

FRACKING FRENZY



HOW THE FRACKING INDUSTRY
IS THREATENING THE PLANET

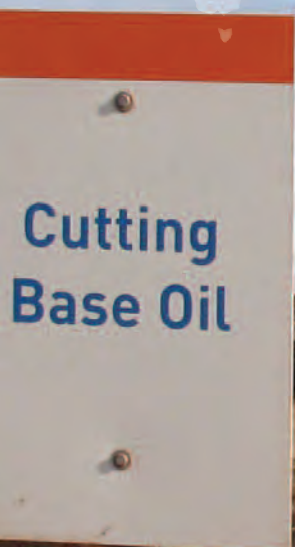
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EXECUTIVE SUMMARY

The global development of ‘unconventional’ fossil fuels (UFF) such as shale gas has provoked much debate involving scientists, industry, political decision-makers, environmental groups and civil society. More than a decade of large-scale development in North America has left a legacy of environmental damage, primarily resulting from the use of high-volume horizontal hydraulic-fracturing (also known as ‘fracking’) to extract the unconventional oil and gas. Despite the controversy surrounding this technique, the numerous unknowns and uncertainties concerning its impacts and the growing number of questions about the economic benefits of this industry, oil and gas operators are eager to identify new opportunities and so are engaged in a battle to make fracking publicly and socially acceptable worldwide.



The United States Energy Information Administration's (EIA) "World Shale Gas and Shale Oil Resource Assessment" report, published in June 2013, analyses the potential shale resources in 42 countries and 95 shale basins worldwide,¹ providing a global overview of the potential scale of the industry. It suggests that outside the EU, US, Canada & Australia, there are considerable potential shale resources (gas and/or oil) on all continents, with the most significant resources available in:

- **The former Soviet Union:** Russia, Ukraine
- **Asia and Pacific:** China, India, Indonesia, Mongolia, Pakistan, Thailand
- **Middle East and North Africa:** Morocco, Algeria, Tunisia, Libya, Egypt, Jordan, Turkey
- **Sub-Saharan Africa:** Mauritania, South Africa
- **Central & South America, and the Caribbean:** Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Paraguay, Uruguay, Venezuela

According to the EIA, the overall estimated technically recoverable resources (including the US) are between 7,299 trillion cubic feet/tcf (206,685 billion cubic metres/bcm) and 7,795 tcf (220,730 bcm) for shale gas and 345 billion barrels for shale oil. Not including the US, the global estimates are 6,634 tcf (187,854 bcm) for shale gas and 287 billion barrels for shale oil.²

These estimates are however little more than guess work, and previous assessments have been shown to be highly misleading in several cases as more accurate data about the geology of different shale areas emerges. In some cases, investments made on the back of such estimates have failed to deliver. For example, in the case of South Africa, the EIA estimated in 2011 that the country was home to significant technically recoverable shale gas resources,³ but these estimates have now been reduced by 20% from 485 tcf (13,734 bcm) to 390 tcf (11,043 bcm) after a re-assessment made in 2013. The Petroleum Agency of South Africa even believes that potential shale gas reserves are not higher than 30 tcf (850 bcm).⁴ Estimates for the shale oil potential for the Monterey basin in California were also reduced by 96 per cent in May 2014.⁵ Estimates have also been reduced in Mexico and China, suggesting that with potential further exploration the current figures could be similarly reduced in the future.

**OVERESTIMATES
HAVE RAISED
DOUBTS THE
TRUE LEVEL OF
RECOVERABLE
RESOURCES
AND QUESTIONS
ABOUT THE
ECONOMIC
VIABILITY OF
THIS INDUSTRY**



² <http://www.eia.gov/todayinenergy/detail.cfm?id=14431>

³ <http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf>

⁴ <http://www.saoga.org.za/oil-gas-hubs/upstream-oil-gas-south-africa>

⁵ <http://www.reuters.com/article/2014/05/21/eia-monterey-shale-idUSL1N00713N20140521>

FRACKING – HOW THE TECHNOLOGY WORKS

Such overestimates have led to considerable speculation as to the quantities of oil and gas available, and have raised doubts about the true level of resources that are technically recoverable and questions about the economic viability of this industry.

While much has been written about fracking in North America and in the EU, this report seeks to provide a global overview of shale gas development in the rest of the world, focusing on a selection of the 42 countries identified by the EIA as having shale oil and gas potential. It concentrates specifically on 11 of these countries: Mexico, Brazil, Argentina, Morocco, Algeria, Tunisia, South Africa, China, India, Indonesia and Russia. These countries include seven of the EIA's top ten countries for technically recoverable shale gas resources,⁶ and are among the leaders in shale development on their respective continents. These countries also reveal the variety and specificity of the dangers associated with the expansion of the fracking industry, including environmental, social and health consequences which extend beyond the borders of individual countries.

High-volume horizontal hydraulic fracturing (fracking) is an extraction process resulting from recent technological improvements that have made it technically possible to extract unconventional sources of fossil fuels in many regions of the world. It is only in the last 20 years that new technologies have made it possible to fracture deep shale rock or clay formations 1 to 5 kilometres underground. Four specific developments have been key:

- Directional drilling (wells that go down 1-5 km and then extend horizontally for another kilometre)
- High-volume hydraulic fracturing (the use of millions of litres of fracturing fluids including sand, water and toxic chemicals, injected at high pressure into deep impermeable geological formations)
- Slick water (the use of gels and high fluid volumes at 100 barrels a minute)
- Multi-well pad and cluster drilling (the drilling of six to twelve wells from one industrial platform)

The first horizontal shale gas well was drilled in 1991, the first slick water fracture took place in 1996, and the use of cluster drilling was introduced in 2007.⁷ What we today call fracking is the result of the aggregation of these new technologies. Industry claims that fracking has been in use since the 1940s are therefore misleading.⁸

CONTROVERSIES ON ESTIMATED SHALE GAS RESOURCES

Country	EIA estimate 2011	EIA estimate 2013	Other estimates	
Poland	187 tcf (5,295 bcm)	148 tcf (4,191 bcm)	27.1 tcf (768 bcm)	Polish Geological Institute
Mexico	681 tcf (19,284 bcm)	545 tcf (15,433 bcm)	141.5 tcf (4,007 bcm)	Pemex (Mexican oil and gas company)
South Africa	485 tcf (13,734 bcm)	390 tcf (11,043 bcm)	30 tcf (850 bcm)	South African Petroleum Agency
China	1,275 tcf (36,104 bcm)	1,115 tcf (31,573 bcm)	885 tcf (20,060 bcm)	Chinese Ministry of Land and Resources

⁶ The US EIA lists the top ten countries with technically recoverable shale gas resources as China, Argentina, Algeria, US, Canada, Mexico, Australia, South Africa, Russia and Brazil. See <http://www.eia.gov/analysis/studies/worldshalegas/>

⁷ <http://thetee.ca/News/2013/01/07/Shale-Gas-Realities/>

⁸ <http://grist.org/climate-energy/stand-back-im-going-to-try-science-inside-the-brain-of-exxonmobil-ceo/>

KEY FINDINGS

Evidence from North America, with anecdotal reports backed up by countless peer-reviewed scientific studies,⁹ shows that fracking can lead to air pollution, ground and surface water contamination, radioactive releases, noise and light pollution, induced earthquakes, climate emissions, occupational health and safety hazards and competition for access to water. This report looks at these threats in the context of 11 countries in the rest of the world (Mexico, Brazil, Argentina, Morocco, Algeria, Tunisia, South Africa, China, India, Indonesia and Russia). It finds:

- **Heavy water demand in water-scarce countries:** The report highlights the crucial importance of water for the future of shale gas and oil development across the globe. Without water, shale gas and oil development cannot happen. The industry needs guaranteed access to millions of litres of (preferably fresh) water (up to 26 million litres of water per fracking operation).¹⁰ According to some analysts “companies will want to secure water rights at reasonable agreed costs stabilised for the entire project life”,¹¹ meaning companies will seek to secure the rights to access water (from lakes and rivers or from groundwater) for the projected lifetime of a project. This could give the industry an important influence over decisions about the future of fresh water resources in targeted states.

Many shale basins are found in areas where water scarcity is already a serious problem or has reached critical levels. In the Maghreb countries – where fresh water availability is expected to drop by 50 percent by the year 2050¹² – water scarcity is already affecting food prices,¹³ while in Mexico, water shortages have already led to violent confrontations. These longstanding issues over access to water can only be exacerbated by the expansion of the thirsty fracking industry.

- **Transboundary aquifers under threat:** Several shale oil and gas basins have been identified underneath important transboundary aquifers such as the Continental Intercalaire Aquifer in the Maghreb, the Karoo Aquifer in Southern Africa and the Guarani Aquifer in South America, creating competition and increasing pressure on their valuable water supplies, which for, in some cases, are non-renewable. Companies will have to drill close to or through these aquifers in order to reach the shale layers. There is a risk of contamination from methane and heavy pollutants, affecting the water supplies used by millions of people, farmers and other business for daily use, with potential severe health and social consequences at a regional level.

- **A shaky industry in earthquake-prone regions:** The geology of the shale basins can vary significantly, sometimes over very short distances. In some regions, such as the earthquake-prone Sichuan basin in China, the Karoo basin in South Africa, the Himalayas or the Sumatran basin in Indonesia, operators face very complex underground geologies, which can vastly inflate the costs and therefore the viability of shale gas extraction. This is on top of the incalculable environmental impacts and risks.

In Mexico for example, seismic activity has considerably increased in the area targeted by fracking operations. In China, devastating earthquakes have been documented in the Sichuan region in the last six years, an area targeted by the shale oil and gas operators. Though the links have not been scientifically proven, the major and deadly seismic events that have occurred here may have been linked to oil and gas activities in this high-risk earthquake region.

Considering that the fracking industry has already managed to trigger several earthquakes measuring more than magnitude 5 on the Richter scale in US regions previously considered to be seismically inactive, there are questions as to what may happen in the case of a large-scale development in these earthquake-prone countries.

- **Sensitive areas already targeted:** Shale basins are also often buried beneath important and sensitive areas including protected natural areas, indigenous territories and primary forests. This has not, however, stopped the fracking industry from developing their activities within the boundaries of these areas, jeopardizing the protection of threatened species, cultural patrimonies and fragile ecosystems.

In Neuquén, Argentina, Total and Shell are already both operating within or just outside the limits of the Auca Mahuida natural protected area, where a wildlife sanctuary is at risk.

Indigenous communities are also at risk, with drilling activities on indigenous lands in Brazil, Russia, South Africa and Argentina leading to conflicts with the local communities, who were not consulted or even informed before exploration activities began.

In the Brazilian Amazon where many areas are classified as conservation areas and also in the Sumatran forest, which has been already badly affected by deforestation for palm oil production and other harmful mining projects, drilling plans have been revealed that would further affect forest areas.

9 The Concerned Health Professionals of New York released in July 2014 an exhaustive “Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Gas and Oil Extraction)” - <http://concernedhealthny.org/wp-content/uploads/2014/07/CHPNY-Fracking-Compendium.pdf>
<http://www.eia.gov/analysis/studies/worldshalegas/>
10 <http://fwap.org/shale-drilling-destroys-regional-water-resources/>
11 http://fdatasrvr.com/fr1/314/48797/Shale_Gas_an_International_Guide_v3.pdf
12 <http://www.fao.org/news/story/en/item/214224/icode/>
13 <http://www.ifpri.org/sites/default/files/publications/ifpridp00985.pdf>
http://www.wri.org/sites/default/files/wri14_report_shalegas.pdf

THE UGTEP NETWORK

Many of the countries in this report are listed as partners of the Unconventional Gas Technical Engagement Program (UGTEP), formerly known as the Global Shale Gas Initiative (GSGI), which was launched by the US Department of State in April 2010.

UGTEP involves at least nine major US government agencies,¹⁴ and was set-up “in order to help countries seeking to utilize their unconventional natural gas resources – shale gas, tight gas and coal bed methane – to identify and develop them safely and economically. [...] Bilateral and multilateral UGTEP engagement has included Mexico, Colombia, Chile, Poland, Ukraine, Bulgaria, Romania, Lithuania, Jordan, Kazakhstan,

Morocco, India, China, Indonesia, Vietnam, South Africa, Botswana and number of other countries, including under IEA, APEC and ASEAN umbrellas.”¹⁵

According to the US Department of the Interior, UGTEP “uses government-to-government policy engagement to bring the US federal and state governments’ technical expertise, regulatory experience and diplomatic capabilities to help selected countries understand their shale gas potential.”¹⁶

According to the 2015 US Congressional Budget Justification for Foreign Operations (Appendix 2) UGTEP will share a budget of US\$ 5.9 million with the Department of State’s Bureau of Energy Resources.¹⁷

- **New industry-friendly legal frameworks:** While Brazil recently introduced a regulatory framework which strengthens the regulations governing the development of fracking projects in unconventional fossil fuel reservoirs, it appears to be the exception to the general rule among the 11 countries analysed in this report. Under pressure from the fossil fuel industry – which has deep pockets and promises employment and investment – several governments have already started to weaken their environmental legislation, alter their tax regimes and put in place industry-friendly mining licensing and production processes, in order to attract foreign investors and expertise. This is often at the expense of the public interest.
- **Worldwide Shale Development – Made in America:** The development of the global shale gas story is – in almost all of the countries covered in this report – found to be closely linked to the activities of the US Unconventional Gas Technical Engagement Programme (UGTEP), a US administration-funded scheme which aims “to increase global energy security and meet environmental objectives through responsible and safe unconventional natural gas development.”²¹

Shale development requires long production periods of 30-50 years in order to recoup the initial investment. Companies need long-term sales contracts and a guaranteed gas price or other forms of attractive financial enticement to make projects economically viable. In the case of Argentina, for example, this ‘need’ has led to a change in the legal framework to guarantee a minimum price of US\$7.50 per unit (MMBTU) for all additional sales to the Argentinian market (above a quarterly adjusted base supply). This is compared to the previous market valuation of US\$2.80 per unit, an increase of more than 250%.¹⁸ In Russia, no taxes will be paid on oil produced from the Bazhenov basin and three other major shale fields for the next 15 years,¹⁹ while in Morocco, oil and gas producers are exempt from corporation tax for the first 10-year of operation.²⁰

UGTEP uses official government channels and US taxpayers’ money to promote high-volume horizontal hydraulic fracturing worldwide, opening doors for the main global players in the oil and gas industry. Through UGTEP, the US is also actively engaged in re-shaping existing foreign legal regulations to create the desired legal framework for the development of shale oil and gas in the targeted countries.

14 hUS government agencies that participate in the UGTEP include: the US Department of Energy’s Office of Fossil Energy (DOE/FE); the US Agency for International Development (USAID); the US Department of Interior’s US Geological Survey (USGS); the US Department of Interior’s Bureau of Ocean Energy Management (BOEM); the US Department of Commerce’s Commercial Law Development Program (CLDP); the US Environmental Protection Agency (EPA) as well as the US Department of the Interior’s (DOI) including its International Technical Assistance Program (ITAP) and the US Trade and Development Agency (USTDA) - <http://www.state.gov/r/pa/prs/ps/2013/06/211017.htm>, <http://www.gastechnology.org/Training/Pages/USTDA-China-Shale-Gas-Training-Workshops.aspx>, <http://www.eia.gov/analysis/studies/worldshalegas/#3>, Footnote 3.

15 <http://www.state.gov/s/ciea/ugtep/>

16 <http://www.doi.gov/intl/itap/ugtep.cfm>

17 <http://www.state.gov/documents/organization/224069.pdf>

18 http://www.pagbam.com.ar/newsletters/OilGas/Energy_Newsletter_-_April_2013_n_55

19 <http://www.platts.com/news-feature/2013/oil/russia-shale-oil/index>

<http://www.washingtontimes.com/news/2014/feb/18/siberian-shale-find-fuels-russias-fracking-future/?page=all>

20 <http://www.nortonrosefulbright.com/knowledge/publications/102343/morocco-ten-things-to-know-about-oil-and-gas%204>

21 http://www.securityassistance.org/sites/default/files/FY2015_CBJ.pdf

CONCLUSION

- **Growing worldwide opposition:** The report finds that even though fracking is only just starting to get underway in most of the countries analysed, public opposition to this industry is already growing and becoming more organised, bringing together a wide range of different actors such as environmentalists, trade unions, political parties, women's organisations and indigenous community representatives.

In some countries, notably in Brazil and Argentina, local authorities have also started to adopt anti-fracking resolutions, triggering a domino effect as others follow suit, as already witnessed in North America and Europe. The South African government also stopped the development of shale gas in the Karoo region for some time, in order to get more clarity about potential impacts.

- **Fracking and climate change:** Energy demand is growing worldwide, creating a major challenge for political decision-makers and civil society alike. The countries analysed in this report are no different. The dangers of climate change are creating pressure to curb coal production, and this pressure is given added weight in countries such as China, where air pollution has reached critical levels.

At the same time, countries which have a long history of oil and gas development (such as Algeria and Argentina) have seen their production levels peak, and are now facing a decline. These countries are now looking for ways to "stimulate" their remaining fossil fuel resources. The opportunity to extract shale oil and gas by fracking is seen as a way to extend production and benefit the economy.

Such a strategy, however, raises serious questions in terms of sustainability, at a time when experts state that no more than one-third of proven fossil fuel reserves can be consumed if we want globally to avoid reaching the 2°C temperature rise tipping point.²² While gas is often promoted as an ideal source of energy for the transition to decarbonising our energy systems, the most recent science has shown that gas production and transportation are far from clean²³ and that unconventional gas could even be comparable to coal in terms of climate impact.²⁴ The IPCC²⁵ and the International Energy Agency²⁶, among others, have warned that the widespread development of shale gas at the global level would have a negative climate impact.

The emerging planned expansion of the shale gas industry outside the EU and North America raises serious concerns because of the almost unavoidable environmental, social and health impacts already seen at existing fracking sites. Given that these problems have proved difficult to avoid in countries with relatively strong regulations to protect the environment, how can this industry be properly monitored in countries where environmental standards are often lower (and sometimes non-existent), and/or where enforcement capacities are frequently limited and where corruption can be an everyday reality?

The short-sighted approach of promoting the development of shale oil and gas in the rest of the world not only ignores the significant and almost inevitable environmental, social and climate impacts, but also overlooks the opportunity for longer term, more sustainable solutions. The urgent need to shift to a low carbon development path requires investment in energy efficiency and renewable energy sources. For the EU, this creates a responsibility as well as an opportunity to support these countries in moving towards a post-fossil fuel future, which is now not only necessary but also feasible.



Residents of the town of Prins Albert in the Great Karoo, South Africa, protest against the proposed hydraulic fracturing or 'fracking' of underground gas reservoirs in the Karoo. This form of drilling may cause leaking of chemicals into the Karoo's sensitive and scarce underground water resources.

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²² <http://www.iea.org/publications/freepublications/publication/english.pdf>

²³ <http://www.pnas.org/content/early/2014/06/25/1323422111>

²⁴ <http://www.nature.com/nature/journal/vaop/ncurrent/full/nature13837.html>

²⁵ <http://www.climatechange2013.org/>

²⁶ http://www.worldenergyoutlook.org/media/weowebsite/2012/goldenrules/weo2012_goldenrulesreport.pdf

<http://www.worldenergyoutlook.org/publications/weo-2014/>

GLOBAL SHALE GAS & DRINKING GROUND WATER RESERVES & EARTHQUAKE REGIONS

IN FOCUS

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MEXICO
SHALE GAS RESERVES
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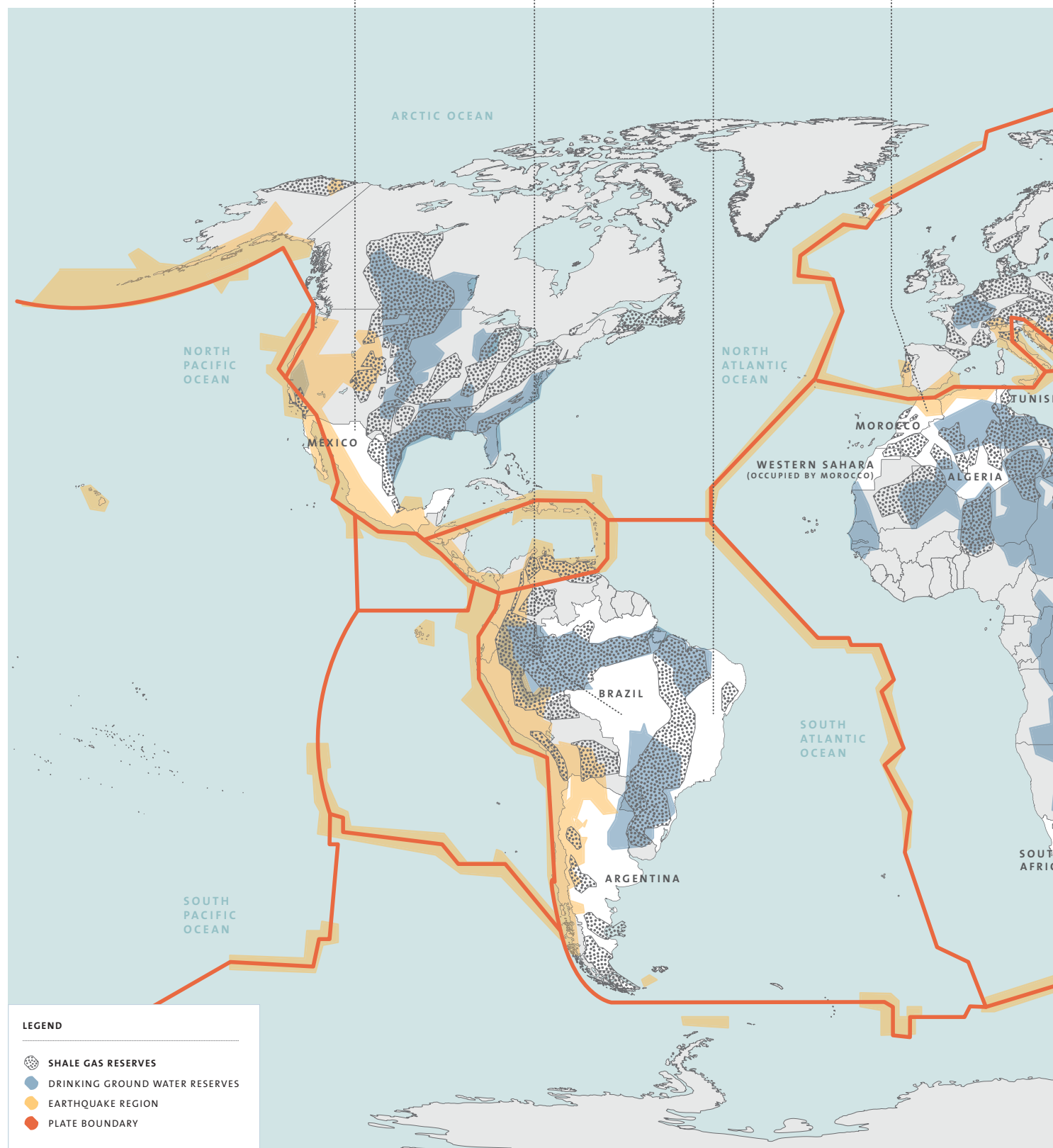
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MAGHREB REGION
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Sources: WVGISTC, WVU, WRI, UNESCO, USGS, NASA.