

POLICY BRIEFING

The Shale gas 'revolution' in the United States: Global implications, options for the EU

Abstract

In recent years, the United States' natural gas industry has undergone a significant transformation, dubbed a 'revolution': extraction rates have soared thanks to new technologies. The shale gas boom is having an unprecedented affect on the US energy market, and this, in turn, has important implications for the rest of the world, notably the Middle East and Russia. While the shale gas 'revolution' has spurred a debate on environmental consequences and sustainability within the US, other countries — including countries as diverse as Canada and China — have, in different ways, aimed to replicate the US boom. In the EU, a shale gas 'revolution' appears relatively unlikely, at least for the moment, given Europe's less favourable geological conditions and its wary public. Nevertheless, some EU Member States rich in shale gas, such as Poland and the United Kingdom, are actively promoting shale gas exploration activities to diversify their energy mix, reduce energy dependency and enhance energy security. Other countries, such as France and Bulgaria, have for the moment chosen to privilege environmental constraints and have implemented bans. The remaining Member States seem to have adopted a 'wait-and-see' attitude. For all these states, however, the EU has an important role to play in ensuring a balanced common approach and encouraging the sustainable development of this industry while ensuring an adequate environmental protection. A recent Commission green paper on shale gas is a good initial step, although this should be followed with concrete action.

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AUTHOR:

Jacopo BELLELLI
supervised by Wanda TROSZCZYNSKA - VAN GENDEREN
Directorate-General for External Policies of the Union
Policy Department
WIB 06 M 093
rue Wiertz 60
B-1047 Brussels
Editorial Assistant: Delphine FUMEY

CONTACT:

Feedback of all kinds is welcome. Please write to:
wanda.troszczynska@europarl.europa.eu.

To obtain paper copies, please send a request by e-mail to:
poldep-expo@europarl.europa.eu.

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1. The shale gas 'revolution' in the US

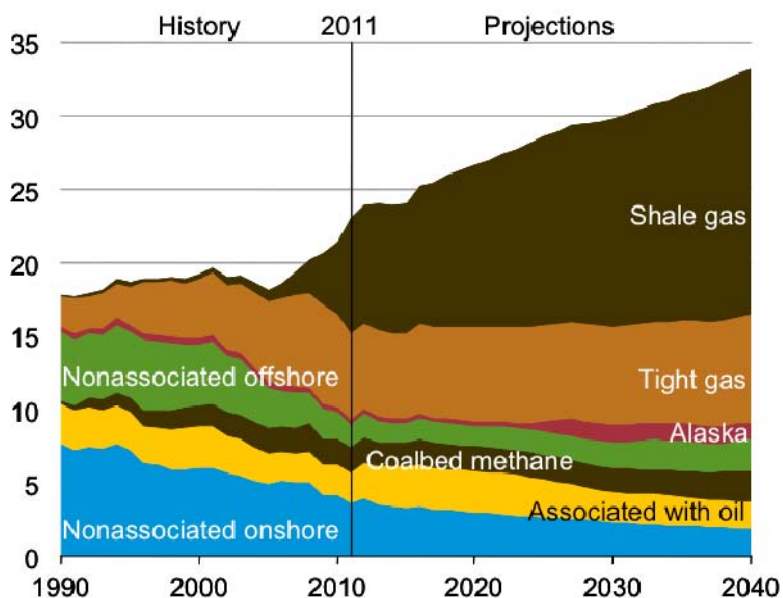
1.1. Location and Impact of the shale gas extraction

In recent years, US shale gas production has soared, due largely to technological innovations.

In recent years, the United States natural gas industry has experienced a quiet 'revolution', thanks to development of new and innovative technologies. Investments in new extraction techniques — drilling horizontal wells and hydraulic fracturing (fracking) techniques — have made the production of gas less expensive¹. Fracking technology has given access to vast resources of unconventional gas, in particular 'shale gas', which is found trapped within sedimentary shale rock formations and which is extracted by injecting sand, chemicals and water at high pressure.

Figure 1:

US dry natural gas production by source, 1990-2040 (trillion cubic feet)



Source: US Energy Information Administration, Annual Energy Outlook 2013 Early Release

<http://www.burnsmcblog.com/2013/03/20/annual-energy-outlook-2013-early-release-insights>.

The shale gas boom, combined with easier access to new and vast natural gas supplies, has led the US shale gas production to soar dramatically since 2007. By 2010 shale gas constituted 23 % of US gas production, a significant change from the previous year, during which shale gas constituted only 14% of the total country's gas production². The US Energy Information Administration's *Annual Energy Outlook Early Release 2013*³ has predicted that the US natural gas production will increase from 23.0 trillion cubic feet (tcf) in 2011 to 33.1 tcf in 2040 — a 44 % increase. This surge is largely due to the anticipated growth in shale gas production,

¹ 'Fracking' consists of fracturing of various rock layers by a pressurised liquid.

² US Energy Information Administration, *Annual Energy Outlook 2011*, http://www.eia.gov/pressroom/releases/images/2010_13_figure1.jpg.

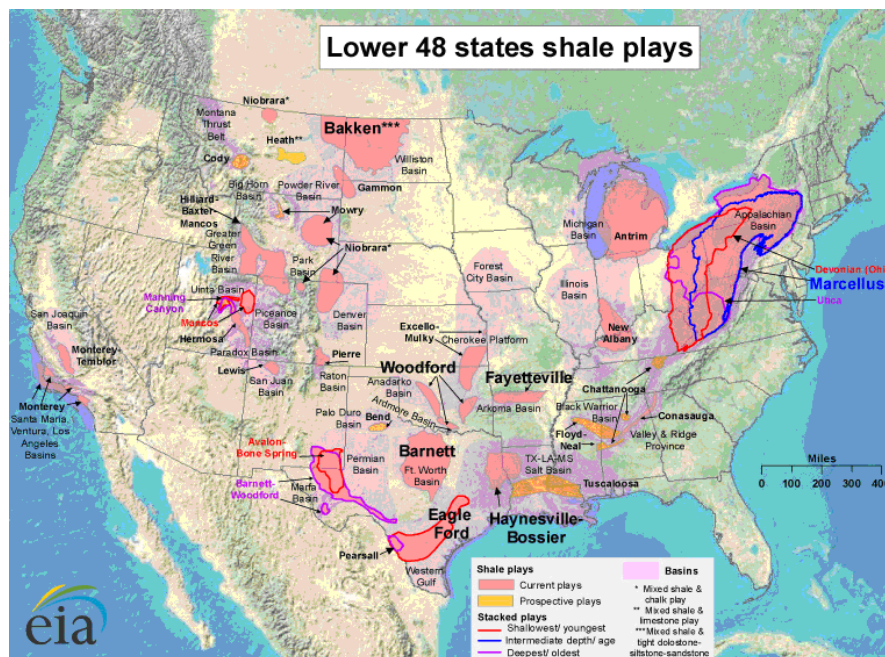
³ US Department of Energy, *Annual Energy Outlook 2013 Early Release Overview*, <http://www.eia.gov/forecasts/aeo/er>.

The United States has significant reserves of unconventional gas, spread across the country.

Figure 2:
Location of US natural gas reserves

which is expected to grow from 7.8 tcf in 2011 to 16.7 tcf in 2040.

Large deposits of unconventional gas are located across the US. The most significant fields including the Barnett reservoir in Texas and the Marcellus reservoir, which run across New York, Pennsylvania and most of the West Virginia. The Barnett reservoir first entered production in the late 1990s and represents one of the more established fields in the US.



Source: Energy Information Administration based on data from various published studies.

<http://www.instituteforenergyresearch.org/2011/06/30/shale-oil-may-mirror-the-shale-gas-boom>.

Shale gas has deeply altered the US gas market and energy mix, reducing gas prices, CO2 and greenhouse gas emissions, and the country's dependence on imports ... as well as generally facilitating economic recovery.

Exploiting these and other reservoirs has already led to a resources surplus and substantially lower prices. US natural gas prices are currently at a record low (close to their 1976 levels). Imports of natural gas into the US have dropped, from 16.5 % of the total gas consumed in 2007 to 11 % in 2010⁴.

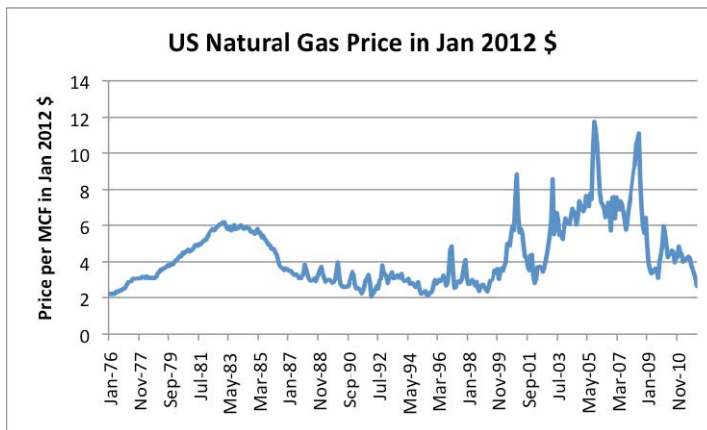
Unconventional and shale gas is also expected to enhance the US's energy security, while helping to reduce CO₂ emissions and greenhouse gas pollution (electricity generated by the combustion of natural gas is generally considered to have lower emissions intensity than that generated by burning coal)⁵.

⁴ L. Dreyer and G. Stang, *The shale gas 'revolution': Challenges and implications for the EU*, European Union Institute for Security Studies, <http://www.iss.europa.eu/publications/detail/article/the-shale-gas-revolution-challenges-and-implications-for-the-eu/>.

⁵ White House, Office of the Press Secretary, 17 November 2009, [Statement on US-China shale gas resource initiative](#).

Figure 3:

US Natural Gas Price in January 2012



Source: Our Finite World based on Energy Information Administration data.

<http://ourfinitemworld.com/2012/03/23/why-us-natural-gas-prices-are-so-low-are-changes-needed>

The country's economy has also benefitted substantially from the availability of cheap energy, revitalising prospects for growth. The shale gas boom is credited with having created 600 000 jobs in 2010⁶ and contributing to a notable recovery in industrial and manufacturing activity.

Despite the many positive aspects of shale gas extraction, there are growing concerns about the scale and scope of the extraction process, as well as about its environmental impact. The estimates of the reserves released this year by the US Department of Energy (DoE) in its *Annual Energy Outlook* (mentioned above) are considerably lower than earlier estimates. Technical improvements in drilling and extraction have provided more accurate and detailed data, which now allow the Department of Energy to estimate the US's shale gas reserves of recoverable natural gas at around 482 trillion cubic feet . This represents a 42 % decline from 2011 projections, when estimates were around 827 tcf.

Even though the US continues to import millions of barrels of crude oil per day,⁷ from 2005 the country's dependence on oil import has dropped from 60 % to 39 % thanks to shale gas. The United States appears well on its way to self-sufficiency in oil and gas and may overcome Saudi Arabia as the world's bigger supplier of hydrocarbons by 2020. Already, the country's increased production is having an impact on the rest of the world.

Despite the promises of shale gas, uncertainty remains about its longer-term productivity.

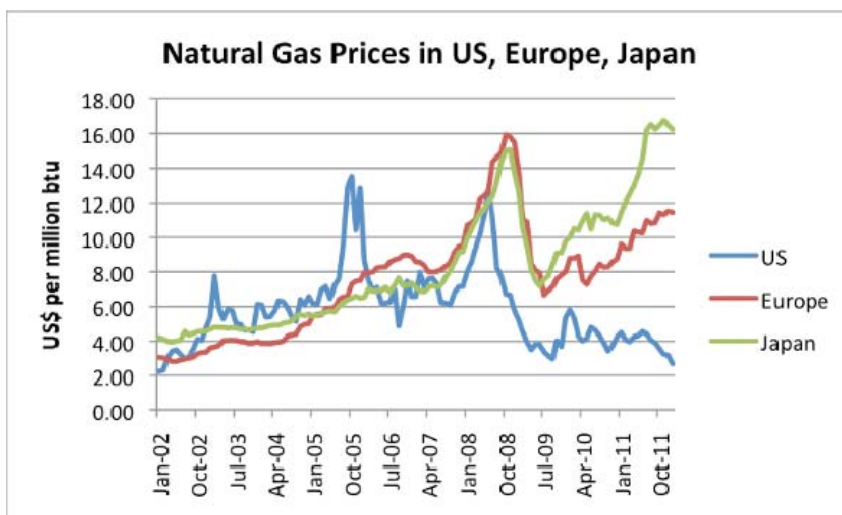
US energy self-sufficiency may potentially redefine the economics and geopolitics of energy across the globe.

⁶ IHS Global Insight, *The Economic and employment contributions of shale gas in the United States*, December 2011, <http://www.ihs.com/info/ecc/a/shale-gas-jobs-report.aspx>.

⁷ C. Ebinger and K. Massy, *Energy and Climate: From black to gold to green*, Big Bets and Black Swans - A Presidential Briefing Book, Foreign Policy at Brookings, 2013, <http://www.brookings.edu/research/papers/2013/01/energy-and-climate-black-to-gold-to-green>.

Figure 4:

Natural Gas Prices in US, Europe and Japan



Source: Our Finite World, based on World Bank Commodity Price Data.

<http://ourfinitemworld.com/2012/03/23/why-us-natural-gas-prices-are-so-low-are-changes-needed>

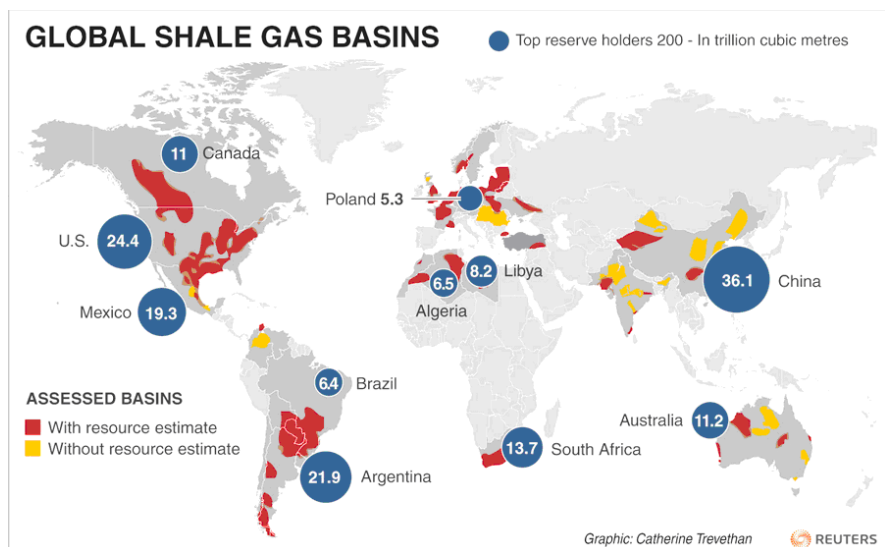
1.2. Geostrategic implications of the US shale gas boom

The shale gas 'revolution' is already having a profound impact on the US and the rest of the world.

The US's growing energy independence — largely the result of shale oil and gas — has the potential to change the global geostrategic landscape, testing the country's engagement with the world, including the Middle East and Europe. A self-sufficient US will likely have fewer strategic interests in the Middle East and other sensitive, energy-rich parts of the world, and will likely feel less vulnerable to developments beyond its borders. Yet its strategic ties with partners abroad are not all likely to dissolve. A close security and economic engagement with Australia — one of the US's most trusted allies, which has substantial natural gas reserves and potential for lowering of liquefaction costs — will continue, and may lead to greater US influence on energy issues in the Asia Pacific region.

Figure 5:

Global Shale Gas Basins



Source: US Energy Information Administration (EIA)

<http://blog.thomsonreuters.com/index.php/global-shale-gas-basins-graphic-of-the-day>

Yet the US's political, military and trade relations

US political, economic, strategic and military relations are unlikely to shift dramatically overnight. As stated by Carlos Pascual, Special Envoy

with the rest of the world are unlikely to shift overnight.

Eventually, however, the US's shale gas 'revolution' may well change have a global impact, affecting the market for liquefied natural gas and bolstering US competitiveness.

and Coordinator for International Energy Affairs for the US Department of State⁸, the gas market is increasingly a global market in which instability retains a significant impact on price. The US's strong interest in peace and security in the Middle East is therefore likely to keep the country engaged in the region.

The shale gas 'revolution' in the US has the potential to change the global gas picture, offering the country the opportunity to strengthen its economic and geopolitical position by responding to the global demand for energy, while bolstering its long-term competitive position in the global market for lower-carbon technology and addressing climate change⁹. It also seems likely that the US's excess supply of natural gas will increasingly be exported to Europe and Asia in the form of liquefied natural gas (LNG), and will affect the composition of domestic markets in those regions.

1.3. US public opinion on shale gas

The US public has expressed reservations about the extraction of shale gas, due to its environmental impact, sustainability and impact on local life.

While the rapid development of a shale gas industry has been supported politically across the aisle, US public opinion has not fully embraced the developments. Many have raised concerns about the environmental consequences and the sustainability of intensified extraction. These concerns stem from techniques involved in hydraulic fracturing, which require large amounts of water — a scarce commodity in some extraction regions — and which may contaminate groundwater with potentially hazardous chemicals. A number of people have also been concerned about the potentially negative impact on local life. The boom in extraction has affected areas unaccustomed to drilling, including various towns in Pennsylvania and around the Dallas metropolitan area in Texas. Many feel a number of environmental, social, regulatory and legal questions have not been addressed fully.

US President Barack Obama directly backed shale gas drilling during his recent State of the Union Address.

Nevertheless, US President Barack Obama directly backed shale gas drilling in his State of the Union Address of January 2013. President Obama stated that his administration is preparing to open more than 75 % of existing offshore oil and gas reserves to extraction. President Obama pointed to the need to safely develop every source of energy available to the US, referring to shale oil and gas as 'cleaner, cheaper and full of new jobs'.

Several NGOs and environmental think tanks

Despite the official position, critics say that the shale gas industry has moved too fast and lacks coherent regulation. Critics also cite potential problems from spills, leaks and contamination from the chemicals used in production. Several prominent NGOs and environmental think tanks have called for a stricter regulatory framework. Others have advocated a moratorium on all drilling activity, similar to the French ban confirmed in

⁸ *Growing US energy self-sufficiency and global consequences*, German Marshall Fund, <http://brussels.gmfus.org/multimedia/full-session-videos-2013>.

⁹ C. Ebinger and k. Massy, *Energy and Climate: From black to gold to green*, *op.cit.*

are launching campaigns to increase US public awareness of the impact of fracking on health.

Industry representatives argue that there is no sound evidence linking fracking technologies to water contamination.

Federal and local authorities have begun considering new regulations for the shale gas industry.

September 2012 by President François Hollande's administration. A similar prohibition has been implemented in Bulgaria. Civic bodies in the US, such as the Natural Resources Defense Council¹⁰, have launched campaigns to increase US public awareness of the health impact of living near oil and gas exploration sites and the need for a stronger federal legal framework. Members of the Pennsylvania Alliance for Clean Water¹¹ and other citizens' committees have also reported that residents in drilling areas are lobbying Congress to halt fracking in general and certain drilling projects in particular.

On the other hand, advocates of shale gas extraction argue that misconceptions about fracking are widespread and that no scientific evidence has demonstrated that the chemicals used in hydraulic fracturing contaminate water or air. In response to public disquiet over the issue, US authorities have taken initial steps towards developing a legal framework for the industry. In some states, such as New York, lawmakers are considering a moratorium on fracking, and some cities have banned fracking within their municipal limits.

President Obama's State of the Union Address¹² also called for a roadmap to be drawn up for 'responsible shale gas production.' President Obama has also expressed support for new regulations to ensure that the shale gas industry protect public interest. Industry representatives have reacted rather negatively to recent official statements hinting at a new regulatory framework, and have argued that overregulation would damage US competitiveness and energy security.

¹⁰ National Resources Defense Council, *Protecting Americans from the risks of fracking*, <http://www.nrdc.org/energy/frackingrisks.asp>.

¹¹ Pennsylvania Alliance for Clean Water, <http://pennsylvaniaallianceforcleanwaterandair.wordpress.com>.

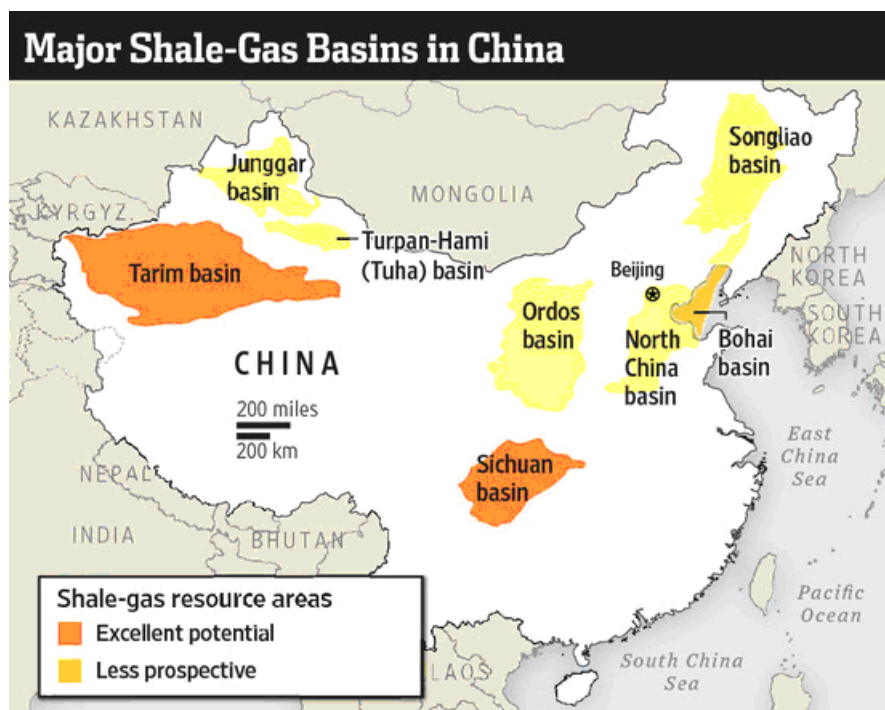
¹² A. Rascoe and E. McAllister, *Obama backs shale gas drilling*, Reuters, <http://www.reuters.com/article/2012/01/25/us-usa-obama-speech-energy-idUSTRE80O06P20120125>.

2. Global reactions to the US shale gas 'revolution'

2.1. China

Figure 6:

Major Shale-Gas Basins in China



Source: US Energy Information Administration (EIA) <http://online.wsj.com/article/SB10001424127887323401904578156710038647662.html>.

As the US's shale gas boom changes the world's energy map, the impact on China is uncertain. The International Energy Agency's (IEA) World Energy Outlook for 2010¹³ predicts that China will continue to import 79% of its oil by 2030. Not yet a shale gas producer, China is facing domestic pressure to develop new energy sources to ensure diversity and security in its energy supplies and to meet the growing domestic demand. The Chinese government has announced its intention to increase domestic shale gas production to 2.1 tcf by 2020; today, the country's production is effectively nil. Major Chinese state-owned companies are examining the costs and benefits of developing domestic reserves. The Chinese public has not been particularly vocal on the issue, though it has in recent years become outspoken on other environmental issues, such as the level of urban pollution. If shale gas extraction advances, the Chinese public may also express an opinion.

The US Energy Information Administration evaluates China's reserves to contain 1 275 trillion cubic feet (tcf), which would make China richer in unconventional gas than the US and Canada together. Because China's environmental regulatory framework remains weak, there are currently no regulatory obstacles to exploration or extraction. That said, the mere

China has a strong need to develop new energy sources. A boom in domestic shale gas production could help the country to meet its growth targets and energy demands.

¹³ International Energy Agency, *World Energy Outlook 2010*, <http://www.iea.org/publications/freepublications/publication/name,27324,en.html>.

Despite vast unconventional gas resources, China still lacks the necessary expertise and regulatory framework to fulfil its shale gas promise.

China is likely to remain dependent on energy imports for the foreseeable future.

existence of shale gas reserves in China does not mean that it can be extracted, at least in the short-term. China's 12th five-year plan for energy development projects that about 6% of the country's energy will come from shale gas by 2020¹⁴. However, the country's recent successes in domestic extraction technology have been rather modest. Drilling technologies require technical expertise and a large volume of water — both still in short supply in China. And even if China were able to overcome these shortcomings and develop enough shale gas to meet its ambitious growth targets, the lack of a safe regulatory framework might lead to an environmental disaster and, ultimately, nationwide instability.

All things considered, China is not likely to achieve energy self-sufficiency in the foreseeable future, but will likely remain largely dependent on oil and gas imports from the Middle East and, increasingly, from Africa. This would also reinforce the US's competitive advantage in a global energy market.

2.2. Russia and the EU's Eastern Neighbourhood

The US shale gas boom will likely affect Russia's export market ... to a limited extent.

The rising importance of shale gas in the US may affect also Eastern Europe, the Caucasus region and Central Asia.

Despite large oil and

Russia will certainly be affected by the changes in the world's energy map resulting from the shale gas 'revolution' in the United States. The International Energy Agency's latest predictions suggest that by 2035 the US will surpass Russia in its production of gas, becoming the world's largest gas producer. The gas market and gas prices will be affected in Russia, as will Moscow's power over the rest of the world and its ability to lock some international clients in onerous contracts.

Yet the impact of the US shale gas boom is also likely to remain limited in Russia. Russia maintains vast conventional gas reserves and a robust transport network, which should allow the country to retain a dominant position in global and European energy markets. The high cost of transporting LNG from the US works to Russia's advantage. Moscow also has the time it needs to protect its interests, by, for example, building its own LNG export infrastructure and accessing new Asian export markets.

The growing importance of shale gas in the US may, however, affect Eastern Europe, the Caucasus region and Central Asia in the longer run. Located along global transit routes, these areas are rich in natural gas and have garnered the interest of global energy players.

Ukraine has recently discovered shale gas deposits, which may provide resources to diversify the country's gas supplies from Russia. Ukraine's shale gas reserves are estimated at 42 trillion cubic feet — Europe's third-largest — and in January 2013, Shell began exploring throughout the country. Ukraine might be able to develop its shale gas for both domestic

¹⁴ C. Yang, *China drills into Shale Gas, targeting huge reserves amid challenges*, National Geographic News, 2012, <http://news.nationalgeographic.com/news/energy/2012/08/120808-china-shale-gas>.

natural gas reserves, most of these countries lack the foreign investment and transport infrastructure necessary to become major exporters.

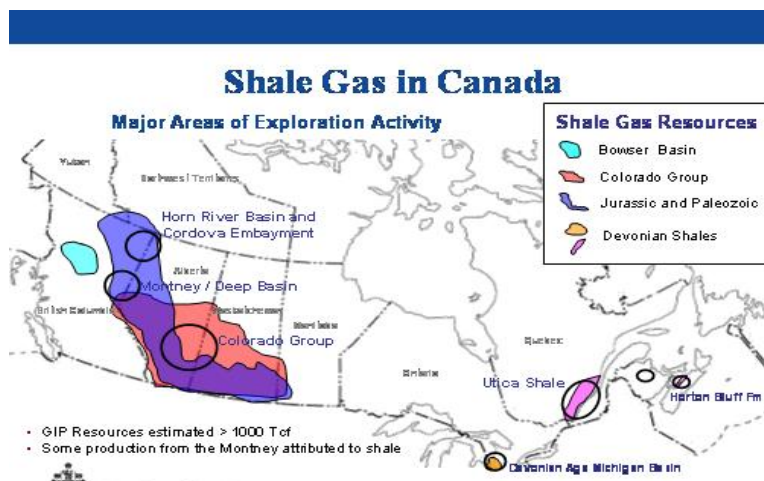
consumption and exports to Western Europe by 2020.

Azerbaijan also has huge shale gas reserves, and aims to become one of the major suppliers to the European and global gas markets. Other countries in Central Asia, including Uzbekistan and Turkmenistan, also own abundant oil and natural gas resources, but insufficient foreign investments and an inadequate transportation infrastructure prevent them from becoming major energy exporters.

2.3. Canada

Figure 7:

Shale Gas in Canada



Source: Canadian Society for Unconventional Gas.

<http://www.neb-one.gc.ca/clf-nsi/archives/rpblctn/spchsndprnttn/2008/mtnqrthmrcndmnd/mtnqrthmrcndmnd-eng.html>

Canada's shale gas production is sharply increasing. The country remains a global exporter with an effective regulatory framework.

In recent years, several discoveries of shale gas have caused a sharp increase in the estimates of the volume of unconventional natural gas in Canada.¹⁵ The country owns the sixth largest technically recoverable shale gas resources in the world, esteemed at 388 tcf¹⁶, principally in the regions of British Columbia, Alberta, Quebec, New Brunswick and Nova Scotia. In 2011, Canada's shale gas production counts for 3.5% of Western Canadian Sedimentary Basin natural gas production¹⁷. Despite prospects for greater US energetic self-sufficiency, Canada still exports a significant amount of natural gas to the US. Regulatory bodies of provinces are responsible to manage natural resources development and shale gas is generally regulated under the same legislation as conventional gas. Where in Quebec a moratorium has been adopted, in New Brunswick and Nova Scotia shale gas projects are at early stage of development. Recently, both

¹⁵ The following section benefited from valuable inputs based on research done by Anne-Christine Poulin, Trainee from the Transatlantic/G8 Unit.

¹⁶ U.S. Energy Information Administration, 2011, *World Shale Gas Resources: an Initial Assessment of 14 Regions outside the United States*, retrieved from <http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf>

¹⁷ Mission of Canada to the EU, 2013, "Shale gas development in Canada – a federal perspective", presentation for the Delegation for relations with Canada, European Parliament (20 March 2013).

Alberta and British Columbia introduced some regulatory requirements to pre-existent acts addressing hydraulic fracturing and water contamination. Up to now, there is no federal legislation specifically for shale gas. Assessment of potential environmental impacts from the exploration, extraction, and development of Canada's shale gas resources is expected to be completed by the end of 2013¹⁸.

2.4. The Middle-East and North Africa

Countries in the Middle East and North Africa (MENA) region have been slow to show interest in shale gas production, partly because many of them own huge reserves of conventional gas. But the growing global energy demand, driven by the population boom and industrial growth, has led some countries to review their options.

As US shale gas production changes the world's energy map, some MENA countries are starting to invest in shale gas exploration.

According to recent reports by the US Energy Information Administration, the region holds substantial unconventional gas resources, particularly shale gas. Libya's are apparently among the largest local reserves, containing an estimated 290 trillion cubic feet of gas, ahead of Algeria's 231 tcf. But it is Algeria that appears to be taking the lead in exploration. The Algerian state energy company recently signed a cooperation agreement with the Italian oil and gas company ENI to develop its shale gas. In addition, Algeria has begun evaluating its natural gas liquids (the liquid components of natural gas, such as propane or butane), either in partnership with foreign companies such as Shell¹⁹ or autonomously. Saudi Arabia, Libya, Egypt and Oman have also begun evaluation their potential reserves, with those of Saudi Arabia estimated at 645 tcf by the US oilfield services company Baker Hughes.






The region is rich in unconventional gas reserves, with Libya, Algeria and Saudi Arabia holding the greatest reserves.

Despite this growing interest in shale gas in the MENA region, the region's energy mix is unlikely to be transformed imminently. North Africa is currently in the midst of a difficult democratic transition, and lingering political instability may hamper potential advances in shale gas production.

Yet political instability and the lack of environmental legislation may prevent extraction from taking off for years to come.

Most of the MENA countries lack clear environmental legislation for the exploration of these unconventional resources.

Figure 8:
World shale gas resources

					
EUROPE					
France	0,03	1,73	98%	0,2	180
Germany	0,51	3,27	84%	6,2	8

¹⁸ Government of Canada, 2012, *Fall Report of the Commissioner of the Environment and Sustainable Development*, retrieved from http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201212_e_37708.html.

¹⁹ A. Maameri, *Time to look for unconventional Gas in the Middle East*, Rigzone, http://www.rigzone.com/news/oil_gas/a/125078/Time_to_Look_for_Unconventional_Gas_in_the_Middle_East.

Netherlands	2,79	1,72	(62%)	49,0	17
Norway	3,65	0,16	(2,156	72,0	83
U.K.	2,09	3,11	33%	9,0	20
Denmark	0,30	0,16	(91%)	2,1	23
Sweden	-	0,04	100%		41
Poland	0,21	0,58	64%	5,8	187
Turkey	0,03	1,24	98%	0,2	15
Ukraine	0,72	1,56	54%	39,0	42
Lithuania	-	0,10	100%		4
Others (3)	0,48	0,95	50%	2,71	19
NORTH AMERICA					
United States	20,6	22,8		272,5	862
Canada	5,63	3,01		62,0	388
Mexico	1,77	2,15		12,0	681
ASIA					
China	2,93	3,08		107,0	1,275
India	1,43	1,87		37,9	63
Pakistan	1,36	1,36		29,7	51
AUSTRALIA					
	1,67			110,0	396
AFRICA					
South Africa	0,07	0,19	63%	-	485
Libya	0,56	0,21	(165%)	54,7	290
Tunisia	0,13	0,17	26%	2,3	18
Algeria	2,88	1,02	(183%)	159,0	231
Morocco	0,00	0,02	90%	0,1	11
Western Sahara	-	-			7
Mauritania				1,0	0
SOUTH AMERICA					
Venezuela	0,65	0,71	9%	178,9	11
Colombia	0,37	0,31	(21ù)	4,0	19
Argentina	1,46	1,52	4%	13,4	774
Brazil	0,36	0,66	45%	12,9	226
Chile	0,05	0,10	52%	3,5	64
Uruguay	-	0,00	100%		21
Paraguay	-	-			62
Bolivia	0,45	0,10	(346%)	26,5	48
TOTAL	53,1	55,0	(3%)	1,274	6,622
TOTAL WORLD	106,5	106,7	0%	6,609	

Source: Seismic Micro-Technology.

<http://southhillcreative.com/june-infographic-world-shale-gas-resources>.

3. Implications for the European Union

In some parts of the EU, expectations are high for a domestic shale gas boom, promising greater energy security, a diversity of energy sources and reduced energy dependency.

The European Commission's 'Energy Roadmap 2050' identifies gas as critical for the transformation of the energy system. The Commission is expected to make proposals for a more united approach.

In 2011, the European Council concluded that the potential of conventional and unconventional gas and oil should be assessed.

The European Parliament has called on the Member States to ensure that

In some parts of the European Union, the US's shale gas boom is contributing to expectations for an EU shale gas 'revolution'.²⁰ Developing unconventional and shale gas in the EU could lead to a greater energy security, while providing a diversity of energy sources in energy-dependent Member States, and ultimately reducing the EU's overall energy dependency.

The European Commission's 'Energy Roadmap 2050' identifies gas as a critical fuel for transforming the energy system. The report states, 'gas is expected to play an important role in the EU energy mix across all scenarios, representing 22-25 % of primary energy consumption by 2030, and between 19 and 26 % by 2050'²¹. Over the past few years, the EU has taken measures to improve the coherence of its energy-related activities.

In February 2011, the European Council concluded that to further enhance the security of its supply, Europe should assess the possibility of sustainably extracting and using unconventional (shale gas and oil shale) as well as conventional fossil fuel resources²². The Commission then released three studies on unconventional and shale gas in 2012²³, examining the potential effects of these fuels on energy markets, the climate impact of potential shale gas production and the additional potential risks associated with hydraulic fracturing. To analyse possible improvements in national regulatory frameworks, the Commission also published a study²⁴ carried out by Philippe & Partners law firm on 27 January 2012 on licensing and permitting procedures for shale gas. This was followed by a green paper, issued in March 2013, with questions for Member States on their approaches to shale gas. Concrete proposals for ways to form a common approach are expected by the end of this year.

Recently, the European Parliament's 'Report on industrial, energy and other aspects of shale gas and oil' called on EU Member States to ensure the necessary administrative and monitoring resources to sustainably develop shale gas activities²⁵. The EP rejected a ban on shale gas, while

²⁰ The following section benefited from valuable inputs based on research done by Anne-Christine Poulin and Sarah Hyon, Trainees from the Transatlantic/G8 Unit.

²¹ European Commission, 2011, *Energy Roadmap 2050*, http://ec.europa.eu/energy/energy2020/roadmap/index_en.htm.

²² European Council, 2011, *Conclusions on Energy*, February 4th 2011, retrieved from http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/119141.pdf.

²³ European Commission, Studies & Evaluations, http://ec.europa.eu/energy/studies/energy_en.htm.

²⁴ European Commission, *Final report on unconventional gas in Europe*, http://ec.europa.eu/energy/studies/doc/2012_unconventional_gas_in_europe.pdf.

²⁵ European Parliament, 2012, *Report on industrial, energy and other aspects of shale gas and oil*, <http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&language=EN&reference=A7-0284/2012>.

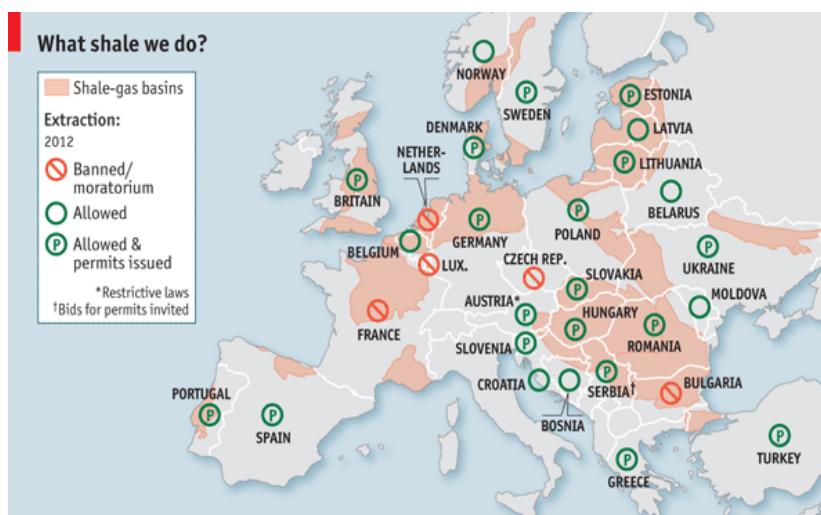
administrative and monitoring resources are adequate to sustainably develop shale gas.

calling for a robust regulatory regime to address environmental concerns²⁶. In the European Parliament resolution of 14 March 2013 on the "Energy roadmap 2050, a future with energy", the EP called the Member States to make use of Environmental Impact Assessment requirements for unconventional gas production.

Europe's significant shale gas resources are mainly located in Western and Northern Europe. According to the 2011 US Energy Information Administration's data, Europe's recoverable shale gas reserves amount to 594 tcf, compared to 862 for the US. Europe as a whole accounts for approximately 10 % of the total global resources. The European countries with the largest reserves are Poland, France and Norway, which own respectively 187, 180 and 83 tcf of recoverable shale gas. Ukraine, Sweden, Denmark and the UK also possess considerable basins.

Figure 9:

Shale gas basins and national regulatory approaches in Europe



Source: *The Economist*, based on information from the International Energy Agency (IEA).

<http://www.economist.com/news/business/21571171-extracting-europes-shale-gas-and-oil-will-be-slow-and-difficult-business-frack-future>.

Europe owns significant shale gas resources, with the largest reserves in Poland, France and Norway.

In southern Europe, Spain holds some potentially significant, yet unexplored, shale gas reserves. While fracking has been banned in the region of Cantabria, some energy lobbyists argue that shale gas could bring economic advantages to the country, currently undergoing a serious economic downturn²⁷.

Member States have followed different trajectories in developing shale gas in recent years. Some — France and Bulgaria — have banned for the moment any activity involving 'fracking' in the name of the 'precautionary principles', and some — such as the Czech Republic — have considered

²⁶ European Parliament, 2012, *Report on industrial, energy and other aspects of shale gas and oil*, <http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&language=EN&reference=A7-0284/2012>.

²⁷ Euractiv, 2013, *Shale-rich Spanish region votes to ban fracking*, <http://www.euractiv.com/energy/shale-rich-spanish-region-votes-news-518963>

France and Bulgaria have banned fracking, while most countries are adopting a 'wait-and-see' approach. Poland and the United Kingdom are supporting the development of shale gas.

adopting similar prohibitions. The key quoted reasons for the bans was water contamination. On the other hand, others — Poland, Romania and the United Kingdom — have promoted exploration and drilling.

Poland in particular has strongly supported the development of the unconventional gas to reduce its energy dependence on Russia. To develop the potential of Polish basins situated in the Baltic, the Lublin, and the Podlasie regions, the Polish government included legislation on shale gas exploration and production among its top priorities. The country has issued many licences to companies (including the US company Chevron) for exploration activities and test wells. Though initial expectations were downgraded in late 2012, when published data lowered the initial estimates of the reserves by as much as 90 %, the country maintains a welcoming attitude towards shale gas exploration and extraction prospects.

The UK is considering developing its shale gas resources, esteemed at 20 tcf, as a means of countering the drop in its national natural gas production. In May 2010, the Energy and Climate Change Committee of the House of Commons stated that there was no evidence that hydraulic fracturing process posed a risk to underground water. In December 2012 Britain lifted a one-year ban on shale gas exploitation²⁸, which had been instituted for fear of earthquakes linked to the exploration process. The UK also established an Office for Unconventional Oil and Gas, which will be dedicated to simplifying regulations and to offering tax breaks to the shale gas industry.

In February 2011, the Dutch Energy Council released a report strongly supporting shale gas. However, subsequent public protests led the Dutch authorities to backtrack somewhat and state that more information was needed about the environmental and social impact before further decisions were taken²⁹.

Sweden and Germany have also faced public opposition to shale gas exploration. Germany is nonetheless exploring possibilities to produce shale gas to compensate for decommissioning its nuclear power plants by 2022³⁰. Despite only moderate reserves — only 8 tcf of recoverable shale gas — the German authorities have authorised exploration projects in the region of North Rhine Westphalia.

All things considered, there currently appears to be no consensus within the EU on the future of shale gas. Government attitudes vary, while public opinion remains divided at best, and often outright hostile. Most countries

Across the EU government attitudes vary, and public opinion on the issue is similarly divided, reflecting concerns about shale gas production and its impact on the environment.

²⁸ EurActiv, 2012, *Britain lifts shale gas ban despite earthquakes*, <http://www.euractiv.com/climate-environment/britain-lifts-shale-gas-ban-desp-news-516639>.

²⁹ <http://www.rijksoverheid.nl/onderwerpen/gas/gasexploratie-en-productie/onconventioneel-gas>.

³⁰ EurActiv, 2012, *Germany moves to allow controversial shale gas drilling*, <http://www.euractiv.com/energy/germany-tables-draft-law-allow-f-news-518131>.

All things considered, a replication of the US shale gas 'revolution' in the EU is not probable, given the current low level of public support.

Nevertheless, developments in the shale gas industry could be significant for individual countries, reducing their dependence on energy imports.

have adopted a 'wait-and-see' approach, and concerns are growing regarding several aspects of shale gas extraction. The high level of population density in the EU is generally not compatible with widespread drilling activity. What is more, EU land ownership legislation attributes ownership of underground resources to the state, so landowners do not benefit directly from extraction, as is the case in the US. Finally, there are doubts about the expertise required for a massive shale gas production, about the transparency of the process, and, above all, about the potential impact on the environment and human health. An increasingly contentious debate on the issue is likely to bolster public support for strengthening the regulatory regime governing shale gas and oil development, and the result will be significantly different from that of the US. In order to further structure debate, the European Commission (DG ENVI) has initiated public consultations, soliciting citizens, civil society organisations and public authorities to submit their opinions on shale gas.

The results of this exercise, which ran from 20 December 2012 to 23 March 2013, are expected to be presented in the spring of 2013³¹.

In conclusion, Europe's own 'shale gas and oil revolution' may be a rather distant prospect. But while shale gas is unlikely to transform the EU energy market as a whole, developments in the unconventional gas and oil industry could be significant for individual Member States, offering them considerable economic benefits, including government revenues, private sector jobs and, above all, a reduced energy dependence³². The impact of shale gas on EU national energy markets may vary widely from one country to another, depending on the national energy strategy, the degree of dependence on imports, the expected growth in demand for gas, and social acceptance of such alternative supply sources.

In this context, the EU should continue assessing its shale gas and oil potential and should ensure that administrative and monitoring resources are made available to sustainably develop this industry, while simultaneously ensuring adequate environmental safeguards. The Commission's recent green paper constitutes a step in a right direction, but more concrete proposals should follow to forge a common approach to the issue and facilitate economic benefits, while ensuring a proper regulatory framework (such as water legislation) guarantees the safety of the process for the environment and for human beings.

³¹ European Commission, DG Environment, http://ec.europa.eu/environment/consultations/uff_en.htm.

³² Ernst & Young, 2011, *Shale gas in Europe: revolution or evolution?*, <http://www.ey.com/GL/en/Newsroom/News-releases/Shale-gas-in-Europe--revolution-or-evolution>.