and to wait for the future. The oil prices, net of cost of extraction, would thus equal the interest rates. The reason is simple: by keeping the resources in their fields, the natural resource concerned would appreciate in value above the interest rates, whereas the monetary resources obtained from its extraction and sale would grow at the (slower) rate of the interest rates. This model has its critics because it is considered to be hardly realistic and its deficiencies in accounting for the actual behaviour of the producers, and especially SA within the OPEC, given that it has very limited suppositions, it ignores the possibility of new oil or gas fields being discovered, that the extraction costs vary in time or that when the markets are oligopolistic the restriction on quantities has a positive impact on the prices and their expectations.

In the 1990s, and resorting to Game Theory, Griffin and Nielson pinpointed three strategies for SA within the OPEC¹⁷:

The Cournot Model, of producing depending on the price floor that would be reached in the worst situation; this is when the rest of the strategies fail and all the producers try to gain a market share. Applied to oil production, the Cournot equilibrium is reached when the quota of each producer, whether or not it is an OPEC member, is the best response to the production quota in equilibrium of the rest of the producers for a specific demand that establishes the total production and, thus, also establishes the price. The problem with this strategy is that the balance it produces is extremely unstable, given that all the producers are encouraged to destabilise the equilibrium as soon as they can produce more, in the belief that this greater production will detract from the production of the others without the prices varying, but this never happens. Therefore, it is a theoretical balance whose only practical application is to determine the aforementioned equilibrium floor.

The strategy of there being a predominant swing producer that would cover the gap between supply and demand in the face of certain temporary shocks, in order to seek price stability. That was the case in the 70s when SA made up for the USA's lower production; at the beginning of the 80s, when it replaced the drop in the wake of the Iranian Revolution; or in 1990-91 when it made up for the lower production brought about

¹⁶ HOTELLING, H.: "The Economics of Exhaustible Resources" *The Journal of Political Economy*, 39 (2), 137-175. 1931.

¹⁷ GRIFFIN, J. M. & NIELSON, W. S.: "The 1985-1986 Oil Price Collapse and Afterwards: What Does Game Theory Add?", *Economic Inquiry*, 32 (4), 543-61. 1994.

by the Iraq-Kuwait War. This strategy leads to periods of price instability despite the fact that there are supply shocks and even if some producers, OPEC members, do not comply with the agreements and exceed their production quotas. Since the fall of the Shah of Persia in Iran in 1979, and especially in the period 2010-2014, this has been the strategy followed most frequently by SA, according to certain analysts, and it has followed in connivance with the USA¹⁸. According to other analysts, there is not enough statistical evidence to define this behaviour as stable and statistically significant¹⁹.

The tit for tat strategy²⁰, according to which SA would decide what its production levels are seeking to punish OPEC members that produce more than their quota while rewarding those that comply with theirs. SA would have pursued this strategy as from 1985, causing volatility and price alterations and, above all, as from 2014, in response to the USA's production of unconventional oil. However, there are analysts who view SA's actions on the oil market in response to the drop of 2014, merely as a strategy to leave the responsibility for adjustment entirely in the hands of the market. The drop in demand was so sharp and the abundance of supply so great that even if SA had cut back production, it would only have had a very limited impact on the prices²¹.

The truth of the matter is that SA has utilised a variety of strategies in its oil policy in different periods of time, from the first drastic production cutbacks in 1973. These strategies can be summarised into trade-off selection decisions or contradiction between stabilising prices by varying production quantities or conserving quantities and letting the price move as far as the floor or ceiling limits, when it once again becomes necessary for there to be a reaction from the producing countries in terms of quantities. The factors that condition the strategy chosen by SA at each particular time are varied and complex, depending on how they perceive the sustainability of the agreements within the OPEC, the world oil market conditions that account for the price changes and even internal factors such as the financial sustainability of the public budget or the potential impact on the available profit. Hence in 2008, when there was a demand shock considered temporary and associated with the economic crisis, SA reacted by cutting back production and lowering it by 1 Mbds for four months running. The Arab Spring in 2011-12 and the sanctions imposed on Iran caused a shock sup-

¹⁸ WESTPHAL, Kirsten, Marco OVERHAUS & Guido STEINBERG: "The US Shale Revolution and the Arab Gulf States: The Economic and Political Impact of Changing Energy Markets". SWP Research Paper. German Institute for International and Security Affairs. Nov 2014.

¹⁹ SMITH, J. L.: "Inscrutable OPEC?: Behavioral Tests of the Cartel Hypotheses". *The Energy Journal*, 26 (1). 2005.

²⁰ Term coined by AXELROD, Robert: "The Evolution of Cooperation". New York. Basic Books. 1984.

²¹ FATTOUH, B. "The Phases of Saudi Oil Policy: What Next". Presentation at the Department of Business, Energy & Industrial Strategy. Oxford Institute for Energy Studies. 2017.

ply with production decreases to which SA responded, considering it also to be temporary, by increasing production by 1.5 Mbds until the end of 2014²².

By contrast, with the fall in oil prices that commenced in June 2014, after almost three years remaining above \$US 100/bbl which took the price to \$US 48/bbl by the end of that year, the reaction was different. This slump was considered to be the beginning of a new era for the balances in international geo-economic relations: the era when unconventional hydrocarbons made major inroads giving the USA new and greater economic influence, to face the coalition of oil-producing countries that were members of the OPEC. SA and the producing countries confronted each other that year with their eternal dilemma, but in a new scenario and with new consequences: if they continued to pursue a policy of high production and low prices, they would prevent the unconventional oil from entering the international markets, even if this meant receiving less income from their exports. The cost of extracting traditional oil was considerably less for SA than the cost of extracting unconventional oil in the USA. The direct cost of extraction ranged from 3 to 5 \$US/bbl²³, although it is true to say that to value the "reserve" price for SA (the opportunity cost) it is necessary to take into account the public budget items, at least the most essential ones, which are financed by the income from oil. If, however, they decided to cut back production, the high prices would encourage the production of tight oil in the USA, and the traditional producers would lose a share of the market. The limit price as from which it is thought that oil production in the USA can be considerably increased, lies above \$US 70/bbl²⁴. Throughout 2015, the price of Brent carried on falling until it dropped below \$US 30/bbl. This state of affairs weakened the power of SA and the OPEC in general²⁵, to such an extent that they even considered that the Algiers Conference in September 2016 would herald the end of one of the most powerful economic organisations on the planet. What happened was quite the opposite, and at the next meeting, in December of that same year, the OPEC and other oil-producing countries (including Russia, Mexico, Kazakhstan and Sudan) signed a Declaration of Cooperation (DOC) in order to "guarantee a stable oil market, to the benefit of producers and consumers and to regularly review at technical and ministerial levels, the status of this cooperation". This agreement basically consisted of a cutback in quotas to be shared by all the producers, whether or not they were OPEC members, for which Russia and SA were to be responsible as main producers. The DOC remained in force throughout 2017 and 2018, and at the end of that year a decision was taken to keep it in force at least until the end of the first half of 2019.

²² FATTOUH, B.. Ibid.

²³ WESTPHAL, K., M. OVERHAUS & G. STEINBERG. "The US Shale Revolution and the Arab Gulf States: The Economics and Political Impact of Changing Energy Markets". Stiftung Wissenschaft und Politik German Institute for International and Security Affairs. SWP Research Paper. Nov. 2014.

²⁴ LEX Opinion. "Opec: Shale not Hardy". Financial Times. 1/12/2017.

²⁵ NOËL, Pierre: "Saudi Arabia Confronts "New Oil Regime"". The Survival Editor's Blog. International Institute for Strategies Studies. April 17, 2018.

In the period before 2014, SA within the OPEC pursued a bipolar strategy, periodically choosing either between maximising its income through sufficiently high prices and production cutbacks or defending its market share by enlarging it. This strategy made sense when short-term considerations were of the essence, such as when the prevailing thought was that the imbalances between supply and demand were temporary. However, in recent years, SA has attached greater importance to considerations in the longer term. Among the long term targets are the need to finance its investments in the oil sector in order to keep up an easy-to-move idle capacity, the convenience to diversify its economic base laying the foundations for an economy less dependent on oil and the promotion of policies guided by supply security and by its effects on a world supply and demand conditioned by the impact of policies aimed at combating climate change in the world²⁶.

To secure and implement this long-term vision within the OPEC+, the producing countries need to make credible their will to cooperate and secure the DOC in future years, so that they will be able to obtain price and quota stability that will allow them to adapt their economies' transformation rates to a certain sustainment of their income while the world as a whole progresses in energy transformation²⁷. The conclusions from the OPEC's Conference in Vienna, held in December 2018 appear to have hinted at this goal, because at the Conference they eventually, and not without difficulty, managed to agree to a cutback of 1.2 Mbd for the first six months of 2019.

All in all, as from 2014 SA has pursued a new strategy as oil producer and has done so in response to two occurrences: the development of tight oil in the USA and the consolidation of the energy-transition policies in the Western countries. In the area of geopolitics, the oil production boom in the USA and the fact that the demand for hydrocarbons is expected to be curtailed is conducive to Saudi Arabia's alliance with Russia and pushing it closer to Iran, all within the context of OPEC+²⁸.

Energy policy as a geo-economic tool: the tight oil revolution

In recent years, the USA has revolutionised the energy world by the industrial implementation of extracting gas and oil utilising unconventional techniques, which has made the country the world's main producer of these energy resources since 2015²⁹. Although until 2016, US production of shale gas and tight

²⁶ FATTOUH, B. and A. SEN: "Saudi Arabia Oil Policy: More than Meets the Eye?". Oxford Institute for Energy Studies. Paper MEP 13 June 2015.

²⁷ FATTOUH, B.: "Saudi Arabia: Shifting the Goal Posts". Oxford Institute for Energy Studies. Comment. February 2018.

²⁸ BORDOFF, Jason: "This Isn't Your Father's OPEC Anymore. Foreign Policy. June. 28. 2018.

²⁹ ENERGY INFORMATION ADMINISTRATION. "United States Remains the World's Top Producer of Petroleum and Natural Gas Hydrocarbons". Today in Energy, 21 May, 2018. <https://www.eia.gov/todayinenergy/detail.php?id=36292>.

oil did not have a specific orientation where foreign policy was concerned, once the Trump Administration arrived, it has been used as a tool to help maintain US supremacy in the world, and even to promote isolationism and energy self-sufficiency in the country. What has changed is not the organisation, the financing or the content of the unconventional production of hydrocarbons, but the USA's foreign policy, which has become a defender of unilateralism and has found in this technique, one more justification for the possibilism and the advantages of this policy. While the Obama Administration tried to sustain an international order of a liberal and multilateral nature, Donald Trump's economic nationalism questions the value of international cooperation in the economic and political area, where the USA's specific interests are concerned: "America First". The unilateralism needs to place value on unconventional production techniques and imbue its foreign policy with this value. Tight oil gains value because by exporting its production techniques it will be possible to achieve oil price stability, which according to the Trump Administration, is of great help to US industry; secondly, because a self-sufficient USA will be able to withstand a foreign policy less conditioned than in the past; and, thirdly, because the strategic reserves and the ability to export unconventional hydrocarbons, could be utilised to help friendly nations in the event of an international energy crisis situation³⁰.

The appearance of tight oil has thus made the USA self-sufficient in the use of primary energy resources, although from the perspective of its geo-economic importance, its influence on international price levels is not direct, given that it is taking place via its effect on the production variation strategies of the producing countries that have the capacity to adjust the quantities of production whose destination is the world markets, and, specifically, Saudi Arabia.

As has already been pointed out, the USA's unconventional production has conditioned the response of producing countries to the 2014 and 2015 price falls, regardless of whether they are OPEC members, as well as the position of Russia towards the EU, which has also been affected by the emergence of shale gas. In this set of responses, SA has maintained its leadership role because it is still the country with the largest amount of idle reserves³¹. The price movements on the international oil markets are influenced by the ability to rapidly mobilise the idle capacity rather than by the production level. In this sense, SA has a great advantage over the USA, because not only is it the country with the largest amount of idle reserves, but it is also the one that can mobilise those resources more

³⁰ ROSSBACH, Niklas: "Energy and the Future of US Primacy: The Geostrategic Consequences of the Shale Revolution". En "Geo-Economics and Power Politics in the 21st Century: The Revival of Economic Statecraft". Edited by Mikael Wigell, Sören Scholvin and Mija Aaltola. Routledge, July 2018.

³¹ JOHNSON, Keith: "Why American Oil Hasn't Been a Total Game Changer." Foreign Policy, 14th November 2018.

quickly and cheaply than any other. It is estimated that the OPEC's idle capacity has reduced oil price volatility by half in recent years³².

There are two factors that limit the way in which unconventional oil produced in the USA can influence international market prices. The first factor concerns the institutional characteristics of the production, especially the way in which US energy companies are owned. Unlike countries such as Norway, Russia and Saudi Arabia, the US energy resource extraction companies are private and not under State control. A sector composed of a host of private companies adopts decisions in a very different way to firms that are concentrated and public, and the way they use the geoeconomic tool is also very different. The second factor is that the unconventional technology itself is more rigid and less flexible than conventional technology, which has an idle capacity that can be mobilised at low cost. To be specific, this difficulty in increasing and decreasing production in short periods of time means that the USA would find it very difficult to become a global swing producer that could threaten the OPEC's power, and thus Saudi Arabia's power, on the international markets³³.

As a result, the point of view that the shale gas and tight oil revolution in the USA destabilises and damages the base income of the producing countries and, especially, the so-called Gulf Cooperation Countries (GCC) must be duly qualified. Rather than having a direct impact on prices, the appearance of unconventional oil in the USA has led to an increase in competitive pressure between producing countries, as a consequence of a decrease in the imports of oil into the USA, which has considerably reduced the total size of the market.

In the words of Bassam Fattouh, analyst at the Oxford Institute for Energy Studies: "The idea that keeping today oil reserves in the ground leads to higher prices in the future needs to be subjected to critical reappraisal"³⁴.

This limitation that prevents tight oil from directly and substantially affecting international oil prices led Bordoff to state in his testimony in July 2018 before the US Senate, that if the Government wished to use the energy policy as geo-economic tool, the best option at the moment would be to reduce domestic demand for the use of oil, and not to seek, as the Trump Administration is doing, a continued policy of low oil prices from the OPEC+. The greatest strength for the US in international politics, is not the capacity to export its unconventional energy resources or techniques, but to reduce its domestic dependence on fossil fuels and facilitate and boost the transition to an econ-

³² PIERRU, Axel et al., "OPEC's Impact on Oil Price Volatility: The Role of Spare Capacity." *Energy Journal*, Vol. 39, No. 2, March 2018, p.173-196, <https://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=48de64de-0a79-4e6c-8ea5-48a81047ac06%40sessionmgr4008>.

³³ BORDOFF, Jason E. "Congressional Testimony Before the Committee on Energy and Natural Resources". United States Senate 115th Session, 115th Congress. July 24, 2018.

³⁴ FATTOUH, Bassam: "Arab Oil Exporters' Diversification Strategies in the Context of the Energy Transition". Oxford Institute for Energy Studies. Eleventh Arab Energy Conference, Morocco, October 2018.

omy not dependent on them, and to do so at a rate and under conditions that are compatible with enabling the oil-exporting countries “to jump on the transition bandwagon”. This, argues Bordoff, would appear to be the best current geo-economic strategy³⁵.

The threat to Saudi Arabia’s public accounts does not come so much from tight oil but from a reduction in the expectations for the use of oil and a drop in oil’s international prices. A decreasing international demand with expectations of a possible peak for the coming decade causes a rapid devaluation of the oil reserves and SA is the country with the largest known reserves remaining idle and waiting to be used. The value of the shortage premium applicable to the valuing of these idle resources, which has hitherto played a fundamental role in attempts to stabilise the price level from the supply side, is being devalued. Yet it is also true to say, given that it is essential for oil exports to carry on being profitable in order to be able to make the investments needed to diversify the economy, a high rate of monetisation of the reserves would be suicide for SA. That is why, rather than the changes in the USA’s energy panorama, it is the domestic factors that affect the slowing down of the success in diversifying their economies and expanding their economic base, coupled with the inefficiency of their domestic energy policies, that constitute the main threat to sustaining the importance and influence of the GCCs in the world economy³⁶.

As is mentioned later, the geopolitical consequences of a geo-economy based on encouraging the consumption of renewable energy resources as an alternative to fossil fuels, would be to enhance SA’s diversification policies, and they would be consistent with the pacification of the zone and with reducing such threats as terrorism, the Yemen War and the Iranian nuclear programme.

The threat or the opportunity of energy transition for the oil-producing countries

Energy transition is to be understood as meaning a change in an energy system’s fuels or its most commonly-used technologies, as well as changes in the social practices of consumption and transforming the energy that predominates in that system³⁷. To be more specific, and according to the Global Energy Assessment, a sustainable future requires the transformation of the current energy systems into others with: (i) substantial improvements in energy efficiency, especially by the end use, and (ii) greater reliance on renewable sources and advanced energy systems with the capture and storage of carbon emissions for fossil fuels and

³⁵ BORDOFF, Jason E. *Ibid.* 2018.

³⁶ FATTOUH, Bassam and Ramatallah POUJINEH: “The Rise of Renewables and Energy Transition: what Adaptation Strategy for Oil Companies and Oil-exporting Countries? Oxford Institute of Energy Studies Paper: MEP 19. May 2018.

³⁷ SOVACOOL, Benjamin K. “How Long Will it Take? Conceptualizing the Temporal Dynamics of Energy Transitions”. *Energy Research and Social Science* 13 (2016) 2010-215. Elsevier.

biomass³⁸. The International Energy Agency (IEA) considers that energy transformation refers to the transition to a heavily decarbonised sector, like the one defined in its Sustainable Development Scenario, recently incorporated into the scenarios considered in the annual World Energy Outlook. This new scenario consists of simultaneously achieving three goals: stabilising climate change in line with the targets set at the 2015 Paris Conference, cleaner air and universal access to modern energy.

The Paris Conference, held on the initiative of the UN Framework Convention on Climate Change and known as the Conference of the Parties or COP21, determined a point of no return that has been mostly maintained in the successive G20 conferences³⁹ held since then. The objective is the international coordination of public policies aimed at decarbonising the world economy by 2050 and reducing global warming to well below 2°C. The 195 countries that signed agreed to adopt policies with a view to keeping the average world temperature increase to well below 2°C when compared to preindustrial levels, trying to ensure that the rise would be about 1.5°C. This Agreement came into force in November 2016. Although President Trump announced on 1st June 2017 that the USA would be withdrawing from the Agreement, the summits of G20⁴⁰ held in Beijing (China) in 2016, Hamburg (Germany) in 2017 and Buenos Aires (Argentina) in 2018, have borne witness to the commitment of the rest of the countries meeting as the G20 to fully implement the Paris Agreement that "reflects the due responsibilities and capacities, in accordance with the particular circumstances of each country".

Three years after the Paris Conference, in 2018, CO₂ emissions reached an all-time record, with an annual growth of around 2% for the world as a whole. To comply with the decarbonisation goals set at the Conference, total CO₂ emissions in the world must start to decrease as from 2020. The greatest effort to reduce emissions has to come between 2030 and 2040, so that by 2050 the world will be virtually decarbonised. The truth of the matter is that after containing emission growth between 2014 and 2016, economic growth once more came to be associated with the use of coal and hydrocarbons in 2017, causing emissions to rise again by 1.6%. In spite of these growths in 2017 and 2018, most of the scientific community is optimistic and thinks that by controlling emissions, restricting the use of coal and hydrocarbons as fuels, together with the technical breakthroughs aimed at reducing the cost of energy storage, thereby allowing for a greater use of electric vehicles, will enable the Agreement Signatories to

³⁸ GLOBAL ENERGY ASSESSMENT: "Towards a Sustainable Future." International Institute for Applied Systems Analysis. 2012. Cambridge University Press.

³⁹ The members of what is known as G20 include the European Union and 19 countries: Argentina, Australia, Brazil, Canada, China, Germany, France, India, Indonesia, Italy, Japan, Mexico, the Russian Federation, Saudi Arabia, South Africa, the Republic of Korea, Turkey, the United Kingdom and the United States.

⁴⁰ G20: "Constructing a Consensus for Equitable and Sustainable Development". Statement from G20 leaders. Argentina. December 2018.

be even more demanding and take on targets that involve temperature rises of less than 2°C, down to 1.5° C⁴¹.

There are many analytical simulation models that attempt to examine the different paths and scenarios for approaching energy transition, and to use these to consider their effects on the energy mix and on the oil geo-economy. There are usually two types of such models: backtesting, which first defines the world that it is intended to reach by a certain deadline and then links it with the current situation, describing one or more possible paths, and forecasting models, which use the background information available from the past, to try and project and illustrate what could happen in the future if certain policies are adopted. There are significant differences between the two models, especially because of the percentage of fossil fuels in the primary energies mix during this transition period.

Some of the most extensively used backtesting models include the already mentioned Sustainable Development Scenario utilised by the International Energy Agency and incorporated into its World Energy Outlook in 2018. This scenario devises a comprehensive approach for complying with the international objectives of climate change, air quality and universal access to modern energy. An oil demand peak for the next few years is anticipated, together with a fall of about 70 Mbds by 2014. The weight of hydrocarbons (oil and by-products, natural gas and coal) on the global supply of energy sources will only decrease marginally in the next few years, going from the current 81% to 74% in 2040. Some analysts consider that, rather than a peak, a plateau will appear with very-low and virtually negligible growth, for several years, until a gently descending ramp emerges. The scale of current demand, together with the use of oil for the industrial production of a variety of non-combustible materials, would support this trend⁴². Whatever the case may be, the uncertain quantification of decarbonisation in Asia (basically China, India and Indonesia) and the time profile for achieving it, is vital for constructing scenarios.

The forecasting-type models anticipate a major development in generation using renewable sources in the next few years, in line with the implementation of policies that give incentives based on the current situation. Yet none of them expect a “surpass” that leads to these energies, within the primary energy sources as a whole, overtaking those coming from hydrocarbons during this transition period⁴³. Therefore, the Paris goals are difficult to achieve with these forecasting models.

⁴¹ FIGUERES, Ch. “Emissions Are Still Rising: Ramp up the Cuts”. Comment. Nature. Vol 564. Dec 6, 2018.

⁴² STANLEY, A.J. & S. LADISLAW: “The Future of Oil Demand: Peak, Plateau or Plummet”. Center for Strategies and International Studies. Washington. July, 16. 2018. <https://www.csis.org/analysis/future-oil-demand-peak-plateau-or-plummet>.

⁴³ O’ SULLIVAN, Megan et alt: “The Geopolitics of Renewable Energy” Working Paper. Columbia/SIPA. Center on Global Energy Policy; Harvard Kennedy School. Belfer Center; Norwegian Institute of International Affairs. June 2017.

All these models are illustrative, but hardly predictive. Unlike what happened in the main changes in the past, the set of changes included in the energy transition are being encouraged and coordinated basically by public intervention policies. None of the possible scenarios is predetermined and the joint action taken by governments, companies and citizens to tackle these changes will be crucial and will have to be particularly intense. Furthermore, it will have to be global and must occur simultaneously in all the geographical areas in the world.

Globalisation and the interrelation between the different geo-economic areas of the energy world have been enhanced in recent decades, mainly as a result of the increase in energy demand from Asia. The production increases in the producing countries, as a consequence of the decrease in US imports, prompted by greater unconventional production, has mainly gone to Asia, and it is expected to continue to do so in the immediate future. The flow of energy sources to Asia is conducive to a much more energy-interdependent world, despite the USA's greater energy auto-sufficiency. However, it is the energy transition and the development of renewable energies that, together with the electrification of the economy, can bring about the biggest changes on the current geo-economic map.

As has been analysed in the recent study prepared with the collaboration of several Norwegian and US Universities⁴⁴, one of these changes will be the one involving the materials required to replace, in the set of primary energies, the generation techniques that resort to fossil fuels and use renewable resources instead. In the coming years, the utilisation (and thus the exports) of oil as a primary energy source, will depend on the rate at which energy transition takes place; i.e., the speed at which fossil fuels are replaced by renewable energies. The current industrial production that emits pollutant gases will be replaced by other cleaner production methods and, in general, the uses and customs of a society with high pollutant emission levels, will have to give way to other uses and customs that are sustainable from an environmental perspective. Technological breakthroughs and the alignment of costs of photovoltaic and wind generation have enabled these technologies to mature in the last two decades. Even in the scenarios where the current policies prepared by the IEA have been maintained, renewables and coal will exchange their weights in the energy mix in the next few years. Generation from renewable sources will rise from the current 25% to 40% by 2040 and coal will do the exact opposite⁴⁵. In these scenarios, the need for raw materials such as lithium, cobalt and indium may give rise to new cartel-type organisations of producers, having a similar influence over investment in these materials as the OPEC has had over oil prices in recent decades.

Secondly, the current oil geo-economy will be affected by the breakthroughs in what has come to be known as the electrification of the economy; this is the use of electricity for mobility and land transport and to generate heat and cold.

⁴⁴ O' SULLIVAN, Megan et al.: *Ibid.*

⁴⁵ INTERNATIONAL ENERGY AGENCY: "World Energy Outlook. 2018". OECD/IEA, 2018.

Approximately 80% of the final energy consumed in the world in 2015 came from transporting and from generating heat that, in turn, used 65% and 70% of primary energy sources of fossil origins to do this. Traditional industry's ability to adapt to these changes or new firms making inroads with suitable technologies, will bring about geographical relocations in the industries concerned and in the associated profits. There will be certain segments of the population and certain countries that gain from these movements and others that lose out. The movements of profit and wealth and the variations in the inequality of its distribution will create obstructions and resistance to the transition. One clear example has been experienced by France in the Autumn-Winter of 2018. The so-called Revolution of the Yellow Vests began as a protest against the tax increase on diesel in order to make progress in energy transition and it has been happening in a country, like France, which from a position of economic and social development wishes to pave the way to being a clear leader in the transition to a low-emission economy. As these reactions indicate, going from words to deeds means major geo-economic changes and the task is not going to be easy⁴⁶.

Thirdly, the unprecedented move towards energy efficiency, not only in industry but also in services and in domestic life, even if it has local roots, must be approached globally, jointly and multilaterally. According to the International Energy Agency (IEA), energy efficiency is the main fuel that can make the energy transition accessible, swift and beneficial to economies as a whole, and describes it as the "cornerstone for a transition to a future for energy that is cleaner, more secure and more sustainable". Energy efficiency will provide 35% of the accumulated savings with respect to CO₂ emissions in 2050⁴⁷ according to the simulation models used by the IEA. If the governments and public sectors in the committed countries tackle the implementation of policies oriented to these goals, it would seem essential for multilateralism and global government institutions to be strengthened, and for political and economic incentive and penalty systems to be found that prevent asymmetrical impact and costs affecting the committed countries. Developing energy efficiency and locating the sources of new materials and the geographical effects on the distribution of profit and wealth, apart from altering the current geo-economic relations, will also generate and consolidate new inequalities and constitute yet another major obstruction to the transition process if they are not approached jointly.

Fourthly, the electricity grids, the international interconnections and the traditional utilities can either adapt to the way distributed generation evolves, placing value on new scale economies with prices that are adjusted to a world of negligible marginal costs, or submerge themselves in the world of "stranded costs" vacating their position and leaving it to new institutions or firms that are

⁴⁶ LADISLAW, S. "Who Cares about France's Energy Transition?". Commentary. Center for Strategic and International Studies. Washington, Nov. 28, 2018.

⁴⁷ INTERNATIONAL ENERGY AGENCY: "Perspectives for the Energy Transition: The Role of Energy efficiency". OECD/IEA, 2018.

very different in size and location. The economic depreciation rate of the assets that are gradually becoming obsolete and the adaptation rate of those whose current value is being renewed or regenerated, may also vary in the different geo-economic areas.

Considering all these movements and their potential drawbacks, the predictable fall in or holding back in the demand for fossil fuels that the energy transition will bring with it is rather uncertain. The world demand for coal, oil and gas will undoubtedly be affected as energy transition takes hold. However, the extent of these effects will depend on whether the transition is more or less quick or more or less slow. And the energy transition rate is one of the main unknown factors or uncertainties that are facing the world in general and the oil-producing countries in particular.

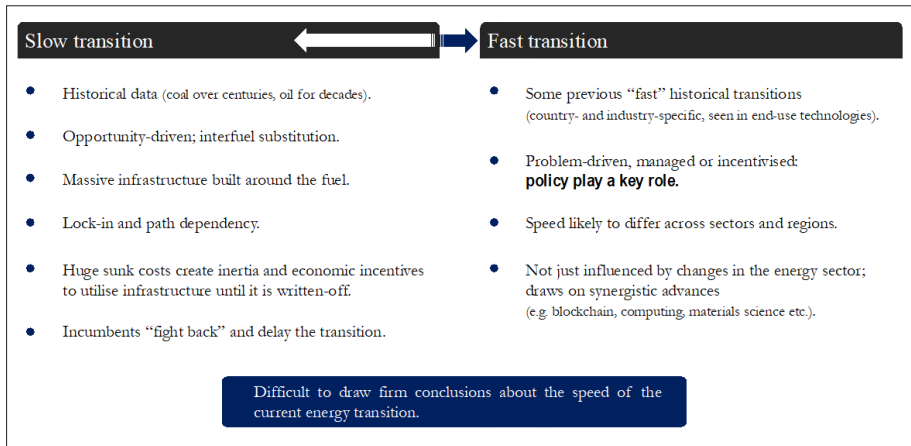


Figure 2. Source: Fattouh, B.: "Arab Oil Exporters' Diversification Strategies in the Context of the Energy Transition". Oxford Institute for Energy Studies. Eleventh Arab Energy Conference, Morocco, Oct 2018

The transition will be relatively quick if international cooperation, political and institutional encouragement, technological progress and the security and profitability of the specific investment projects come up against few obstructions. The transition will be slow if the recoupment of investments made in the past, technological and economic inertia against the replacement of old fuels for new fuels, the social and economic cost of redistributive effects and the bias towards the status quo inherent to the current institutions have greater influence and hold back the change rate. At the present time, it seems difficult to reach conclusions about which factors will be predominant and how swift the transition rate will be⁴⁸ in the different geo-economic areas, and especially how swift that rate will be in the oil-producing countries.

⁴⁸ FATTOUH, Bassam. *Ibid.* Oct 2018.

Whatever the case may be, the uncertainties surrounding the transition rate strengthen the possibilities of an adaptation time that is sufficient to encourage cooperation between the oil-producing countries and, within them, among the political institutions and their social groups. Apart from cooperation between the producing countries, domestic cooperation and cooperation between countries in geographical proximity seems to be essential if they are to be able to diversify their economies and to progress at a similar rate as the energy transition rate and to overcome the existing inequality problems. All in all, the uncertainty surrounding the energy transition rate makes it possible to progress in cooperation options that will help the countries in the Middle East and North Africa (MENA) not to lag behind. To be specific, and in view of Saudi Arabia's role as market manager⁴⁹ in this geo-economic zone, such cooperation seems essential:

To prevent the suicide policy of competing for the market share and seeking a rapid monetisation of the oil reserves, expecting a restraint in the demand for oil in the medium term, which it appears is going to be achieved after the DOC of the OPEC+; and

To get the networks to adapt and to improve the interconnections required for a better use of the renewables and a higher level of electrification.

Economic diversification and Vision 2030

Saudi Arabia is a country that has traditionally followed "rentier State" practices with a domestic economic structure conditioned by its influence on the world oil market. The lack of transparency, its highly bureaucratic nature and a contemptible corruption are the other side of a prosperous economy and a public sector that can finance itself hardly needs to resort to taxation. The resources obtained from oil exports have proved more than sufficient to finance the growing economy. SA's Gross Domestic Product is currently 20 times greater than in 1970. Anybody born in SA today has a life expectancy 22 years greater than a Saudi Arabian citizen born in 1970 and access to infrastructures (schools, roads, hospitals and communications network) that did not exist 45 years ago⁵⁰. Saudi Arabia's economic dependence on the profit obtained from oil and gas exports makes its entire economy exposed to the short- and long-term vicissitudes of the oil market and its prices.

In 2015, after prices fell in 2014 and the new strategies had been implemented by SA within the OPEC+, a group of experts sponsored by Crown Prince MBS issued the Report entitled "Vision 2030" with a view to proposing a plan of action for becoming a society with an economic structure diversified and adapted to energy transition. The target of this ambitious plan was to triple the profits

⁴⁹ FATTOUH, Bassam: "Saudi Arabia: "Shifting the Goal Posts". Oxford Energy Comment. February 2018.

⁵⁰ INTERNATIONAL ENERGY AGENCY: "Outlook for Producer Economies: 2018". World Energy Outlook Special Report. 2018.

coming from sources other than oil by 2030 and to generate more than 450,000 jobs in the private sector before 2020. This Plan revolved around considerable growth in the use of clean energies. According to Vision 2030, the Kingdom expected to commission a 3.2 GW nuclear plant by 2027 and two small 120 MW reactors, both by 2023. In that same year, it expected to already have 9.5 GW solar and wind generation installed. In order to achieve this, it announced that it would invest between \$US 20 and 50 million in renewables until 2023. Furthermore, it announced that it was going to reform the Administration, set up new ministries (Energy, Industry & Mineral Resources and Environment, Water & Agriculture), plus the privatisation of ARAMCO, to obtain resources.

In the Heading to its Introduction, the document Vision 2030 prayed with great optimism: "The Kingdom of Saudi Arabia has been blessed with many valuable assets. Our geographical, cultural, social demographic and economic advantages have enabled us to hold a position of world leadership"⁵¹. However, in spite of these initial blessings, the programme's future is by no means simple. When Vision 2030 was publically presented in summer 2016, oil prices were stabilised at around \$US 50/bbl after having seen prices lower than \$US 30/bbl in February of that year. The country's economy was not going through its best moments, not only because that low oil prices had damaged the public accounts but also because demographic pressure was boosting domestic energy consumption, inflation and unemployment. Under these not very favourable circumstances, but with a political capital not very tarnished given the recent ascent to the throne of King Salam, his son Crown Prince MBS, backed the preparation and publication of the Report.

The document indicated three basic pillars on which to find the transformation of the Saudi economy and to diversify it (its religious leadership as the Custodian of the Two Holy Mosques, its investment capacity and its strategic location between Asia, Africa and Europe). At the beginning the expectations for its implementation were backed up by the political and financial support from the new Saudi leaders. Prince MBS, son of the 80-year old King Rey Salam who had come to power in 2015, was the person who represented the image of a society that wanted to modernise itself, diversify and obtain a domestic economy that would break away from its exclusive dependence on oil. At the outset, it faced opposition from the most conservative and traditional sectors of society but was supported by the young. As Adel Abdel Ghazar, analyst from the Brookings Institution stated, before the murder of the journalist Khashoggi, "Only time will tell if Prince MBS has the patience or skill for a slow and sustained transformation of the Kingdom"⁵². From then until the assassination of the journalist from the Washington Post, most of the equity capital that Vision 2030 had in the beginning, had been spent without the expected results and progress being achieved.

⁵¹ KINGDOM OF SAUDI ARABIA: "Vision 2030". April 2016. Available at <http://vision2030.gov.sa/en>.

⁵² GHAFAR, A.A. "A New Kingdom of Saud?" Cairo Review 28. 2018.

It was originally planned that the financing for the diversification would come mainly from the Saudi Arabian Public Investment Fund (PIF) established in 1971 and this would be supplemented by the sale of 5% of the shares in SA ARAMCO, which currently has over \$US 250 billion in assets. The privatisation of ARAMCO would provide around \$US 300 billion that, together with private international investment, would lend support to the more than \$US 500 billion originally required by the project for the City of Neom: "Most Ambitious Project in the World. A new land constructed with a view to finding a new way of life". A city constructed from scratch on the shores of the Red Sea to achieve geo-strategic leadership in sustainability, new technologies, financial services, tourism & sport, design & construction and education & welfare.

The initial start-up for the Vision 2030 programme was immediate. As part of it, the Saudi Minister of Employment intensified the Nitaqat Program that got under way in 2011 with a view to guaranteeing the "Saudification" of employment in the private sector, requiring that firms employed at least 30% Saudi workers on their pay rolls. Previous similar experiences set in motion since midway through the 1990s met with little success, owing to the large number of exceptions that were applied to the programmes, which initially required annual increases of 5% for contracting Saudis until 50% was reached for the economy as a whole. In 2006, this limit was reduced to 30% for the economy as a whole, to 20% in the industrial sector and to 5% for operation & maintenance contracts. The document Vision 2030 also set as a target increasing female participation in the labour market from 22 to 30%.

The difficult times that the oil market was experiencing in 2016, with the consolidation of tight oil in the USA and relatively low prices, made it difficult for Saudi Arabia to cope with these changes quickly, breaking away from its economic dependence exclusively on oil. Be that as it may, these wishes to make headway with the diversification policy meant that it was necessary to seek support and cooperation within the OPEC from the producers as a whole, in order to be able to assimilate the arrival of tight oil and stabilize. Potential unilateral positions would lead to competitive and suicide dynamics to gain or maintain market shares⁵³.

In 2016, apart from the uncertainties stemming from the economic transition, the inroads made by unconventional oil and the domestic situation, further doubts were caused by the weakening of its ties with the USA, where the Obama Administration was forging a new balance in the region. The abandoning of Mubarak, Saudi ally in Egypt, the apathy shown towards supporting Bahrain during the protests against Monarchy and, above all the signing of the nuclear treaty with Iran, lifting many of the economic sanctions applied until then, increased this uncertainty involving the relations with the USA. Such doubts raised the cost of an early and swift initiation of economic reforms that would require a spirit of cooperation in the world in general and in the MENA zone in particular.

⁵³ FATTOUH, Bassam & Amrita SEN: "Saudi Arabia's Vision 2030, Oil Policy and the Evolution of the Energy Sector". The Oxford Institute for Energy Studies. July 2016.

This slow initial rate would not appear to have speeded up after 2016. Many things have happened since the Vision 2030 programme was announced, and most of them have added to the initial uncertainty. The Trump Administration came to power and once again modified US foreign policy, oil prices that recovered up to \$US 80/bbl at the beginning of October 2018, dropped back to \$US 60/50/bbl in November, indicating volatility for 2019. The speed of energy transition continued to be uncertain, while the threats of climate change are becoming increasingly firm and immediate.

It is true to say that if the energy transition is not particularly swift, there is no contradiction between sustaining profit from oil exports and promoting renewable energy in the producing countries, given that the domestic use of energy produced by a new generation not emitting pollutant gases, would leave more room for exporting oil, thereby helping to finance of internal transition⁵⁴.

The fact is that from 2016 to 2019, under these determinants, very little progress has been made in transforming SA's actual economy. However, while awaiting a degree of stability in the oil markets, progress was at least made in identifying the main restrictions, some domestic and others external, that SA has to face when diversifying its economy and finding its place in the new geo-economy of a world that is heading towards decarbonisation at an unknown rate, with a considerable energy demand from Asia, and a USA, abandoning multilateralism and almost self-sufficient where energy is concerned.

The difficulties involved in SA's economic and social adaptation to energy transition

The difficulties in giving support to diversification

Usually, the greater the economic uncertainty, the greater the increase in the State's role, and private investors tend not to exercise options, preferring to keep them open in time. They would rather not invest and wait. If the energy transition were to bring a gentle drop in demand and thus a slight drop in oil prices, as contained in some IEA scenarios, the oil-producing countries would see their profit reduced by \$US 7 trillion between now and 2040, when compared with the profit they would have obtained in a no-change scenario⁵⁵. The effects of these scenarios on trade deficits, the public deficits and the value of currencies would be dramatic and would hinder, in a vicious circle difficult to break, the support that those countries can give to the transition, because such support would only be possible through a diversification compatible with keeping up current standards of living.

⁵⁴ FATTOUH, B., R. POUDINEH & R. WEST: *Ibid.*

⁵⁵ INTERNATIONAL ENERGY AGENCY: "Outlook for Producer Economies. 2018. What do Changing Energy Dynamics Mean for Major Oil and Gas Exporters?". World Energy Outlook Special Report. OECD/IEA, 2018.

The influence of the public sector in SA can help to design and apply suitable incentives for enabling the diversification programmes to take place at the same rate at which the reduction in the domestic use of fossil fuels evolves, for example in areas such as education and the labour market. But this adaptation of rates in public policies can reveal certain contradictions if it is not accompanied by more radical transformations. There are those who argue that a decarbonised energy system supported by renewable and distributed generation, is only possible when new social and political models are consolidated as alternatives to the established central powers that lend support to the current energy systems⁵⁶. The diversification of a decarbonised economy, in such a case, would only be consolidated under decentralised social environments, with competing markets and redistributive social institutions.

The region's geopolitical and geo-economic environment

For many years, there has been a confrontation between SA and Iran as they have competed for power and influence over other Moslem and Arab countries. The Saudi autocracy accuses Iran of trying to dominate the rest of the Gulf States: Lebanon, Gaza, Yemen and Afghanistan; all of which have a Sunni majority, like Saudi Arabia. Iran, with a Shiite majority, accuses the Saudi monarchy of being an agent and collaborator of the US Government and Israel in the Zone. This is a struggle between Sunnis and Shiites for leadership of the Arab World that dates back to the times of the prophet Mohammed. Both understand the legacy of the Prophet in very different ways. In our times, although the Shiites backed Hezbollah in the Lebanese Civil War, most of the Islamic terrorist groups admit that they are Sunnis. However, curiously, both SA and Iran have identified the Islamic State as a common enemy.

Not long after the signing of the Joint Comprehensive Plan of Action over Iran's nuclear programme in 2015, SA embarked on an unprecedented arms race to redress the military balance in the Middle East. In 2015 SA's military budget was greater than the UK's and France's, and Saudi Arabia's aim was to replace Egypt as the most powerful army in the Arab world⁵⁷.

This policy of heavy military expenditure aimed at strengthening its role in the Middle East is a major burden on the progress of the economic diversification policy announced in 2016 after the plummeting of oil prices and after the "golden" years from 2011 to 2014 for the Saudi budget, when the prices remained at around \$US 100/bbl. Military de-escalation and pacification of the zone, especially putting an end to the Yemen War, are prerequisites to tackling the in-

⁵⁶ BURKE, M.J. & J.C. STEPHENS: "Political Power and Renewable Energy Futures: A Critical Review" *Energy Research and Social Science* 35, Pages 78-93. 2018.

⁵⁷ COUGHLIN, C. "Saudi Arabia: The Region's New Superpower". Gate Stone Institute. September 4 2015. <https://www.gatestoneinstitute.org/6458/saudi-arabia-the-region-new-superpower>.

vestments that the internal revitalisation and transformation of the Kingdom's economy requires⁵⁸.

For example, the electrification of the economy that is required by the energy transition means enhancing the interconnection level between the region's electricity systems and obtaining a higher level of distributed energy. The former characteristic increases the degree of interdependence and the latter improves the resistance of the grids to cyber-attacks or any network dysfunctionality. Both factors, in any case, demonstrate the advantages of reinforcing and extending regional cooperation in the energy field⁵⁹.

The institutional structure of Saudi society

In 2003, the International Monetary Fund described Saudi Arabia as a paternalistic autocracy in which the governments based their legitimacy on a combination of traditional and religious authority with a social respect gained by increasing the population's standard of living thanks to the wealth provided by oil⁶⁰.

As SA is an oil-rich country, its energy consumption, both industrial and domestic, has been greatly enhanced by a policy of low prices for the energy coming from its own fossil sources. The needs imposed by a severe climate, such as the extensive use of air-conditioning equipment and water desalination installations, will grow substantially if, as expected, the population grows in the near future⁶¹.

The public sector requires a transformation that has started under the auspices of the National Transformation Program and the National Center for Performance Management. Its aims are to reduce public employment by 20% over the next few years and improve its efficiency as a whole. The intention is to increase the importance of the private sector. If this transformation is to be successful, SA will have to implement a modern, sufficient and popular taxation system that enables it to support efficient public expenditure and with redistributive capacity.

Its education system, heavily reliant upon religious values, currently resorts to memorising rather than developing abilities for solving problems and creative thinking. An extensive reform must also be undertaken here to train the professional profiles required by a diversified economy based on new technologies.

⁵⁸ VAN DER BERG, W. "Saudi Arabia's Strategic Stalemate- What Next?". Clingendael. Netherlands Institute of International Relations. Nov. 2017.

⁵⁹ O'SULLIVAN, Meghan, Indra OVERLAND & David SANDALOW: "The Geopolitics of Renewable Energy". Faculty Research Working Paper. Harvard Kennedy School. RWP17-027. July 2017.

⁶⁰ EIFERT, Benn, Alan GELB & Nils Borje TALLROTH: "Managing Oil Wealth". Finance and Development. A quarterly magazine of the IMF. March, 2003.

⁶¹ CÔTÉ, Sylvain: "Renewable Energy and its Potential Impact on GCC Labor Markets: Opportunities and Constraints". In AKHONBAY, Hisham M. "The Economics of Renewable Energy in the Gulf." Routledge, VitalBook file. 2018.

The characteristics of the Saudi labour market

The employment market is characterised by a high level of segmentation between national and foreign employees, with the former working mainly in the Public Administration and in the energy sector, and the latter in the rest of the private sector. Most of the low-paid and unskilled jobs in the construction, manufacturing and wholesale trade sectors are occupied by expatriates. This situation conditions the expected earnings in productivity arising from the deployment of renewable energies⁶².

In 2030, half the Saudi population will be under 25. Approximately 4.5 million young people will be available for employment at that time. As the active population is growing at a faster rate than the total population growth, what occurs is a phenomenon known as a "demographic dividend", given that the mere evolution of the population causes a productivity explosion. But for this to happen, the unemployment rates must be low, but Saudi Arabia's unemployment rate is above 25%⁶³. Educating, training and incorporating these young people into the production system are some of the major challenges that the Saudi economic policy has to overcome in the next few years. It is expected that the deployment of renewable energies will create up to 140,000 jobs per year with different profiles and levels in the GCC area⁶⁴.

An education that trains young people in the technical matters involved in industrial development based on new energies is essential for achieving these goals. The production of renewable generators, new intelligent networks, energy storage facilities and electric vehicles, plus the operation & maintenance for all this new equipment requires a training based on scientific knowledge and engineering, more than on laws, administration, business management and social sciences, which currently predominate⁶⁵.

The Saifi Programme, which began to be applied in July 2017, is one example of a public action devised to deal with this structural gap in the labour market. The programme requires employers to contract Saudi students over 17 years of age for practical activities during the vacations, so they can obtain experience⁶⁶. Education is a basic strategic for removing barriers that, anchored in the SA's labor market, are contrary to economic diversification.

⁶² CÔTÉ, Sylvain. *Ibid.* 2018.

⁶³ WORLD BANK DATA: "Unemployment Youth Total (% of total labor force ages 15-24)" Available at <https://data.worldbank.org/indicator/SL.UEM.1524.ZS?end=2017&locations=SA&start=1991>

⁶⁴ IRENA. "Renewable Energy Market Analysis: GCC Region". International Renewable Energy Agency, Abu Dhabi. 2016.

⁶⁵ CÔTÉ Sylvain: "Renewable Energy and its Potential Impact on GCC labor Markets. Opportunities and Constraints" in Akhonbay, Hisham M. "The Economics of Renewable Energy in the Gulf." Routledge, 20180927. VitalBook file. 2018

⁶⁶ PRICE WATERHOUSE COOPERS: "Saudi Arabia Implements the Saifi Student Training Program". Insights Tax and Legal Services. PWC Middle East. July 2017.

Conclusions

Along its history, AS has adopted different strategies in its geo-economic relations as an oil producer within the OPEC. At times it has unilaterally cut back on production and at other times it has mobilised reserves; often seeking cooperation from a maximum number of producing countries and occasionally adopting reward and punishment policies, depending on those countries' reactions. SA has sought, with different degrees of success, to cover short-term goals and give the oil market certain stability, thereby stopping the volatility its income from oil exports. As from 2014, the unexpected arrival of unconventional oil in the USA has forced SA to look for more long-term strategies that take into account not only the quantities to be extracted in the future and investments in production installations and new oilfields, but also to try and coordinate policies between producing countries.

This need to seek long-term solutions becomes all the more necessary in the face of the potential breakthroughs in the world energy transition, with the possible emergence in the coming years of a peak in demand for oil which will gradually start to descend or simply remain stable.

Therefore, the current combination of geo-economic relations between SA and the rest of the world, and especially the USA, Russia and China, is being thrown into uncertainty by the inroads made by unconventional hydrocarbons on the US market and by the expectations of a rapid energy transition towards a decarbonised world.

The traditional interdependence between producers and consumers has created a series of tensions in the Middle East and has created world alliances that could be modified, giving way to other new alliances that would open up opportunities to strengthen pacific cooperation relations between the countries in the MENA Zone. But if this is to occur, it is essential that the Saudi economy transformation rate and the Saudi economy get into step with energy transition in the rest of the world, and that this should happen without sudden changes in the oil markets.

A series of difficulties have to be overcome when transforming the current, authoritarian and indoctrinated Saudi institutions and equipping them with the flexibility and resilience that is required by the economic diversification of its society. For some time, SA has adopted as its target the idea of achieving an industrial structure and diversified services that are not based exclusively on oil exports. If progress is not made in this transformation, the only available option will be to carry on depending economically and socially on oil and to oppose to energy transition, seeking to maximise income in a way compatible with oil prices of around at least \$US 55/60/bbl.

Faced with these geo-economic scenarios, SA has planned to progress slowly but surely in its diversification strategy, as defined in its document Vision 2030. Until these domestic diversification aims are achieved, the support through co-

operation from the oil-producing countries grouped around the so-called OPEC+ (which includes Russia and Kazakhstan) seems essential to maintain oil prices within a margin that lies around \$US 65/bbl. Above such prices, the unconventional oil exports from the USA would jeopardise the producing countries' need to obtain the resources required to diversify with certain guarantees of success. Prices under \$US 55/bbl would also jeopardise the public budget of the producing countries and hinder the diversification investment process. This could strengthen cooperation within the OPEC+, bring SA closer to Russia, and even require a reduction in SA's hostilities towards Iran and of course recover part of the budget that goes into the Yemen War. SA would cease to be an ally only to the USA and would adopt a more balanced position that would be closer to Russia, as the main collaborator within the OPEC+ and to China, as the main gas and oil consumer during the transition.

All in all, the success of these diversification policies (in the long term) and domestic development policies regarding renewable resources (in the short term) seek to position SA in the new geo-economic world order. If it is successful, this situation will be characterised by:

Cooperation within the OPEC+, which includes, amongst other producing countries, Russia and Iran. Tight oil imposes limits and creates an environment not very favourable to this cooperation. The price rises if there are supply shocks, for example in 2019 prompted by the collapse of production in Venezuela, the come into force of sanctions imposed on Iran or the riots in Libya and Nigeria, will only be partially made up for by greater production. Furthermore, if the first half of 2019 is affected by a slowdown in world growth and there is no supply shock predicted, this will be the first period when the cooperation agreement between producers is put to the test under conditions that are not totally favourable⁶⁷.

Containment of the resources obtained from oil exports to cope with the investments required due to energy diversification. The market will be more competitive and the way demand evolves will be more contained. The US is far from being in a position to dominate the world oil market (despite what Trump's Government promised): "The credibility of the Saudi threat to use oil as a weapon –although it currently has very little possibility of materialising– ought to serve as a warning to politicians that what are needed today are actions aimed at not increasing the domestic oil supply, or if not, which is more important, actions aimed at reducing its consumption"⁶⁸.

A pacification of the MENA area that puts an end to the waste of resources aimed at consolidating SA's military predominance and, especially, financing the Yem-

⁶⁷ ECONOMU, A. and B. FATTOUH: "5+1 Key Facts about the OPEC Declaration of Cooperation". Oxford Institute for Energy Studies. Oxford Energy Comment. Sept. 2018.

⁶⁸ BORDOFF, J.: "Khashoggi Affair Exposes Myth of US Energy Dominance". The Hill, 28/9/2018. <https://thehill.com/opinion/energy-environment/413598-khashoggi-affair-exposes-myth-of-us-energy-dominance>.

en War. In a world where the prospects for the demand for oil and the energy transition rate are a matter of great uncertainty, the immediate benefits of cooperation strategies are more visible and definite than the alternative of competitive strategies.

In view of all the aforementioned, SA is currently being subjected to greater instability than on previous occasions⁶⁹. The greater uncertainty surrounding the oil economy brought about by the different scenarios that are considered for energy transition is causing a response in SA that takes the form of a concentration of power in the hands of MBS, with very few control mechanisms, which even makes a break with other previous systems with greater acceptance from the ruling class. As stated by the analysis from Oxford Institute for Energy Studies, Bassam Fattouh, this centralisation of power makes the decision-making process easier, but its quality is in danger. Nevertheless, the current balance does not appear to be sustainable in the long- or medium term, which causes an increase in the fear of external threats and hinders the opening up of potential channels of cooperation to other alternatives that are being considered on a regional basis⁷⁰ and that constitute the only stable and peaceful option given the current geo-economic situation.

⁶⁹ RIEDEL, B.: "Saudi Arabia is at its Least Stable in 50 Years". Al-Monitor, Sept, 23. 2018. <https://www.al-monitor.com/pulse/originals/2018/09/saudi-arabia-stability-crown-prince-mohammed-bin-salman.print.html>.

⁷⁰ FATTOUH, B.: "Saudi Arabia's Energy Pricing Reform in a Changing Domestic and Global Context". Oxford Institute for Energy Studies. Presentation at the Oxford Centre for Islamic Studies. Jan. 2018.

Composition of the working group

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<i>Coordinator</i>	Mr. Francisco Márquez de la Rubia <i>Army Lieutenant colonel Spanish. Chief Analyst of the SISS.</i>
<i>Members</i>	Mr. Manuel Conthe Gutiérrez <i>Columnist with Expansion, independent advisor and arbitrator for Acerinox and Unicaja Banco. Trade Specialist and State Economist, he was Chairman of the Comisión Nacional del Mercado de Valores and Secretary of State for Economic Affairs.</i> Mrs. Jennifer Winter <i>Assistant Professor, Department of Economics and Scientific Director, Energy and Environmental Policy research division, School of Public Policy, University of Calgary.</i> Mr. Emilio Sánchez de Rojas Díaz <i>Army Colonel of Artillery Spanish. (R). Professor of EAE Business School. Member of the Climate Change and Security Expert Group (United Nations Environment Programme).</i> Mr. Christian Egenhofer <i>Director of CEPS Energy Climate House, Brussels and Visiting Professor at the College of Europe in Bruges and Natolin and at Sciences Po in Paris.</i> Mr. Milan Elkerbout <i>Research Fellow at CEPS Energy Climate House.</i> Mr. Miguel A. Lasheras <i>Consultant, Economist, MPA.</i>



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