REGULATING UNCONVENTIONAL OIL AND GAS PRODUCTION: TOWARDS AN INTERNATIONAL SUSTAINABILITY FRAMEWORK

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Abstract

Many of the emerging literatures on unconventional oil and gas production have taken the form of arguing for and against its positive and negative impacts. Studies have taken the form of exploring how it could result in increased energy production, energy security, financial returns and profits to local entities, increased investments in priority sectors, and generation of local employment opportunities. On the other side, there have been explorations of the costs of fracking to the environment, human health, long term sustainability and contamination of drill sites. Less attention have been paid to exploring the possibilities of an international framework through which we could achieve a win-win scenario, i.e maximizing the economic potentials of unconventional oil and gas by reducing the environmental side effects. This paper discusses an international framework built on the theory of sustainable development, through which the environmental concerns associated with unconventional oil and gas production can be addressed.

***Keywords**: sustainable development; unconventional oil; shale gas; hydraulic fracking*

I. INTRODUCTION

The aim of this paper is to explore policy and regulatory issues that must be addressed to ensure the sustainable production of oil from unconventional sources. By unconventional sources we mean oil and natural gas that are found in source rocks, such as shales, oil sands, coal bed methane (CBM), biomass based liquid supplies, rather than in reservoir accumulation. According to the United States Energy Information Administration, shales are fine-grained sedimentary rocks that usually contain natural gas and petroleum, which are embedded between layers. After drilling into the shale, water is pumped, and the ensuing pressure forces the hydrocarbon particles to be released and collected for processing.[1]

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More than ever before, the economic potentials and promise of unconventional oil and gas production and its likely impacts on global energy supply and demand have been subjects of increased attention. According to the International Energy Agency (IEA), unconventional gas will account for nearly half of the increase in global gas production to 2035, with most of the increase coming from the United States and Australia.[2] Unconventional gas production can result in massive expansions of energy production, increased economic activity and job opportunities for local communities. It could also diversify global trends in energy supply and demand, putting pressure on conventional gas suppliers and altering demand and supply trends and traditional pricing mechanisms.[3]

Governments and multinational oil companies are therefore increasingly investing in unconventional oil sources due to the increased scarcity of conventional oil and the higher cost of conventional oil production. Most recently, Shell signed a $10billion shale gas deal with Ukraine – the biggest contract yet in Europe. Similarly, China, India and Indonesia are considered as potential Asian giants in shale gas resources. According to the Indonesian Ministry of Energy and Mineral Resources, Indonesia has potential shale gas resources of 574 trillion cubic feet (tcf) in Sumatra Island, (233 tcf); Kalimantan Island (194 tcf); Papua Island, (90 tcf); Java Island (48 tcf); and in other locations (9 tcf).[4]

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[1] United States Energy Information Administration, "What is shale gas and why is it important" <http://www.eia.gov/energy_in_brief/article/about_shale_gas.cfm> accessed 12 May 2013.

[2] Oil shale deposits in the United States alone constitute 62% of world resources. See WORLD ENERGY OUTLOOK 2012 FACTSHEET, *How Will Global Energy Markets Evolve to 2035?* <http://www.worldenergyoutlook.org/media/weowebsite/2012/factsheets.pdf> accessed 12 May 2013.

[3] Jakarta Globe, "Shale Gas Could Be the Next Big Thing, BCG Says" <http://www.thejakartaglobe.com/business/shale-gas-could-be-the-next-big-thing-bcg-says/> accessed 12 May 2013

[4] There are also enormous shale gas potentials in Africa. For example, the World Bank has recently agreed to help jump start the implementation of Malawi's $84.7 million Energy Sector Support Project, designed to also identifying alternative energy sources such as shale gas production. African countries such as South Africa, Morocco, Algeria, Tunisia, Libya, and Egypt are among the top African countries that have designed *Alternative Energy Programs* aimed at unearthing new sources of energy.

Despite these potentials and promises however, the unconventional gas business is still a subject of controversies in many countries. While the United States and Canada are already taking the lead in the shale gas boom, a greater part of Europe and Asia continue to view shale gas production with skepticism, particularly by asking questions on the quality and environmental sustainability of this resource.[5] While proponents of unconventional oil and gas point to the enormous economic potentials and benefits of exploring huge reserves of gas and oil that were previously prohibitively difficult to reach. Environmental advocates raise concerns about the adverse environmental implications of the multi-stage hydraulic fracturing technology through which shale gas is explored. For example, France, which is estimated to be have one of Europe's largest deposit of shale gas at 180 trillion cubic feet, has

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The Government of South Africa has finalized plans to issue shale gas exploration licenses in the first quarter of 2014. Several companies have already submitted work plans aimed at exploring for shale gas using hydraulic fracturing in the Karoo region. Falcon Oil & Gas Ltd, Shell, Sunset Energy and The Sasol/Chesapeake/Statoil JV are some of the early entrant into the shale gas market in South Africa. Falcon obtained an 11,600-mi2 (30,000-km2) Technical Cooperation Permit (TCP) along the southern edge of the Karoo Basin; while Shell obtained 71,400-mi2 (185,000-km2) TCP surrounding the Falcon area. Similarly, Sunset Energy holds a 1,780 mi2 (4,600-km2) TCP to the west of Falcon; while the Sasol/Chesapeake/Statoil JV TCP hold a permit covering 34,000-mi2 (88,000-km2) in the north of Shell and the Anglo Coal TCP cover an application area of 19,300 mi2 (50,000-km2) to the east of Shell's TPC. See POTENSI ENERGI, "Potensi shale gas Indonesia capai 574 Tcf" <http://industri.kontan.co.id/news/potensi-shale-gas-indonesia-capai-574-tcf> accessed 12 May 2013; also U.S. Geological Survey, *An Estimate of Undiscovered Conventional Oil and Gas Resources of the World, 2012*, Fact Sheet 2012-3028, March 2012; U.S. Geological Survey, *Assessment of Potential Additions to Conventional Oil and Gas Resources of the World (Outside the United States) from Reserve Growth, 2012*, Fact Sheet 2012-3052, April 2012. For a table containing the top ten countries in Shale gas reserves, see United States Energy Information Administration, "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States" <http://www.eia.gov/analysis/studies/worldshalegas/> accessed 12 May 2013.

[5] For example, as of 2013, there have been no commercial production of shale gas and coal bed methane (CBM) in Indonesia. See F Geny, 'Can Unconventional Gas be a Game Changer in European Gas Markets' (Oxford Energy Institute 20120); see also N Altun, C Hiçyilmaz, J Hwang, A Suat Bağci, & M Kök, 'Oil Shales in the World and Turkey; Reserves, Current Situation and Future Prospects: A Review' (Estonian Academy Publishers 2006) 23 (3): 211–227

already banned the procedure.[6] Environmental concerns include issues of contamination of ground water, depletion of fresh water, risks to air quality, the migration of gases and hydraulic fracturing chemicals to the surface, subsurface trespass, performance assurance of multistage hydraulic fracking and the effects of activities on landscape.[7] In South Africa, prospective shale gas exploration in Karoo region has been met with large protests and resistance due to the perceived environmental problems associated with production technologies and processes.[8] These questions remain unanswered and have even resulted in litigation in some countries.[9]

To address these concerns, there is a need for robust international policies and regulatory frameworks that could provide uniform guidelines on sustainable shale gas production. This paper examines some of the legal and sustainability challenges that arise with shale gas exploration. This paper is divided into four parts, this introduction being the first. Part two examines the legal and sustainability issues in horizontal multi-stage fracking activities. Part three explores the prospects of an international approach that sets out detailed procedures and practices

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[6] Shale Gas Europe, "France" (2012) <http://www.shalegas-europe.eu/en/index.php/resources/shale-opportunities-in-europe/france> accessed 12 May 2013. See also A Lund, ' Europe, the New Frontier in Shale Gas Rush' (Financial Tines, 7 March 2010).

[7] See Keith Luft et al., 'Regulatory and Liability Issues in Horizontal Multi-Stage Fracturing' (2012), 50 Alberta Law Review 403; see also Environmental Protection Agency, "Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (2012); see also T Colborn, C Kwiatkowski, K Schultz, K. and M Bachran, 'Natural Gas Operations from a Public Health Perspective' (2011) 17 (5) Human and Ecological Risk Assessment 1039-1056; S Osborn, A Vengosh, N Warner, and R Jackson, 'Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing' (2011) *Proceedings of the National Academy of Sciences* 108 (20): 8172-8176.

[8] Karoospace, "Fracking the Karoo-The People Say No" <http://karoospace.co.za/karoo-space-magazine/talking-point/100-fracking-the-karoo-the-people-say-no> accessed 12 March 2013.

[9] For example in the recent Canadian case of *Ernst V Encana Corp.* (amended statement of claim filed on 21 April 2011), Ms. Jessica Ernst alleges that her water supply was contaminated as a result of fracking operations by Encana. She claims that her water is now so contaminated that it can be lit on fire. As of today, judgement has not been given. See also *Cross Alta Gas Storage and Services v Bonavista Energy Trust* (11 January 2011) Calgary 0901-15314.

to mitigate the environmental concerns associated with shale gas production, particularly how to ensure that shale gas production do not compromise public health and safety. The paper concludes in part four.

II. LEGAL AND SUSTAINABLE DEVELOPMENT ISSUES IN HYDRAULIC FRACKING

Hydraulic fracturing is a mechanical process, which involves the use of pressurized liquid to fracture rock layers so as to increase the permeability of the rocks and to increase the amount of gas produced from the rocks. It is a technique used to release natural gas including shale gas, tight gas, coal bed methane and coal seam gas, petroleum, or other substances for extraction.[10] Hydraulic fracturing creates fractures from a wellbore drilled into reservoir rock formations. In the case of *Coastal Oil & Gas Corp. V Garza Energy Trust*, the Texas Supreme Court describes it as follows:

Fracking is done by pumping fluid down a well at high pressure so that it is forced out into formation. The pressure creates cracks in the rock that propagate along the azimuth of natural fault lines in an elongated elliptical pattern in opposite directions from the well. Behind the fluid comes a slurry containing small granules called proppants-sand, ceramic beads, or bauxite are used that lodge themselves in the cracks, propping them open against the enormous subsurface pressure that would force them shut as soon as the fluid was gone. The fluid is then drained, leaving the cracks open for gas or oil to flow to the wellbore.[11]

The first experimental use of hydraulic fracturing was in 1947 and its first commercial success was with Stanolind Oil in 1949.[12] Since

[10] H Williams & C Meyers, *Manual of Oil and Gas Terms* (Lexis Nexis 2009).

[11] (2008) C268 S.W 3d 1, 6-7, The United States Environmental Protection Agency also defines it as a temporary and intermittent process in which fluids are injected underground at high pressures to create fractures in the coals seam that enhance the recovery of methane gas by creating pathways for the gas to flow to the surface. See (2000) 65 Fed. Reg. 2889, 2892. See also *Legal Environmental Assistance Foundation Inc. V U.S Environmental Protection Agency* 276 F. 3d 1253, 1256.

[12] C Montgomery and M Smith, 'Hydraulic Fracturing: History of an Enduring Technology' (2010) <http://www.spe.org/jpt/print/archives/2010/12/10Hydraulic.pdf> accessed 12 May 2013.

then, it has become a popular mechanical process for extracting unconventional oil and gas from hitherto hard to reach source rocks. As of 2012, it is estimated that close 2.5 million fracture operations have been performed worldwide, more than one million of them in the United States; and that 65% of all new oil and gas wells worldwide were being hydraulically fractured.[13] Proponents of hydraulic fracturing point to the economic benefits of tapping from vast amounts of formerly inaccessible reserves of gas and oil .

In the US for instance, it has been credited for massive economic resurgence and a geometric expansion of energy production. Opponents point to potential environmental impacts, including contamination of ground water, depletion of fresh water, risks to air quality, the migration of gases and hydraulic fracturing chemicals to the surface, subsurface trespass, performance assurance of multistage hydraulic fracking and the effects of activities on landscape. Air pollution from hydraulic fracturing are related to CO2 and methane leaks originating from wells. Studies show that 3.6% to 7.9% of the methane from shale-gas production escapes to the atmosphere in venting and leaks over the lifetime of a well.[14]

There have also been concerns on groundwater methane contamination.[15] According to a 2011 study, there is increased evidence of natural gas (methane) migration into freshwater zones due to methane con-

[13] G King, ' Hydraulic Fracturing 101: What Every Representative, Environmentalist, Regulator, Reporter, Investor, University Researcher, Neighbour and Engineer Should Know about Estimating Frac Risk and Improving Frac Performance in Unconventional gas and Oil Wells (2012) A Paper presented at the SPE Hydraulic Fracturing Technology Conference held in The Woodlands, Texas on 6-8 February 2012. See also EIA, 'World Shale Gas Resources: An Initial Assessment' (2011).

[14] A Mazzoldi, A Rinaldi, A Borgia, & J Rutqvist, 'Induced Seismicity within Geological Carbon Sequestration Projects: Maximum Earthquake Magnitude and Leakage Potential from Undetected Faults. (2012) 10 (1) International Journal of Greenhouse Gas Control 434-442.

[15] R Jackson, S Osborn, A Vengosh, A. and N Warner, 'Reply to Davies: Hydraulic Fracturing Remains a Possible Mechanism for Observed Methane Contamination of Drinking Water. (2011) *Proceedings of the National Academy of Sciences* 108 (43): E872.; ee R Davies, 'Methane Contamination of Drinking Water Caused by Hydraulic Fracturing remains unproven. (2011) *Proceedings of the National Academy of Sciences* 108 (43): E871.

tamination stemming from hydraulic fracturing.[16] For example in 2006, over 7 million cubic feet (200,000 m^3) of methane were released from a blown gas well in Clark, Wyoming resulting in groundwater contamination. These air and water pollution from fracking come with short and long term health effects. Studies show a rise in respiratory diseases and health concerns in some US communities due to a community-wide exposure to airborne contaminants associated with shale exploration. Some studies also show that most residents of these communities would be diagnosed with cancer at some points in their lives due to the fact that airborne chemicals used during the fracking process, such as benzene and benzene derivatives, naphthalene, methylene chloride, are either carcinogenic or suspected as a human carcinogen to the human body.[17] These environmental and health impacts of hydraulic fracking have resulted in a rise in campaigns against the process and in litigation.

Due to the fact that hydraulic fracturing originated in the United States, there have been a plenitude of US environmental litigations on the side effects of hydraulic fracking and on subsurface trespass due to fracking. In the US, there are currently over 20 active lawsuits on contamination of ground water, soil. air and personal injury due to fracking. In most hydraulic fracturing litigation, the Plaintiff brings forward claims based on the torts of trespass, nuisance, negligence and strict liability.[18] Plaintiffs have complained that fluids from an injection dis-

[16] S Osborn, A Vengosh, N Warner, and R Jackson, 'Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. (2011) *Proceedings of the National Academy of Sciences* 108 (20): 8172-8176; see also J Lee, 'Hydraulic Fracturing and Safe Drinking Water' (2012) Proceedings of the US Environmental Protection Agency Technical Workshops for the Hydraulic Fracturing Study: Water Resources Management, Arlington, Virginia.

[17] J Richenderfer, 'Natural Gas Industry Effects on Water Consumption and Management. (2011) Susquehanna River Basin Commission. 40 p. <http://www.mde.state.md.us/programs/Land/mining/marcellus/Pages/surfacewater.aspx.> accessed April 30, 2013;
see also S Richardson,M Plewa, E Wagner, R Schoeny & D DeMarini, 'Occurrence, Genotoxicity, and Carcinogenicity of Regulated and Emerging Disinfection By-Products in Drinking Water: A Review and Roadmap for Research. (2007) *Mutatation Research* 636 (1-3): 178 242.

[18] B Nicholson and B Albrecht, 'Hydraulic Fracturing as a Subsurface Trespass' <http://www.americanbar.org/content/dam/aba/publications/nr_newsletters/energy/201205_energy.authcheckdam.pdf> accessed 12 May 2013; see also Keith Luft et

posal well on a neighbouring property have intruded into the subsurface of their land.

US courts have generally suggested that recovery in such cases can only be allowed where the Plaintiff is able to establish actual harm. In *Coastal Oil & Gas v. Garza Energy Trust,* 258 S.W.3d 1 (Tex. 2008), the court held that a subsurface invasion due to fracking which results in actual damages could constitute an actionable trespass. Courts in Colorado, Ohio and Oklahoma have also provided similar rulings in *Board of Count Commisioners V Park County Sportmen's Ranch LLP; Chance V BP Chemicals* 77 Ohio St.3d 17, 670 N.E.2d 985*; West Edmond Salt Water Disposal Association V Rosecrans* 226 P.2d 965.

Defendants in the US have tried to put up a defence to such claims by arguing that they have operated pursuant to government-issued permits. In *Railroad Comm'n v. Manziel*, 361 S.W.2d 560 (Tex. 1962), the court explicitly stated that it was not granting operators a "protective cloak"; as such a permit does not preclude all liability for trespass. In the 2011 case of *FPL Farming Ltd. v. Envtl. Processing Sys., L.C.*, 351 S.W.3d 306 (Tex. 2011) the Texas Supreme Court, held that a permit is not a "get-out-of-tort-free card" and as such it is an error to hold that because the Texas Commission on Environmental Quality permitted the injection wells, there was no trespass.

Some companies have also sough to rely on the 'Rule of capture' as a possible defence. The rule of capture provides that if a landowner drills a well on their property, and the well does not trespass onto a neighbour's property, then the landowner is entitled to all the oil or gas produced by his well, even if the well drains oil or gas from beneath his neighbour's property. Simply put,a landowner who extracts or "captures" groundwater, oil, or gas from a well that bottoms within the subsurface of his land acquires absolute ownership of the substance, even if it is drained from the subsurface of another's land.[19] . However in *Coastal Oil & Gas v. Garza Energy Trust, it was* held that even though the rule of cap-

al., 'Regulatory and Liability Issues in Horizontal Multi-Stage Fracturing' (2012), 50 Alberta Law Review 403.

[19] The cases of *Ohio Oil Co. v. Indiana,* 177 U.S. 190, 203 (1900); *Acton v. Blundell*, 12 Mees. & W. 324, 354, 152 Eng. Rep. 1223, 1235 (Ex. Ch. 1843); *Kelly v. Ohio Oil Co.,* 49 N.E. 399 (Ohio) illustrate the rule of capture

ture affords forgiveness for subsurface drainage. It is doubtful whether this rule would protect producers from liability where fracking causes communication between wellbore and a gas storage reservoir.

In the Canadian case of *Ernst V Encana Corp.* (amended statement of claim filed on 21 April 2011), Ms. Jessica Ernst alleged that Encana contaminated her water supply as a result of fracking operations. She claimed that her water is now so contaminated that it can be lit on fire. The lawsuit was therefore filed against Encana, the Alberta Energy Resources Conservation Board, and the Alberta Government for contamination of her property and drinking water due to Encana's fracking program. Causes of action alleged by Ernst against Encana, include negligence, nuisance, strict liability and trespass. The plaintiff sought general damages of $500,000, special damages of $100,000, aggravated damages of $100,000, restitutionary damages of $1million and punitive and exemplary damages of $10 million. As of today, judgement has not been given.

The second case was filed by one oil and gas company against another seeking damages for unlawful hydraulic fracturing operations conducted by the latter company. In *Cross Alta Gas Storage and Services v Bonavista Energy Trust* (11 January 21011) Calgary 0901-15314 (Alta QB), the Plaintiff alleged that in 2001, a natural gas well that had been abandoned since 1980 was fracture-stimulated and put back in production, resulting in unlawful gas production by the defendants. The Plaintiff's claim relies on theories of conversion, unjust enrichment and unlawful interference with economic interests. The Plaintiff sought an order asking the defendant to shut in and abandon the well; general damages in the sum of $40 million and punitive damages of $500,000. On 11 January 2011, the Alberta Court of Queen's Bench issued an interim injunction directing that the well be shut-in pending the determination of the suit. The substantive suit however remains undetermined.

These cases demonstrate some of the legal and sustainable development issues that unconventional oil and gas exploration through the hydraulic fracking process has generated. More than ever, communities and landowners are raising concerns on the sustainability of this process, resulting in a plenitude of subsurface intrusion litigations based on the torts of trespass, nuisance, negligence and strict liability.

tional oil and gas production by reducing the environmental side effects. By establishing a legal framework which is built on a compulsory sustainable development screen for projects, the environmental and health impacts of unconventional oil and gas production could be holistically addressed.

The most commonly cited definition of sustainable development is the definition provided by the Brundtland Commission: 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.[20] The idea of sustainable development allows us to balance economic gains with environmental protection, without one conflicting with the other. The concept of sustainable development advocates development that promotes economic development, environmental protection, social development, (which includes the fulfilment of fundamental human rights) in a balanced, mutually supportive and integrated manner.

Some of the health and environmental impacts of hydraulic fracking touch directly on human rights. Without adequate protection for the environment while pursing the economic benefits of unconventional oil and gas production, the human right to health and life would be substantially threatened.[21] Hydraulic fracking projects that pollute the environment pose direct threats to human survival and to the enjoyment of the right to life. The adverse health impacts of hydraulic fracking could also constitute a violation of the right to health.

As such, there is a need for an approach that mainstreams the protection of the right to life and other human rights into the design and execution of unconventional oil and gas projects. Without good health, the ability to enjoy the economic prosperity brought by unconventional

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[20] The United Nations World Commission on Environment and Development Report (the Brundtland Report) *Our Common Future* (OUP 1987).

[21] See also, The Preamble to the Aarhus Convention, which links human rights and environment. It notes that adequate protection of the environment is essential to the enjoyment of basic human rights. UNECE, Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Adopted 25 June 1998, entered into force 30 October, 2001) No. 37770 <http://treaties.un.org/doc/Publication/MTDSG/Volume%20II/Chapter%20XXVII/XXVII-13.en.pdf> (accessed 19 March, 2012).

oil and gas production would be significantly threatened.[22] Economic growth that is anchored on the respect of the fundamental human rights of citizens is a pre-requisite and a pre-condition for achieving sustainable development.[23] To avoid a trade off between the economic prospects of unconventional oil and gas production and its environmental side effects, there is a need to balance unconventional oil and gas production with the goal of respecting and protecting fundamental human rights.

The indicators for assessing sustainability embody the balancing of the two complementary pursuits that are often portrayed as opposing: economic growth and respect for human rights. It is necessary to expound these indicators as necessary criteria that a project must meet

[22] As Herophilus the Physician to Alexander the Great wrote in his often quoted poem: 'When health is absent Wisdom cannot reveal itself, Art cannot become manifest, Strength cannot fight, Wealth becomes useless and intelligence cannot be applied' *Encyclopedia of World Biography Supplement* (Vol. 25, Thomson Gale 2005).

[23] Ever since the 1986 *United Nations Declaration on Development* described the lack of attention for the implementation, promotion and protection of civil, political, economic, social and cultural rights as one of the obstacles to development; and that the promotion of, respect for and enjoyment of certain human rights and fundamental freedoms cannot justify the denial of other human rights and fundamental freedoms, many scholars have argued that respect, protection and fulfilment of human rights is crucial to achieving sustainable development. This is the argument that human rights and sustainable development are interdependent and mutually reinforcing concepts. One cannot be achieved without the other. This idea was affirmed at the World Conference on Human Rights in the 1993 Vienna Declaration and Programme of Action, which stated that democracy, development, respect for human rights and fundamental freedoms are interdependent and mutually reinforcing. It was acknowledged that the full enjoyment of human right requires durable economic and social progress, and vice versa: in other words, there cannot be full attainment of human rights without development, nor can there be development without respect for human rights. See also Resolution 1819 of the General Assembly of the Organization of American States which asserts that: "the effective enjoyment of all human rights, including the right to education and the rights of assembly and freedom of expression, as well as full enjoyment of economic, social, and cultural rights, could foster better environmental protection by creating conditions conducive to modification of behavior patterns that lead to environmental degradation, reduction of the environmental impact of poverty and of patterns of unsustainable development…" We support this argument. This paper argues that without explicit safeguards, policies and projects intended to advance economic goals can have serious negative impacts on fundamental human rights.

before it can be approved under a sustainable development threshold. By exploring the main linkages between projects and their impact on the economic, environmental and social pillars of SD (which includes respect for human rights), countries can design and execute projects that adopt cleaner technologies that could minimize the environmental and health impacts of hydraulic fracking.

IV. SUSTAINABLE SHALE EXPLORATION MATRIX

During the project planning phases, it is important that companies consider and demonstrate through a comprehensive work plan, how each of the criteria of sustainability will be met and complied with. The work plan must not only be anticipatory by demonstrating how issues of water contamination, waste and effluent discharge and air contamination will be prevented and/or addressed; the work plan must also demonstrate how an exploration project would provide positive long term benefits to residents of the communities where projects will be located.

Examples of factors to be demonstrated under a Sustainability Matrix include:

A. The Economic Criteria

For a project to be considered sustainable, it should lead to economic growth, financial returns and profits to local entities, increased investments in priority sectors, generation of local employment opportunities, a positive balance of payments. A project must lead to an improvement in economic activities in the host community and should add to the economic development of the country as a whole. Project planners must demonstrate how much economic benefits and contributions an exploration project will provide within a specific period of time.

The economic indicator is a major advantage of unconventional oil and gas production. For example, in 2011 alone, the USA produced 8,500,983 million cubic feet of natural gas from shale gas wells, a value of about $36 billion, due to shale gas alone. This increase in value produced has resulted in a net increase in employment rate in the US, with employment rate at the end of 2012 at its highest since 1987. Natural gas imports into the US also decreased by 25 percent between 2007 and

2011, while petroleum imports dropped from a high of 29.248 quadrillion Btu in 2005 to 24.740 in 2011. The Energy Information Administration (EIA) predicts with sustained shale gas production, the USA will by 2020 become a net exporter of natural gas.

These figures show that unconventional oil and gas production will undoubtedly contribute to economic activities an growth in countries with commercial deposits.[24] However these economic potentials must be balanced with the other indicators of sustainable development under a sustainable development screen for projects.

B. The Social Criteria

Unconventional oil and gas exploration should result in increased social benefits, equity and improved quality of life in the host community. Examples include non-interference with clean water supply; reduced air and water contamination; adequate disaster response measures to prevent and to mitigate local impacts. Unconventional oil and gas exploration should not worsen water and air conditions in drill sites and communities. Oil production activities must not result in the violation of human rights of the public. As such, any project that produces human rights impacts or does not positively improve the quality of life for residents cannot be adjudged as leading to sustainable development.

The desired outcome under this indicator therefore is that unconventional oil and gas exploration activities must be planned and executed in a manner that they could contribute to the quality of life in the project communities. For example, residents of Karoo in South Africa have resisted shale gas exploration due to the risks associated with production, particularly concerns that fracking could result in water shortage and could worsen already low standard of living in the region.[25] There

[24] Estimates of global deposits of Shale Oil range from 2.8 to 3.3 trillion barrels of recoverable oil. There are around 600 known oil shale deposits around the world. Even though Shale Oil deposits can be found in about 33 countries, the United States, Russia and Brazil together account for 86% of the world's resources in terms of shale-oil content. Additional deposits are found in Australia, Indonesia, India, Sweden, Estonia, Jordan, France, Germany, Brazil, Morocco, China, and Southern Mongolia. See EIA, 'World Shale Gas Resources: An Initial Assessment' (2011).

[25] In October 2013, more than 200 people marched nearly 3 km to the Shell offices located in the Foreshore are of Cape Town to protest hydraulic fracturing in South

are also concerns that the social benefits and employment to be generated may be negligible in terms of actual numbers and overall sustainability. One importance of adopting a coherent sustainability matrix is that it allows governments and local stakeholders the opportunity to ask companies to demonstrate the actual benefits to be created by a project at the planning an approval stages, and to review these figures with the actual local benefits over a given period of time.

C. The Environmental Criteria

This is arguably the most important criterion of all. Projects should lead to progress in environmental issues, including reduction of methane, CO2 and other green house gases (GHGs), reduced air and water pollution, conservation of local resources, improved health and reduced pressure on local environments. To achieve this, oil companies must invest in cleaner methods of production that could eliminate the risks of methane leakage, water contamination, air pollution and high levels of radioactivity in wastewater.

The desired outcomes are to maintain a sustainable level of non-saline water use; maintain quality of surface water and non-saline groundwater; conserve resources, minimize waste, prevent pollution, and protect the environment and the public; ensure that the public and the environment are not measurably affected by adverse air quality; maximize economic recovery of reservoir fluids and conservation of gas and to ensure that oil and gas production activities do not compromise public safety.

The above discussed sustainability indicators could be adopted as tools for designing provincial or national shale gas exploration policies for project participants. What these indicators emphasize is the need to balance economic prospects of shale gas exploration methodologies and technologies with the local environmental and social impacts, such

Africa. According to the Treasure Karoo Action Group chief executive Jonathan Deal, the march was intended to show the government that people would not stand for the damage fracking would do to the environment. «We are very concerned about the environmental impact, especially because fracking is not regulated in South Africa". According to Deal, The nation's plans to exploit shale-gas reserves are "indefensible" and will lead to a legal battle, Treasure Karoo Action Group Chief Executive Officer Jonathan Deal said Oct. 16.

that progress on one does not result in problems in the other. In the current economy, it is unrealistic to abandon very promising alternatives to oil production when statistics continue to show how much resource rich countries such as Canada, United States, Australia, Indonesia, South Africa and European countries could benefit from unconventional oil and gas. Adopting a sustainability matrix would however serve as a holistic regulatory response that could enable countries to balance the economic effects with the social and environmental aspects.

An argument could be made for setting international regulatory standards that would ensure that global unconventional oil and gas production are sustainable in the short and long term. Since shale gas exploration has already generated global attention, specifically with more Asian and African countries now designing local plans on how to tap into the shale gas boom, there is a need for a body at the level of national governments to establish international guidelines on sustainable shale gas exploration. To achieve this standardization, there is a need to develop an *International Legal Framework on Unconventional Oil and Gas Production,* that would establish a compulsory sustainable development screen for unconventional oil and gas production activities. Perhaps this framework could be established under the auspices of the United Nations Environment Program or the International Maritime Organization.[26]

Under this framework, oil companies would be required to demonstrate that their project activities will have clear sustainable development benefits through a mandatory Detailed Impact Assessment (DIA). Companies must be required to assess the risk that their project activities will have a severe negative environmental, social and/or economic impact through a 'Do No Harm' Assessment. This is in line with the United Nations Guiding Principles for the Implementation of the UN "Protect, Respect and Remedy" Framework which calls on companies,

[26] While UNEP is an international institution that coordinates United Nations environmental activities, the International Maritime Organization (IMO) is a United Nations specialized agency, with a mandate to promote safe, secure, environmentally sound, efficient and sustainable shipping. Within its environmental mandate, IMO has developed and adopted a range of international instruments to address marine pollution which include the United Nation on Civil Liability for Oil Pollution Damages, 29 November, 1969, 14097 U.N.T.S.355 (entered into force on 14 June 1981).

business enterprises and multinational corporations to avoid the human rights impacts of projects on host communities.[27]

Though not legally binding, the UN Guiding Principles, provide an authoritative global standard for preventing and addressing the risk of adverse impacts on human rights linked to business activities such as oil production. By adopting a sustainable development screen, projects that fail to satisfy the above sustainable development threshold would be identified and would not be allowed to continue as they could be detrimental to human health and life. Through such screen there would be an increased potential of mitigating and eliminating the high environmental side effects of unconventional oil and gas production such that its enormous economic potentials would not be lost in transit. This is a win-win scenario.

V. CONCLUSION

Despite the enormous economic potentials of producing oil from the world's vast reserves of unconventional sources, the environmental and health effects have continued to generate scepticisms about the short and long term sustainability of this energy source. Apart from concerns and litigations generated in Canada, and the United States, environmental stakeholders in countries such as Indonesia, South Africa, and Mexico continue to question the environmental impacts of shale gas production.

This paper has argued the environmental and social impacts of shale gas exploration could be addressed by establishing mandatory sustainability requirements or matrix that must be complied with by prospective oil and gas companies in project planning and in selecting production technologies and methodologies. The paper has discussed the sustainability matrix as a pre-requisite for attaining a framework for a 'win-win scenario' with regards to the economic and environmental aspects of unconventional oil and gas production.

Through this framework the economic potentials of unconventional

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[27] J Ruggie, 'Guiding Principles on Business and Human Rights: Implementing the United Nations 'Protect, Respect and Remedy' Framework' (2011) A/HRC/17/31.

oil production could be maximized while minimizing its environmental side effects. By adopting the sustainable development matrix at national and international levels, the economic goals of unconventional oil production could be balanced with environmental and social protection goals, including the protection of fundamental human rights affected by pollution from shale gas exploration sites. An international legal framework will particularly standardize these requirements such that oil companies may be held to the same level of accountability irrespective of whichever country production activities will take place.

Through the sustainable development matrix, oil companies would be required to demonstrate the likely impacts of technologies, processes and procedures adopted for unconventional oil production on the rights and welfare of communities. Companies would also be mandated to adopt international best practices, technologies and internal control mechanisms to ensure that oil and gas production activities do not result in negative health and environmental impacts; and that adequate response measures are put in place in case of such impacts. Arguably this matrix would ensure a drastic reduction in air and ground water contamination that have been associated with sustained hydraulic fracking technologies. It would also ensure that the public and the environment are not measurably affected by oil and gas production activities.

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