Grant agreement No. 640979

ShaleXenvironmentT

Maximizing the EU shale gas potential by minimizing its environmental footprint

H2020-LCE-2014-1
Competitive low-carbon energy

D11.2
Policy Recommendations for the effective governance of shale gas operations in Europe

WP 11 – Suggestions for Policy Formulation

Due date of deliverable 31/08/2018 (Month 36)
Actual submission date 31/08/2018 (Month 36)
Start date of project 1st September 2015
Duration 36 months
Lead beneficiary UCL
Last editor Jędrzej Górski and Christine Trenorden
Contributors UCL
Dissemination level Public (PU)

This Project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 640979.
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History of the changes

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<th>Version</th>
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</tbody>
</table>
Table of contents

Key word list ........................................................................................................... 4
Definitions and acronyms.......................................................................................... 4
1. Introduction ........................................................................................................... 6
2. Background .......................................................................................................... 8
   2.1 Scope of regulatory challenges .................................................................. 8
   2.1.1 Shale gas-specific investment process ................................................. 8
   2.1.2 Shale gas-specific environmental risks .................................................. 9
   2.1.3 Access to land and infrastructure ......................................................... 10
2.2 Recent studies .................................................................................................. 11
   2.2.1 ShaleXenvironmentT ........................................................................... 12
   2.2.1.1 Technical reports ......................................................................... 12
   2.2.1.2 Risk assessment (WP9) ................................................................ 13
   2.2.1.3 Life-cycle assessment (WP10) ....................................................... 14
   2.2.1.4 Regulatory framework for the SLO (WP11) ................................... 15
   2.2.2 Other Horizon 2020 studies ................................................................ 16
   2.2.2.1 FracRisk ..................................................................................... 16
   2.2.2.2 M4shale ......................................................................................... 17
   2.2.2.3 SHEER ........................................................................................ 19
2.3 Concept of governance ..................................................................................... 20
   2.3.1 What is to be governed? ...................................................................... 20
   2.3.2 Definitions of governance ..................................................................... 21
3. Exploitation rights and market access ................................................................. 23
   3.1 Exploration/exploitation authorisations ....................................................... 23
   3.1.1 Prospection, exploration and exploitation permitting ............................ 23
   3.1.1.1 Hydrocarbon directive .................................................................. 23
   3.1.1.2 Hydrocarbon directive in Poland .................................................. 23
   3.1.1.3 Hydrocarbon directive in the UK .................................................... 25
4. Factors in the Successful Exploitation of Shale Gas ........................................... 27
   4.1 The industry perspective .......................................................................... 27
   4.2 The regulator’s perspective ....................................................................... 28
   4.3 The community perspective ....................................................................... 29
5. Matters for Regulation ....................................................................................... 30
   5.1 Reports of Regulation ............................................................................. 30
6. A Reconsideration of the EU Approach ............................................................ 31
   6.1 The 2014 EC Recommendation .................................................................. 31
   6.2 The EIA Directive .................................................................................... 33
7. Policy Matters and Governance ......................................................................... 33
   7.1 Coordinating Authority / Lead Agency ..................................................... 33
   7.2 New Governance ....................................................................................... 35
8. A Stand-Alone Legislative Framework or Integration? ........................................ 35
9. Recommendations ............................................................................................... 37
### Key word list

EIA; energy law; energy policy, environmental impact assessment; EU law; EU energy policy; governance; mining law; resources governance; resources management; risk governance; shale gas; SEA; spatial planning; strategic impact assessment; unconventional hydrocarbons; zoning.

### Definitions and acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>ADP</td>
<td>Abiotic Depletion Potential</td>
</tr>
<tr>
<td>BGS</td>
<td>British Geological Survey</td>
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<tr>
<td>CBM</td>
<td>Coalbed Cethane</td>
</tr>
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<td>CEO</td>
<td>Corporate Europe Organisation</td>
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<td>CTL</td>
<td>Coal to Liquids</td>
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<tr>
<td>DOF</td>
<td>Declaration of Interest</td>
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<tr>
<td>EAGGF</td>
<td>European Agricultural Guidance and Guarantee Fund</td>
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<td>EC</td>
<td>European Commission</td>
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<td>ECJ</td>
<td>European Court of Justice</td>
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<td>EEA</td>
<td>European Economic Area</td>
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<td>EIR</td>
<td>Environmental Information Regulations (UK)</td>
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<td>ELO</td>
<td>Economic License to Operate</td>
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<td>EGS</td>
<td>Enhanced Geothermal System</td>
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<td>ESTNUHE</td>
<td>European Science and Technology Network on unconventional hydrocarbon extraction</td>
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<tr>
<td>EUR</td>
<td>Estimated Ultimate Recovery</td>
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<tr>
<td>FAETP</td>
<td>Fresh Water Aquatic Ecotoxicity Potential</td>
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<tr>
<td>IEA</td>
<td>International Energy Agency</td>
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<tr>
<td>IGEM</td>
<td>Institution of Gas Engineers &amp; Managers</td>
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<td>IMPEL</td>
<td>European Union Network for the Implementation and Enforcement of Environmental Law</td>
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<td>IRP</td>
<td>International Resource Panel (United Nations)</td>
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<td>EU</td>
<td>European Union</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FoI</td>
<td>Freedom of Information Act (UK)</td>
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<td>GWP</td>
<td>Global Warming Potential</td>
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<td>GTL</td>
<td>Gas-To-Liquids</td>
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<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
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<td>J&amp;E</td>
<td>Justice and Environment</td>
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<td>JRC</td>
<td>Joint Research Centre (European Commission)</td>
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<td>LLO</td>
<td>Legal License to Operate</td>
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<td>LNG</td>
<td>Liquefied Natural Gas</td>
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<td>MAPP</td>
<td>Major-Accident Prevention Policy</td>
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<td>mD</td>
<td>milli Darcy</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<td>MP</td>
<td>Polish Monitor, Monitor Polski</td>
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<td>MS</td>
<td>Member States</td>
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<td>NATO</td>
<td>North Atlantic Treaty Organization</td>
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<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<td>NGLs</td>
<td>Natural Gas Liquids</td>
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<td>OGA</td>
<td>Oil and Gas Authority (UK)</td>
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<td>OJ</td>
<td>Official Journal</td>
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<td>ROMP</td>
<td>Reviews of Mineral Planning</td>
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<td>SEA</td>
<td>Strategic Environmental Assessment</td>
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<td>SLO</td>
<td>Social License to Operate</td>
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<td>UNECE</td>
<td>United Nations Economic Commission for Europe</td>
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<td>TEN</td>
<td>Trans-European Networks</td>
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<td>TEN-E</td>
<td>Trans-European Networks for Energy</td>
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<td>TETP</td>
<td>Terrestrial Eco-Toxicity Potential</td>
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<td>TTIP</td>
<td>Transatlantic Trade and Investment Partnership</td>
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<td>UFF</td>
<td>Unconventional Fossil Fuels</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<td>USA</td>
<td>United States of America</td>
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<td>USEIA</td>
<td>United States Environmental Information Agency</td>
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<td>USGS</td>
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<td>World Wildlife Fund</td>
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1. Introduction

If it is accepted in the interests of energy security, that bridging fuels have a role in the transition towards the development of a resource-efficient, low-carbon economy, in the European Union, then not only is it necessary to consider the environmental footprint of the development of natural gas and in particular shale gas, but also the content of policy and a regulatory framework for the effective governance of shale gas operations to protect the health and well-being of the community which entails the maintenance of a sustainably healthy environment.

The ShaleXenvironmentT project aimed to quantify, and identify technologies that would minimise, the environmental footprint of shale gas development.

The objective of WP 11 of the project was to explore the likely benefit of, and the options for, new governance framework approaches to the development and facilitation of the shale gas industry, based on scientific evidence and stronger participating mechanisms that better connect stakeholders to decision-making processes. In addition, the work package was tasked with assessing whether a dedicated regulatory regime for shale gas operations is desirable (to assuage community concerns). The intention was to make recommendations for new regulatory approaches and industry practices to enhance community confidence, focusing on transparency, engagement and participation.

In D11.1 we realised that there had already been a number of concise summaries of shale gas-related and SLO-related legislation commissioned by institutions of the EU and published since 2011 and as the relevant EU laws had not essentially changed, we decided to add to the literature and differentiate from existing reports by providing a comprehensive analysis of legislation relevant to public engagement around the development of shale gas at the level of the EU and Member States (MS) along with results of and some conclusions from shale gas-related public opinion surveys also commissioned by the EU.

The objective of D11.2 was the drafting of recommendations that policymakers and governmental agencies might consider in regulating shale gas in Europe. The task to be addressed by this deliverable was the following: identify the nature and content of the regulatory framework for the successful exploitation of shale gas, including factors to enable a choice to be made between whether integration (with other legislation) or a "stand-alone" approach is desirable. Thus the specific topic of this deliverable is: Policy recommendations for the effective governance of shale gas operations in Europe.
It has long been recognised that States have a role in protecting and improving the natural environment for present and future generations, and while they have the sovereign right to exploit their own resources for the purposes of development, that development should be sustainable and in consequence environmental protection must constitute an integral part of the development approval process. States should have effective environmental legislation.

All concerned citizens should have access to information concerning the environment that is held by public authorities, the opportunity to participate in the decision-making process concerning development where there are environmental issues and effective access to justice.

The European Union agreed to guarantee the rights of access to information, public participation in decision-making and access to justice in environmental matters, in accordance with the provisions of the Aarhus Convention, and to take the necessary legislative, regulatory and other measures to establish and maintain a clear, transparent and consistent framework to implement the provisions of the Convention.

The progressive development of shale gas deposits in the United States of America resulted in environmental concerns being raised by concerned citizens in that country. The prospect of the exploitation of shale gas in the European Union alarmed some of its citizens, and led to consideration by the European Parliament, resulting in the Recommendation of 2014. The concept of social licence has pervaded discussion around the progress of EU MS towards the exploitation of shale gas within their jurisdictions. Indeed, in a number of MS, hydraulic fracturing (necessary for the exploitation of shale gas) has been banned or suspended for lack of a social licence to proceed in that direction or as a result of serious environmental concerns around the activities necessary for the exploitation of shale gas.

However it is now timely to consider the governance of shale gas development in the European Union. Sound governance will assist in allaying fears in the community culminating in the recognition by elected governments of the absence of a social licence to operate for shale gas developers, that have led to the abandonment of shale gas development in a number of MS. Governance is not only about the content of the underpinning policy and regulation at the EU and member state and local authority levels, but also the institutional arrangements, namely the nature and culture of the authorising and responsible authority(ies) and the coordination or relationships between them (if multiple authorities) in relation to the approval and oversight of shale gas exploration and development.

This report establishes the background by a consideration of the scope of regulatory challenges before looking at the results of the recent studies funded by the European Commission, of which this project is one, together with the results of two of the work packages in ShaleXenvironmenT, before considering some concepts of governance. Part 3 looks briefly at exploitation rights and market access; that is the nature of hydrocarbon development permitting through the implementation of the Hydrocarbon Directive in Poland and UK. In Part 4 there is a consideration of the factors involved in the successful exploitation of shale gas, from the various perspectives of the industry, the regulator and

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1 Declaration of the UN Conference on the Human Environment, Stockholm, 1992
3 ibid, Principle 11
4 ibid, Principle 10
6 ibid, art 3
7 Bulgaria, France, Germany, the Netherlands, Ireland, Scotland, Wales.
the community, in an attempt to ascertain the essence of good governance for the shale gas industry. In matters for regulation in Part 5, some comments from the other projects that relate directly to the content of regulation are reviewed. In part 6, there is discussion of the European Union Recommendation of 2014 and whether consideration should be give to a harder form of law, as well as the EIA Directive. Policy matters and Governance is the subject of Part 7, with Part 8 being devoted to a discussion of whether domestic legislation governing shale gas operations should be integrated with existing hydrocarbons legislation or ‘stand-alone’. Part 9 is devoted to conclusions and recommendations.

2. Background

2.1 Scope of regulatory challenges

The wide scope of regulatory challenges related to the effective governance of shale gas operations in Europe largely stems from the ‘fracking’-specific problems which vastly add to the complexity of problems normally encountered by policy-makers regulating the exploration and/or production of conventional hydrocarbons and competitive access to the mid-stream infrastructure in Europe. The scope of regulatory challenges related to the governance of production and exploration can be best explained by looking at the dynamics of the shale-specific investment process from a more technical perspective.

2.1.1 Shale gas-specific investment process

As explained in the very first study on the existing EU shale gas-related regulation released in 2011 (‘Phillipe Report’), the field-specific investment process generally includes five distinct phases: 1) ‘identification of the gas resource’ (including geological surveys), 2) ‘early

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10 For the technical terms (such as definitions of conventional and unconventional hydrocarbons), see Error! Reference source not found.. The concepts of ‘upstream,’ ‘midstream’ and downstream refer to sectors within oil and gas industry (primarily oil). These concepts are usually a matter of convention within this industry and are rarely defined by binding legislation. For example, according to a glossary release by Esanda Engineering in 2016, (i) ‘upstream’ refers to “[e]xploration, development and production,” (ii) ‘midstream’ refers to “[t]ransportation to market or refinery,” and (iii) ‘downstream’ “[g]enerally refers to crude oil refining, petrochemicals, marketing and distribution.” See generally, Esanda Engineering, ‘Upstream Oil and gas glossary’ (March 2016). In turn, according to more complex definitions offered by the ABB (ASEA Brown Boveri), (i) ‘upstream’ “[t]ypically refers to all facilities for production and stabilization of oil and gas” whereby “[t]he reservoir and drilling community often uses upstream for the wellhead, well, completion and reservoir only, and downstream of the wellhead as production or processing” while “[e]xploration and upstream/production together is referred to as E&P,” and (ii) ‘midstream’ is “[b]roadly defined as gas treatment, LNG production and regasification plants, and oil and gas pipeline systems.” ABB’s study does define downstream, instead referring to (i) ‘refining’ sector that is “[w]here oil and condensates are processed into marketable products with defined specifications such as gasoline, diesel or feedstock for the petrochemical industry” whereby “[t]he refinery offsites such as tank storage and distribution terminals are included in this segment, or may be part of a separate distributions operation,” and (ii) ‘petrochemical’ sector where “[t]hese products are chemical products where the main feedstock is hydrocarbons. Examples are plastics, fertilizer and a wide range of industrial chemicals.” See Håvard Devold, ‘Oil and gas production handbook An introduction to oil and gas production, transport, refining and petrochemical industry’ (ASEA Brown Boveri, August 2013) Edition 3.0, ISBN 978-82-997886-3-2, 4.

As far as non-binding definitions proposed by governmental bodies are concerned, according for example to the British Columbia Oil and Gas Commission, (i) ‘upstream activity’ refers to “[r]ecovery, production and gathering of natural gas and petroleum.” (ii) ‘midstream activity’ refers to “[t]he processing of natural gas or crude oil including transportation by pipeline of a raw product to a processing facility” whereby “[t]he Commission views the midstream infrastructure as including primarily gas processing plants and major pipelines transporting raw product (crude oil, natural gas, or natural gas by products) to a processing facility,” and (iii) ‘downstream activity’ refers to “[t]he selling, distributing of natural gas and the refining of petroleum.” See generally, British Columbia Oil and Gas Commission, ‘Glossary and Definitions’ Version 1.3 (June 2017) <http://www.bcogc.ca/node/11467/download> accessed 27 July 2017.

As far as legal definitions are concerned, for example the Directive 2009/73 defines ‘upstream pipeline network’ as “any pipeline or network of pipelines operated and/or constructed as part of an oil or gas production project, or used to convey natural gas from one or more such projects to a processing plant or terminal or final coastal landing terminal.” See Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC (2009) OJ L 211 94–136, article 2.2.

evaluation drilling’ (for example involving collection of samples), 3) ‘pilot project drilling’ (involving drilling some horizontal wells some fracking), 4) ‘pilot production testing,’ (involving drilling multiple wells and planning gas transmission infrastructure), and 5) ‘commercial development.’ In turn, a well-specific investment process, according to the report on shale-related environmental and health risks released in 2013 (“AEA Report”)


2.1.2 Shale gas-specific environmental risks

The shale gas-specific investment process thus comes with numerous associated risks as well as technical challenges. The key environmental risks were categorised in the report by the European Union Network for the Implementation and Enforcement of Environmental Law (“IMPEL”) into:

- contamination of groundwater by: 1) inadequate well design or well failure, 2) spills of chemicals or returned fluids at the surface, and 3) mobilisation of solutes and/or methane by high-volume hydraulic fracturing,
- contamination of surface water and/or soil by above-ground spills, and/or leaks from storage tanks,
- adverse impacts on water resources through abstraction for high-volume hydraulic fracturing,
- pollution of the air by: 1) fugitive emissions of methane, 2) venting from on-site tanks/equipment, 3) flaring,
- pollution caused by the inadequate management of wastes, including: 1) waste waters, 2) drilling muds and cuttings, 3) gases, and 4) and naturally occurring radioactive material (NORM),
- induced seismicity: both from conventional and unconventional onshore oil and gas activities.

More specific environmental risks were assessed in separate studies. For example, as far as increased emissions are concerned, according to Milieu’s report on the impact of shale gas on climate released in 2012: 1) “the GHG Emissions per unit of electricity generated from shale gas [are estimated] to be around 4% to 8% higher than for electricity generated by conventional pipeline gas from within Europe,” 2) “[t]he additional emissions arise in the pre-combustion stage, predominantly in the well completion phase when the fracturing fluid is brought back to the surface together with released methane,” and 3) “[i]f emissions from well completion are mitigated, through flaring or capture, and utilised then this difference is reduced to 1% to 5%.” Or, as far as land and water use is concerned, the JRC’s case study of Poland and Germany released in 2013 assessed that 1) “under the Average Impact Scenario, (…) [t]he land taken up for shale gas extraction as a percentage of the total land converted to industrial purposes within the whole country in the period 2006-2028 is 2% in

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13 Phillipe Report (n12), para. 8.
14 Mark Broomfield, ‘Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe’ AEA Technology plc (10 August 2012, reissued with minor corrections 11 February 2013) 07.0307/ENV.C.1/2011/604781/ENV.F1, ED57281 - Issue Number 1 7 c
17 Daniel Forster and Jonathan Perks, ‘Climate impact of potential shale gas production in the EU’ AEA Technology plc (30 July 2012) CLIMA.C.1./ETU/2011/0039r, AEA/R/ED57412, iv. (“Milieu Report”) The caveat is that such findings pertain to the report’s ‘base case’ which assumes (i) “15% of the emissions from well completion are flared and the remainder are vented,” and (ii) a well productivity of 2 bcf (56.6 million m³), and a transport distance of 100km.” See ibid, 58.
both Poland and Germany,"^{18} and 2) (Considering only water withdrawals within the shale play area) "the share of water use for shale gas extraction accounts for 0.15% of the total water withdrawals for all sectors in Poland, and 0.10% in Germany for the average impact scenario in 2028."^{19}

2.1.3 Access to land and infrastructure

Another set of shale gas-related challenges pertains to the unimpeded access to: land for gas exploration and production, midstream-infrastructure for gas transmission, and to markets for gas commercialisation. As far as land access is concerned, the ECR study on the market impact of unconventional gas development in Europe ("JRC Market Report") released in 2012 stated that “with farm plots smaller and land ownership more diffuse in Europe, a key regulatory consideration is how to manage multiple landowners and their varying claims and concerns."^{20} As far as the access to the mid-stream infrastructure and the markets is concerned, the JRC Market Report states that 1) “[r]eforms to the EU’s Internal gas market are still ongoing [and] [t]here have been encouraging recent developments indicating that EU market liberalisation is gathering pace.”^{21} and 2) “[q]uestions thus remain as to whether the EU’s Internal market rules can be practically applied in the context of possible unconventional gas development and be clear, non-discriminatory, timely and repeatable across large operations.”^{22}

Altogether, at the initial stage of conceptual works towards an improved regulatory environment in the EU, the Philippe Report^{23} categorised shale gas-related challenges for the purposes of that early analysis into:

- ‘general regulatory environment’ defined by the authors as “the position of the government, other authorities and the public regarding shale gas activities,”^{24}
- ‘core procedures’ which, according to the authors include: 1) “[t]he number and role of the competent authorities in the authorisation and core permitting procedures,”^{25} 2) “[t]he core procedures properly speaking (e.g. duration, documents to submit, criteria for granting the authorisation and/or permit, appeal possibilities, public participation),”^{26} and 3) “[t]he authorisations and/or permits properly speaking (e.g. duration, content, conditions, stages of prospection/production it covers, sanctions in case of non-compliance).”^{27}

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18 Carlo Lavalle, Claudia Baranzelli, Ines Vandecasteele, Ricardo Barranco, Ines Mari Rivero, Serenella Sala, Pascual Perez Ballesta, Annette Borowiak, Robert Field, Ad de Roo, Peter Burek, Bernd Gawlik and Nathan Pelletie, ‘Spatially - resolved Assessment of Land and Water Use Scenarios for Shale Gas Development : Poland and Germany’ Publications Office of the European Commission (2013) JRC83619, EUR 26085 EN, 13. The average scenario in this assumed in the case of the water use that “35% of the flowback water is recycled, and in the high impact scenario we assume that no water is recycled, and therefore 100% of the water withdrawn is consumed.” (see ibid, 58), whereas in the case of the land use “[t]he High and Low Impact Scenarios are compared to the Average Scenario in terms of number of people living at different distances from the exploitation sites (blue and red line, respectively), in the last allocation year 2028” (see ibid, 58).

19 See ibid, ix.


21 JRC Market Report (n20), ix.

22 ibid. ix.


24 See Philippe Report (n22), para 13, 16.

25 ibid.

26 ibid.

27 ibid.
• ‘authorisation and permit characteristics’ including: 1) “[c]ontent of authorisations/permits” 28) 2) “[v]alidity duration of authorisations and permits,” 29) 3) “[s]anctions in case of non-compliance,” 30)
• ‘transit to production and post-authorisation and/or post-permits aspects’ which authors further categorised into: 1) “[t]ransit to production,” 31) 2) royalties, 32) 3) “[c]ontrol once the exploration/production is launched,” 33) 4) “[t]ermination of exploration/production operations,” 34)
• ‘environmental and health protection aspects’ including: 1) “general environmental legislation,” 35) 2) “environmental liability,” 36) 3) water, 37) 4) “extraction and disposal of mineral resources,” 38) 5) “gas emissions in the air,” 39) 6) soil protection, 40) 6) wild life protection, 41) 7) noise, 42) and 9) “[p]ressure equipments,” 43)
• ‘legislation with respect to chemicals’ including: 1) “[t]ransport of dangerous goods,” 44) 2) “[p]revention of major accidents and limitation of their consequences for man and environment,” 45) and 3) registration, evaluation, authorisation and restriction of chemicals (“REACH”), 46)
• ‘civil law aspects other than property law,’ which according to the authors come down to “[l]egal regime concerning civil liability aspects related to shale gas activities,” 47) further subcategorised by the authors into: 1) civil liability, 48) and 2) the compensation of damage, 49) and
• ‘other permitting procedures’ identified by the authors. 50)

2.2 Recent studies

While the above studies were conducted at the early stage, a number of further research projects was funded by European Commission after the culmination of shale gas-related discussion with EU institutions in 2014, including: 1) ‘Furthering the Knowledge Base For Reducing the Environmental Footprint of Shale Gas Development (…)’ (‘FracRisk’) co-ordinated by University of Edinburgh, 51) 2) ‘Measuring, monitoring, mitigating, managing the environmental impact of shale gas (…)’ (‘M4ShaleGas’) co-ordinated by the Netherlands Organisation for Applied Scientific Research, 52) 3) this project - ‘Maximizing the EU shale gas potential by minimizing its environmental footprint (…)’ (ShaleXenvironmenT) co-ordinated

28 ibid, para 13, section 3.1.
29 ibid, para 13, section 3.2.
30 ibid, para 13, section 3.3.
31 This, according to the authors, pertains to the post-exploration phase when separate authorisation need to be granted to the developers prior to commencing production activities. Phillippe Repo (n12), para 13, section 4.1.
32 ibid, para 13, section 4.2.
33 ibid, para 13, section 4.3.
34 ibid, para 13, section 4.4.
35 ibid, para 13, section 5.1.1.
36 ibid, para 13, section 5.1.2.
37 ibid, para 13, section 5.2.
38 ibid, para 13, section 5.3.
39 ibid, para 13, section 5.4.
40 ibid, para 13, section 5.5.
41 ibid, para 13, section 5.6.
42 ibid, para 13, section 5.7.
43 ibid, para 13, section 5.8.
44 ibid, para 13, section 6.1.
45 ibid, para 13, section 6.2.
46 ibid, para 13, section 6.3.
47 ibid, para 13, section 7.2.
48 ibid, para 13, section 7.2.1.
49 ibid, para 13, section 7.2.2.
50 ibid, para 13, section 7.2.2.
by the University College London,\textsuperscript{53} of which this report is a part, and 4) ‘SHale gas Exploration and Exploitation induced Risks develops best practices for assessing the impacts and mitigating the environmental footprint of shale gas extraction and exploration,’ (‘SHEER’) co-ordinated by AMRA research centre from Naples\textsuperscript{54} - among which FracRisk, M4ShaleGas and SHEER have made express references to regulatory reform.\textsuperscript{55}

\subsection*{2.2.1 ShaleXenvironmentT}

The overall purpose of the entire ShaleXenvironmentT project has been to propose a comprehensive approach towards ensuring that the future development of shale gas in Europe would safeguard the public with the best environmental data suitable for governmental appraisal, and ultimately for encouraging industrial best practice.\textsuperscript{56} More specific objectives of the project have been to: 1) to assess the environmental footprint of shale gas exploitation in Europe in terms of water usage and contamination, induced seismicity, and fugitive emissions, and 2) maintain a transparent discussion with all stakeholders, including the public, and to suggest ideas for approaches on managing shale gas exploitation, impacts and risks in Europe, and eventually worldwide.\textsuperscript{57}

\subsubsection*{2.2.1.1 Technical reports}

It is beyond the scope of this report and the competence of its authors to draw conclusions and make recommendations from ShaleXenvironmentT’s exclusively technical reports which expressly indicated their regulatory and policy-related implications, including the following deliverables:

\begin{itemize}
  \item ‘Report on PTx properties of shale rock samples,’\textsuperscript{58}
  \item ‘Reservoir conditions for rock library samples’\textsuperscript{59}
  \item ‘Full traditional characterisation on shale core samples representative of EU formations,’\textsuperscript{60}
  \item ‘Experimental tomographic imaging of pore size, structure, networks and potential flow paths within selected shale core samples,’\textsuperscript{61}
  \item ‘Fluid behaviour for water, methane, other hydrocarbons, fracturing fluids and their chemicals confined in the narrow pores found in shale rocks,’\textsuperscript{62}
  \item ‘Experimental characterization regarding fracture permeability and healing properties, elastic mechanical data and creep behaviour under high pressure,’\textsuperscript{63}
\end{itemize}

\textsuperscript{53} <http://shalexenvironment.org/> accessed 1 May 2018.
\textsuperscript{54} <http://www.sheerproject.eu/> accessed 1 May 2018.
\textsuperscript{55} As far as SHEER is concerned, some minor discussion of proposed changes to shale-related regulation can be found in two SHEER deliverables, including: Paolo Capuano, Raffaella Russo, S. Lasocki, J. Jaruslawski, A. Gunning, S. Cesca, ‘Guidelines for the monitoring of shale gas exploration and exploitation induced environmental impacts’ (29 May 2018) SHEER Horizon 2020 Project no. 40896 Deliverable 8.2; Paolo Capuano, Raffaella Russo, S. Lasocki, J. Jaruslawski, A. Gunning, S. Cesca, ‘Guidelines for Risk Management of Shale Gas Exploration and Exploitation’ (29 May 2018) SHEER Horizon 2020 Project no. 40896 Deliverable 8.3.
\textsuperscript{56} The project’ (Shalexenvironment.org) <https://shalexenvironment.org/the-project/> accessed 1 August 2018.
\textsuperscript{57} The project’ (Shalexenvironment.org) <https://shalexenvironment.org/the-project/> accessed 1 August 2018.
\textsuperscript{59} Nils Backeberg, ‘Reservoir conditions for rock library samples’ (31 August 2016) ShaleXenvironmentT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D2.2.
\textsuperscript{60} Anne-Laure Fauchille, ‘Full traditional characterisation on shale core samples representative of EU formations’ (22 February 2017) ShaleXenvironmentT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D3.1.
\textsuperscript{62} Alberto Striolo, ‘Fluid behaviour for water, methane, other hydrocarbons, fracturing fluids and their chemicals confined in the narrow pores found in shale rocks’ (26 February 2018) ShaleXenvironmentT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D3.3.
\textsuperscript{63} Johannes Herrmann, Erik Rybacki, ‘Experimental characterization regarding fracture permeability and healing properties, elastic mechanical data and creep behaviour under high pressure’ (3 April 2017) ShaleXenvironmentT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D3.4.
• ‘New models for clay and kerogen pores in shales,’ \(^{64}\)
• ‘Equation of states of fluids needed for process design and risk assessment,’ \(^{65}\)
• ‘Hydraulic fracturing formulations effective at high salt content, along with laboratory scale samples of the best formulation prepared in the presence of large amounts of salt,’ \(^{66}\)
• ‘Characterization of fluid properties in zeolites,’ \(^{67}\)
• ‘Full experimental materials characterisation and fluid transport data within the engineered materials with dual porosity,’ \(^{68}\)

2.2.1.2 Risk assessment (WP9)

The technical matters related to risk-assessment in the shale industry, which might inform policy-making and law making regarding the design of the EIA process, were addressed by the ShaleXenvironmenT in: 1) Deliverable D9.1 titled ‘Application of well blowout model to an existing well to generate fire and explosion risk contours,’ \(^{69}\) and 2) Deliverable D9.2 titled ‘Likelihood of induced seismic/ micro seismic activity in shale formations throughout Europe, including a risk assessment.’ \(^{70}\) The obvious case for working on the matters of risk assessment was the increased risk related to the exploration and exploitation of shale deposits, with an emphasis on the risk of accidental blowouts and induced seismicity. \(^{71}\)

The D9.1 Report aimed at ‘describing’ the methodology for evaluation of the consequences of accidental blowout of a shale gas well, and its application to hypothetical scenarios of failure of a realistic shale gas facility. \(^{72}\) The authors of the D9.1 report used the case study of Cuadrilla’s site in Roseacre Wood, for assessing safe distances to the well, \(^{73}\) whereby the explosion over-pressure contours are a function of distance and time following well blowout. \(^{74}\) The authors have analysed various scenarios of blowouts and their impact within a radius of up to 200 meters, on steel structures, people in the open, \(^{75}\) as well as people in buildings of various grade of blast resistance \(^{76}\) - with a conclusion that the distance of 150 meters for people in the open and 60 meters for people in a building could in principle be regarded as safe. \(^{77}\)

The work underlying the D9.2 Report aimed at assessing the potential seismicity risks associated with the exploitation of shale gas in Europe using hydraulic fracturing. A

\(^{64}\) Andrey Kalinichev, ‘New models for clay and kerogen pores in shales’ (1 September 2017) ShaleXenvironmenT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D4.1.


\(^{66}\) Pierandrea Lo Nostro, ‘Hydraulic fracturing formulations effective at high salt content, along with laboratory scale samples of the best formulation prepared in the presence of large amounts of salt’ (1 September 2017) ShaleXenvironmenT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D5.1.


\(^{68}\) Jiří Čejka, ‘Application of well blowout model to an existing well to generate fire and explosion risk contours’ (20 February 2018) ShaleXenvironmenT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D7.2.

\(^{69}\) Sergey Martynov, Haroun Mahgerefteh, ‘Application of well blowout model to an existing well to generate fire and explosion risk contours’ (12 April 2018) ShaleXenvironmenT Project H2020-LCE-2014-1 Grant agreement No. 640979, 10.13140/RG.2.2.20135.85921, deliverable D9.1.


\(^{71}\) See D9.1, 6. See also, D9.2, (n 59), 6.

\(^{72}\) D9.1, 7.

\(^{73}\) ibid.

\(^{74}\) ibid, 8.

\(^{75}\) ibid, figure 10, at 21.

\(^{76}\) ibid, table 3, at 22.

\(^{77}\) ibid, table 3, at 23.
methodology for assessing the seismic hazard due to induced seismicity was developed, key related risks identified and then the developed modelling methodology was applied to a case study (Enhanced Geothermal System (EGS) injection carried out in Basel in 2006). D9.2 described the “development of 1 dimensional finite difference models ... used to model the transient pressure response of a subsurface reservoir subject to time varying injection profile” with the results indicating that the statistical model for criticality gives a reasonable qualitative and quantitative prediction of the seismicity rate (when applied to the case study).

2.2.1.3 Life-cycle assessment (WP10)

Sustainability is one of the three aspects of the energy trilemma, the others being security and affordability. It is important therefore to understand the potential environmental burdens likely to result from the exploitation of shale gas, as they will affect the sustainability of shale gas as an energy source. This understanding could inform macro/strategic policy-making and law making regarding the shape of EU’s energy policy, and thus were addressed by the ShaleXenvironmenT project in Work Package 10, resulting in deliverables: 1) D10.1 Report titled ‘Comparative environmental footprint of shale gas vs. traditional energy sources and alternative low-carbon renewables’ and 2) D10.2 Report titled “Sensitivity analysis of the LCA of the environmental footprint of shale gas in Europe”. The purpose of working on matters related to life cycle assessment was to contribute to the general project objective of “understand[ing] and quantify[ing] whether shale gas has the potential of contributing to a clean and efficient energy market, necessary to continue to improve our standards of living and sustain our economy, without compromising the environment.”

The D10.1 Report aimed at quantifying the environmental burdens of electricity production from shale gas by comparing them against electricity production from other sources, including 1) coal, 2) bio-methane obtained from centrally separated waste, 3) bio-substitute natural gas (Bio-SNG) obtained from advanced gasification and plasma technology, 4) bio-methane obtained from source separated waste, and 4) nuclear power plants. The study focused in four categories of impact, including: 1) climate change - the Global Warming Potential (GWP) comparing the impact of specific impact gases emitted over a given period, 2) fossil resources depletion - the Abiotic Depletion (ADP) addressing the diminishing pool of resources, 3) ecotoxicity (freshwater) - the fresh water aquatic ecotoxicity potential (FAETP), and ecotoxicity (terrestrial) - the terrestrial eco-toxicity potential (TETP) with the UK used as a base case study. The D10.1. Report concluded that:

“Shale gas consistently showed lower environmental impacts than the other technologies analysed, especially coal. The higher energy efficiency of the electricity production process from fossil resources compared to renewable resources has been highlighted by the global warming potential. For this indicator all renewable technologies performed worse than electricity production from shale gas. However,
both electricity production from coal and shale gas were shown to have a greater
toxicological impact on land due to the mining and well production emissions. Both
stages are not required in case of renewable energy production from waste.”

The D10.2 Report aimed at conducting a sensitivity analysis on the environmental impact of
a shale gas well during its lifespan (quantified in D10.1) by analysing a variation in a number
of parameters of the life cycle assessment model, including: 1) estimated ultimate recovery
(EUR), 2) fraction of flowback fluids injected, 3) fraction of the flowback fluids recycled, 4)
fraction of flowback disposed industrial treatment, 4) potential completion emissions, 5)
potential workover emissions. The D10.2 Report stated the results of the analysis:

“All characterisation factors show the same trend in the results: the EUR is the
parameter that mostly influences the environmental impact of shale gas. [...] Overall an increase in EUR determines a decrease in environmental impact,
because for the same usage of production material and energy, more gas is
delivered to the consumer and hence, the environmental impact per unit of gas
decreases. [...] An increase in potential workover and completion emissions of
20% cause an increase in the GWP of only 0.2%. This is due to the use of
reduce emission completion (REC) which avoid the flaring or direct release of
methane into the atmosphere.”

2.2.1.4 Regulatory framework for the SLO (WP11)

A huge portion of the regulatory challenges related to the shale gas industry in the EU were
addressed in the Report D11.1 authored by us and titled ‘Regulatory framework on
environmental impacts and community acceptance of shale gas.’ Our objective was to
review the regulatory framework on environmental impacts and community acceptance of
shale gas. We realised that there had already been a number of concise summaries of shale
gas-related and SLO-related legislation commissioned by institutions of the EU and published
since 2011 and that the EU laws relevant for this subject matter had not changed in essence.

Thus, we decided to add to the literature and differentiate from existing reports by offering
a comprehensive analysis of legislation relevant to public engagement around the
development of shale gas at the level of the EU and MS along with results of and some
conclusions from shale gas-related public opinion surveys commissioned by the EU. We
aligned the scope of the D11.1 report to various definitions of the SLO by focusing on public
consultations, access to public information and access to justice in the course of shale gas-
related law-making, assessing the potential impacts of environmental plans and
programmes and assessing the likely impacts of specific projects.

Our prima facie conclusions regarding legislation covered in the D11.1 Report were that the
EU and some MS’ legislation regulating environment-related consultations, information and
review procedures arguably need some consolidation. We concluded that the lack of
consolidation of the SLO-relevant provisions at the level of EU could be partially cured in the
case of directives – i.e. when the EU laws do not apply directly but rather need to be
implemented by the MS’ lawmakers.

86 ibid, 26.
87 ibid., 6.
88 ibid., 13.
We also found that the quality of implementation varies across MS. On the one hand, all SLO-related provisions stemming from numerous directives can be rounded up in one act as in the case of Poland’s Environmental Information Act of 2008, the coverage of which is similar to the Aarhus Convention, and which offers almost a one-stop roadmap for the public information and engagement requirements including review procedures, around the necessary assessments in relation to environmental planning, zoning and specific projects.

On the other hand, as in the case of the UK, the national implementing legislation can incorporate EU standards by numerous references to the EU directives instead of being a stand-alone document, which is contrary to the very idea of the implementation of directives. Instead of consolidating SLO-related provisions in one act, such provisions are dispersed and repeated in various acts such as the Planning Act 2008 and Town and Country Planning Act 1990 accompanied by a number of overlapping secondary regulations, each addressing a different aspect of public information and engagement.

2.2.2 Other Horizon 2020 studies

2.2.2.1 FracRisk

Among predominantly technical and scientific output delivered by FracRisk, there have also been reports and other documents addressing regulatory issues. For example, in the document titled “An Independent Assessment of Shale Gas Operations and Impacts in Pennsylvania,” FracRisk recommended that monitoring should not be limited to gas and nearby water wells but that specific aquifer monitoring programmes should be developed at every site, to be funded from resource rents accruing to governments.⁸⁹

Within the framework of Work Package 7 ‘Dissemination’, FracRisk devoted two deliverables specifically to regulatory issues. Parry in the deliverable titled ‘Interim Legislative and Regulatory Review - Summary of Legislation and Regulation relating to Onshore Hydraulic Fracturing For Shale Gas in the EU’⁹⁰ released in November 2016 preliminarily noted that:

• “It has [been] independently established during this review that cutting edge science, such as that being undertaken by FracRisk, is currently not legally integrated into the regulatory process, and that it has a place within regulation as part of both the permitting process (risk assessment) and operational process (risk management).”⁹¹

• “There are currently no specific requirements in any regulatory regime in the EU that require full quantitative modelling of fluid and gas flow or induced seismic activity within the geosphere, nor that the results of such modelling be used within a quantitative risk assessment framework such as is being researched and developed by the FracRisk team.”⁹²

• “Although there is indeed recognition at a EU level that the use of such research is helpful is (sic) reducing uncertainty in decision making during the permitting process; at the moment the legislation gives the MS wide discretion as to the scope and level of

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⁹⁰ S. Parry, ‘Interim Legislative and Regulatory Review - Summary of Legislation and Regulation relating to Onshore Hydraulic Fracturing For Shale Gas in the EU’ UGOE (11 November 2016) FracRisk Project Horizon Grant Agreement no. 636811 2020, deliverable D7.2

⁹¹ Parry (n 90), point 7.1. 2nd para at 29.

⁹² ibid, point 7.1. 3rd para at 29.
rigour and detail of any risk assessment required at law to establish the safety of an operation.”

In a subsequent final report, Parry additionally paid attention to the fact that – although some quantitative/mathematical approaches like the Bayesian approaches to law might potentially be applied to risk assessment - virtually all MS having been given a wide discretion regarding risk assessment within their permitting process have only established descriptive (qualitative) as opposed to mathematic (quantitative) criteria of risk assessment in the EIA process.

Finally, in a collective work titled ‘Best Practice Document: Recommendations from the FracRisk project for European legal guidelines on Shale Gas development,’ the authors suggested:

- “acknowledge[ing] the right of affected communities to benefit directly from shale gas extraction,”
- “step[ping] forward in Risk Assessment, making it a tool for effective management, including extraction operations, monitoring and mitigation,”
- “treat[ing] monitoring not as a passive exercise mainly oriented to measuring impact, [but as] a proactive task that is oriented to guaranteeing that operation proceeds as expected and, if not, helps on defining corrective and mitigation actions, before impacts occur,”
- “include[ing] corrective and mitigation action explicitly in future regulations,”
- “acknowledge[ing] risks of induced seismicity,”
- “improving modelling tools for (1) real-time monitoring, (2) using monitoring data to improve site understanding and to update reservoir properties during production, and (3) early detection of anomalies, such as leakage events, for early definition of corrective and/or mitigation actions.”
- “hold[ing] a portfolio of leakage remediation techniques that can be implemented rapidly.”

2.2.2.2 M4Shale

Within the framework of sub-programme SP1 titled ‘Impact of subsurface activities: Hydraulic fracturing, induced seismicity and well integrity,’ M4Shale first touched upon

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93 ibid (n 90), point 7.1. 4th para at 29.
94 S. Parry, ‘Final Legislativeand Regulatory Review-Summary and Discussion of Legislation and Regulation relating to Onshore Hydraulic Fracturing for Shale Gas in the EU’ UGOE (29 April 2018) FrackRisk Project Horizon Grant Agreement no. 636811 2020, deliverable D7.3.
96 Parry (n 95), 37.
98 Jesus Carrera et al. (n 97), abstract, point 1.
99 ibid, point 2. Including: “(...)numerical models that take into account not only parametric uncertainty but also model uncertainty and that are oriented to improve site management, increase understanding of geohazards, and anticipate possible problems.” See ibid.
100 Jesus Carrera et al. (n 97), abstract, point 3. The authors suggest that the monitoring “should be a proactive task that is oriented to guaranteeing that operation proceeds as expected and, if not, helps on defining corrective and mitigation actions, before impacts occur.” See ibid.
101 Jesus Carrera et al. (n 97), abstract, point 4.
102 ibid., abstract, point 5.
103 ibid., abstract, point 6.
104 ibid., abstract, point 7.
regulatory issues in a number of early deliverables. For example, in the report titled ‘Review of monitoring and existing best practices for monitoring well leakage in the USA and Canada’, the authors noted a lack of regulatory co-ordination at the federal level as well as huge diversity of regulatory approaches adopted at the states level in the US.

The report titled “Review of Seismic Monitoring Network Design, Waveform Processing Procedures, and Best Practices in the USA and Canada”, emphasised the need of regulatory solutions for best practice microseismic monitoring of hydraulic fracturing operations in the shale industry, then operative only in some regions. In the report titled ‘Induced Seismicity Related to Global Shale Gas Operations: a Review’, the authors concluded that although there exist techniques enabling the hazards of induced seismicity to be assessed and the risks reduced, the use of and requirement for such techniques remains unregulated. Nonetheless, in the report titled ‘Hydraulic Fracturing: A Review of Theory and Field Experience,’ the authors rightly observed that not only regulatory approaches but also technical and geographical factors (such as geological conditions or population density, also geopolitics) do differ between Northern America and the EU, and therefore while shale gas development in the EU may benefit from lessons learned in North America, any models of quantitative risk assessment of shale gas operations must be tailor-made for European conditions. Among the deliverables released towards the end of the project, in the report titled ‘Final Report on Shale Gas Hydraulic Fracturing’, the authors suggested that 1) “a thorough appraisal should be made of differences observed by microseismic monitoring in real time during operations,” and 2) “the independent observer should have discretionary power to halt operations if the deviation from prediction is above a set threshold.” The authors exemplified the suggestion by reference to the “traffic light system” adopted in the UK under which exceedance one of the seismic thresholds of operations set in advance for a specific reservoir, allows the regulator to half operations.

Within the framework of sub-programme SP2, the report titled ‘Impact of surface activities: Water, soil and well site activities’ touched upon regulatory aspects of construction law (safe distances) and waste management. Among the early reports, in the report titled...

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107 Garcia, Rouchon and Deflandre (n 106), 5-6.
110 Bohnhoff and Malin (n 109), 10. See also, Marco Bohnhoff, Christopher Wollin, Jean-Pierre Deflandre, ‘Review of current state of the art in seismic waveform data evaluation techniques’ (February 2017) M4Shale Horizon 2020 Grant Agreement no. 64071 Deliverable D.3.2, 4-5.
112 Osinga, Wassing and ter Heege (n 111), 34.
116 Cuss, Wiseall and Hough (n 115), 75-76.
117 ibid., 76.
118 Ibid.
'Review of Impact of Well Site Infrastructure,'\textsuperscript{120} the authors noted among other matters the wide diversity of regulation regarding building setbacks (distances) across both North America and Europe\textsuperscript{121}. The report titled 'Risk Assessment of Impacts on Groundwater Quantity and Quality,'\textsuperscript{122} concluded that "the current regulation of shale gas wastewater management, treatment and disposal is inadequate because it fails to safeguard against foreseeable risks of harm to human health and to the environment".\textsuperscript{123} In 'Integrated review of data and best practices of surface operations related to shale gas in the USA, Canada and Europe,'\textsuperscript{124} the authors paid attention to the lack of uniformity of legal requirements to publicly disclose chemical-related information, between the respective federal government and state/provincial governments in the US and Canada.\textsuperscript{125}

In the report titled, ‘Integrated Best Practices and Recommendations for Minimising the Environmental Footprint of Surface Shale Gas Operations,’\textsuperscript{126} the authors, regarding liquid waste among others, recommended: 1) “[s]upplement[ing] the existing legislation with requirements on how to handle waste such as flowback and produced water, including uniform requirements for testing/characterization of this waste,”\textsuperscript{127} 2) “not-classify[ing] flowback water as a wastewater, since as such, it cannot be reused for hydraulic fracturing or injected underground as disposal option in accordance with current legislation,”\textsuperscript{128} 3) “[f]ull disclosure of the applied chemicals for hydraulic fracking is necessary for risk assessment.”\textsuperscript{129}

2.2.2.3 SHEER

The SHEER Project examined induced seismicity, water contamination and air pollution. In the SHEER Deliverable D8.2 titled ‘Guidelines for the monitoring of shale gas exploration and exploitation induced environmental impacts,’\textsuperscript{130} the aim of the Guidelines is stated to be ‘defining early observations for monitoring the effects of human activities, such as the hydraulic fracturing techniques on environment to establish monitoring procedures and protocols, considering methods to analyse the effects of induced seismicity, groundwater contamination and air pollution’.\textsuperscript{131} Included in the suggested guidelines are elements that may be relevant for governance of shale gas, are:

- Monitoring of environmental impacts:
  - Licence conditions to include a requirement that the operator must provide geological and technical data to the regulator along with permission for it to be used for scientific purposes;
  - Monitoring activities should be adapted as the technological plans of the operator change;

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\textsuperscript{121} Clancy, Worrall, Goodman and Thorpe (n 120), 16.
\textsuperscript{123} Jacobsen, Johnsen, Gravesen and Schovsbo (n 122), 17.
\textsuperscript{124} Anna Król,Ewa Kukulska-Zając, Marta Dobrzyńska, ‘Integrated review of data and best practices of surface operations related to shale gas in the USA, Canada and Europe’ (April 2016) M4Shale Horizon 2020 Grant Agreement no. 64071 Deliverable D.13.1.
\textsuperscript{125} Król, Kukulska-Zając and Dobrzyńska (n 124), 16.
\textsuperscript{126} Anna Król, Ewa Kukulska-Zając, Monika Gajec ‘Integrated Best Practices and Recommendations for Minimising the Environmental Footprint of Surface Shale Gas Operations’ (December 2016) M4Shale Horizon 2020 Grant Agreement no. 64071 Deliverable D.13.3.
\textsuperscript{127} Król, Kukulska-Zając and Gajec (n 126), point 2.3, 1st tier at 7.
\textsuperscript{128} ibid., point 2.3, 3rd tier at 7.
\textsuperscript{129} ibid., point 2.3, 5th tier at 7.
\textsuperscript{130} Paolo Capuano, Raffaella Russo ‘Guidelines for the monitoring of shale gas exploration and exploitation induced environmental impacts’, (May 2018) EC Horizon2020 Programmme Grant Agreement 640896. D8.2.
\textsuperscript{131} ibid, 6
- The local community must be informed about purpose and activities to be undertaken before monitoring equipment is brought onto the site.
  • Public engagement:
    - The local community and local authority should have the opportunity to learn from scientists about the methods and results of monitoring and testing (seismicity, groundwater testing and air quality monitoring);
    - The industry needs to proactively engage in risk management, beyond compliance with standards.

The SHEER Report ‘Guidelines for Risk Management for Shale Gas Exploration and Exploitation’\textsuperscript{132} identifies legal risks - for the shale gas developer - around licensing and permissions and conformity with them and suggests there is benefit in establishing and maintaining a good risk management system, together with engaging in a good working relationship with the regulator.

2.3 Concept of governance

In the quest for any policy recommendations regarding ‘governance of shale gas operations in Europe,’ we first need to be clear as to:
  • what we understand by ‘governance’ as opposed to ‘regulation,’
  • how it squares with the concept of lawmaker/legislator versus regulator at the level of:
    1) legislative works,\textsuperscript{133} 2) strategic energy and environmental planning at the central/federal level, 3) regional planning regarding strategic impact assessment (SEA),\textsuperscript{134} 4) individual permitting by regulators/administrative authorities,\textsuperscript{135}
  • how and where (at which government level) governance goes beyond enforcement of the law.

2.3.1 What is to be governed?

First, the subject of the governance of shale gas is not very precise. It may refer to the EU shale industry in its entirety along with macro-level strategic and geopolitical dimensions, or some narrower issues, which are more significant for individuals affected by the shale industry, like ‘risk management’.\textsuperscript{136} For example, Osofsky and Wiseman under the US conditions,\textsuperscript{137} noted that the fragmentation of the academic discussion about energy systems is a reflection of the energy systems themselves, and instead proposed a concept of the ‘tripartite structure’ of energy systems.\textsuperscript{138}

In Osofsky’s and Wiseman’s tripartite structure, there are ‘physical’ components, ‘market’ components, and ‘regulatory’ components of the energy system.\textsuperscript{139} The ‘physical’ according to the authors means: 1) “primary sources of energy, from fossil fuels to renewable sources

\textsuperscript{132} Thomas Kelly, Dr Catherine Isherwood, Andrew Gunning, ‘Guidelines for the Management of Shale Gas Exploration and Exploitation’ (April 2018) EC Horizon2020 640896 D8.3.
\textsuperscript{133} Regarding the specific subject of EU’s regulatory framework for obtaining the SLO, we have address this level in: Górski and Trenorden section 3 at 33-54.
\textsuperscript{134} Regarding the specific subject of EU’s regulatory framework for obtaining the SLO, we have address this level in: Górski and Trenorden section 4 at 54-64.
\textsuperscript{135} Regarding the specific subject of EU’s regulatory framework for obtaining the SLO, we have address this level in: Górski and Trenorden section 5 at 64-77.
\textsuperscript{138} Osofsky. and Wiseman (n 137), 780.
\textsuperscript{139} ibid, 781.
such as sunlight and wind,” 140 2) uneven distribution of resources “within and among countries,” implying the spatial mismatch between energy resource production and energy consumption generating demand for transportations/transmission infrastructure, 141 3) the environmental, natural resource and social impacts of specific types of energy projects and the environmental vulnerability of some locations, and 4) the physical movement of fuel to generators and of electricity to utilities and consumers. 142

The market components of the tripartite structure of energy systems are made up of several trends, including 1) increasing internationalisation of markets (with traditionally international oil market and still rather regional energy markets) with an emphasis on the developments in the shale gas industry and global LNG supply chain whereby national energy markets are less and less regarded as natural monopolies, 143 2) changing choices of fuels for energy generation as a function of price, cost of transportation, environmental impacts, and available technologies. 144 4) enduring resistance to market forces caused by long term supply agreements (nonetheless allowing to secure against price volatility) and natural monopolies along transmission lines/pipes, 145 and 5) consumers’ environmental awareness generating demand/preference for renewables. 146

Finally, regulatory elements of the tripartite structure of energy systems discussed by Osofsky and Wiseman, although US specific, are still worth referring to and include: 1) a complicated interplay of “local, regional, federal, and state regulations, standards, and quasi-formal governance schemes” with local and state governments having broad control over the type of fuel used to generate electricity and often prescribing specific requirements as to energy mixes and percentage of energy sourced from renewables, 147 2) authority of regulators to decide on the location of transmission infrastructure, approve the tariffs, or require transmission utilities to prioritise establishment of interconnections with specified producers. 148 Such regulatory elements are not unlike regulatory elements of the energy system of the EU, except for a different distribution of powers between various levels of government whereby the US federal government has arguably more power regarding energy and resources policy than the European Commission.

2.3.2 Definitions of governance

With such an overview of what is to be governed within energy systems in mind, one could look at more academic definitions of the governance of natural resources predominantly coming from social sciences, management and economics. 149 As Stroker summarises it, in the Anglo-American political science, the concept of governance denominates “the development of governing styles in which boundaries between and within public and private sectors have become blurred,” 150 whereby “[t]he essence of governance is its focus on governing mechanisms which do not rest on recourse to the authority and sanctions of government.” 151 In turn, the United Nations Educational, Scientific and Cultural Organization

140 ibid, 781, 787-789.
141 ibid, 781-782.
142 ibid, 785-786.
143 ibid, 791-794.
144 ibid, 796.
145 ibid, 798-799.
146 ibid, 800-801.
147 ibid, 802-803.
148 ibid, 804.
151 Stroker (n 150), 17.
(UNESCO) defines governance as 1) “structures and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity and inclusiveness, empowerment, and broad-based participation,” as well as 2) “the norms, values and rules of the game through which public affairs are managed in a manner that is transparent, participatory, inclusive and responsive.”

In the wide context of social-ecological systems, Folke, Hahn, Olsson and Norberg by governance understand “creating the conditions for ordered rule and collective action or institutions of social coordination,” as well as “the structures and processes by which people in societies make decisions and share power.” In the narrower context of natural resources, according to Lange, O'Hagan, Devoy and Tissier, natural resources governance “describes how societies make decisions, share power, ensure accountability and take actions in response to diverse dynamics and complex challenges today.” According, to Acosta the concept of ‘natural-resource governance’ refers to “the set of strategies for improving transparency and accountability in the management of natural resources” whereby “[t]he range of initiatives covered includes licensing, exploration, contracting, extraction, as well as revenue generation and allocation of natural-resource revenues, and the relevant actors involved include governments, private companies, nongovernmental organisations, the media and civil society in general.”

In the context of infrastructural or energy megaprojects, Sovacool and Cooper observe that governance might have three distinct meanings, including 1) “the internal operation and management of the megaproject itself; how well it is built and maintained, and how efficiently or reliably it delivers energy fuels or services,” 2) “the economics and politics of the system, the coalitions of interest involved in supporting or opposing a megaproject,” and 3) “the interaction between the technology of a megaproject and the types of social organization it creates—whether it produces competition or collaboration(...)”. Finally, in a historical dimension, Steelman observes that the governance of environmental and natural resources includes: 1) “shifts not only in the types of people involved in environmental and natural resource policymaking but also in the types of values that are pursued, the strategies and tactics used, the venues for taking action, and the outcomes desired,” and 2) “[t]he range of initiatives covered includes licensing, exploration, contracting, extraction, as well as revenue generation and allocation of natural-resource revenues, and the relevant actors involved include governments, private companies, nongovernmental organisations, the media and civil society in general.”

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153 ibid.


155 Lange et al. (n 149), 624.


158 Sovacool and Cooper (n 158), 8.

159 ibid.

160 ibid.

161 Todd A. Steelman, Implementing Innovation: Fostering Enduring Change in Environmental and Natural Resource Governance (Georgetown University Press, 2010) 224, 30.

162 Steelman (n 161), ibid.
For the purposes of this report, and from a legal/regulatory perspective we regard shale gas governance as a collection of regulatory measures and the institutions and actors (established by those measures) in a position to affect the shale gas industry in the EU, including authorities within various levels of government responsible for the different aspects of the shale gas industry (exploration and exploitation permitting, environmental assessment, construction permitting, etc.) along with the procedural dimensions of addressing shale gas related energy policy.

3. Exploitation rights and market access

3.1 Exploration/exploitation authorisations

3.1.1 Prospection, exploration and exploitation permitting

3.1.1.1 Hydrocarbon directive

In the furtherance of its shale-related legislative competence, the EU has in the first place regulated the conditions for granting and using authorizations for the prospection, exploration and production of hydrocarbons generally. The Directive 94/22/EC ("Hydrocarbon Directive") defines ‘authorization’ as “any law, regulation, administrative or contractual provision or instrument issued thereunder by which the competent authorities of a Member State entitle an entity to exercise, on its own behalf and at its own risk, the exclusive right to prospect or explore for or produce hydrocarbons in a geographical area,” and further provides that such authorisation “may be granted for each activity separately or for several activities at a time.” The chief purpose of the Hydrocarbon Directive is to “ensure that there is no discrimination between entities as regards access to and exercise of these activities,” yet without violating the above-mentioned TFEU principle that regulating and governing property rights belongs within the sole competence of the MS, and providing that a Member State may refuse an application from an entity effectively controlled by a third country or third country nationals on grounds of national security. (On the conditions of granting hydrocarbon-related authorisation see further section 3.1).

3.1.1.2 Hydrocarbon directive in Poland

In Poland, under the 2011 Geological and Mining Law, the Ministry of Environment is responsible for granting licences for exploration and exploitation, and such licences in principle shall be granted by means of competitive tendering procedures. After a major
shale gas-related amendment to that law which entered into force on 1 January 2015,172 concessions can only be granted to entities prequalified by the Ministry of Environment,173 whereby the Ministry verifies whether the potential concessionaire: 1) is or under corporate control of a third country, entity or person of a third country, and if so whether such control might constitute a danger to the security of the country,174 and 2) has relevant experience and the necessary resources to conduct the activities.175

After the amendment of 2014 aimed at improved implementation of the Hydrocarbon Directive,176 in the case of hydrocarbon-specific rules, two types of concessions are granted namely: 1) a combined concession for prospection, exploration and exploitation of hydrocarbons, and 2) a concession limited to the exploitation of hydrocarbons.177 Previously, separate concessions had been granted for firstly prospection and exploration works and subsequently for exploitation works178 with successful explorers having had a pre-emptive right to be granted an exploitation concession. However, this situation provoked a complaint by the European Commission that the pre-emptive right was contrary to the Hydrocarbon Directive, and subsequently led to a case being brought against Poland in the European Court of Justice (ECJ) in December 2010.179

The ECJ decided that case in June 2013, and ruled that the pre-emptive right was non-compliant with the Hydrocarbon Directive, observing that:

“although the Member States are free to guarantee some compensation for entities which have incurred expenditure in drawing up geological documentation in the course of their prospection and exploration activities, that compensation may not be in the form provided for in the Geological and Mining Law without infringing the rule of non-discriminatory access for all entities to activities such as the extraction of hydrocarbons.”180

In consequence the Polish Geological and Mining Law was amended in 2014 (effective 1 January 2015) as described above.

A peculiarity of the Polish permitting system lies in that concessions need to be accompanied by the so-called ‘mining usufruct’ (użytkowanie górnicze).181 While the concessions are public-law administrative decisions, the agreement that creates the mining usufruct is quasi-private-law contract concluded between a concessionaire and the State Treasury (represented by the Ministry of the Environment) along with the grants of a concession.182 These are mining usufruct agreements, rather than administrative concessions themselves, which determine the compensation for mining activities that will be paid to the Treasury.183

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173 2011 Mining Law (n 169), art 49a.
174 ibid., art 49a.2.1.
175 and ibid., art 49a.2.2.
177 2011 Mining Law (n 169), art 49e.
178 See Raszewski and Górski (n 176), 21.
179 European Commission vs Republic of Poland Case C-569/10
180 Case C-569/10 ECR [2013], para 63.
181 2011 Mining Law (n 169), art 12.1.
182 ibid, art 13.1.
183 ibid, art 13.3.
The Ministry of Environment is obliged to publicise the list of planned tenders for hydrocarbon-related concessions by the end of June of the preceding year.\(^{184}\) The concessions are in principle granted for the period of 10-30 years.\(^{185}\) However, the prospection/exploration phase shall not last longer than 5 years and can only be extended by 1 year whereby an extension of the phase implies an extension of the prospection/exploration concession if the end date of the phase goes beyond the end date of the concession.\(^{186}\) Likewise, if need be, the exploitation phase might be extended by no more than five years which implies an extension of the exploitation concession.\(^{187}\) Regardless of the obtained exploitation concession, before a commencement of the exploitation phase, a developer still needs to secure an investment decision (decyzja inwestycyjna) which determines technicalities and timeline of the exploitation,\(^{188}\) optionally including technical conditions of pumping water to the rock mass.\(^{189}\)

In addition, the concession-holder must have obtained consent from the landowner to access and perform works on the surface land and before drilling, an environmental decision from the relevant authority.

### 3.1.1.3 Hydrocarbon directive in the UK

In the UK, matters of licensing for exploration and exploitation are primarily regulated through the Petroleum Act 1998\(^{190}\) which regulates matters related to petroleum defined as “any mineral oil or relative hydrocarbon and natural gas existing in its natural condition in strata,”\(^{191}\) excluding “coal or bituminous shales or other stratified deposits from which oil can be extracted by destructive distillation”.\(^{192}\) The Petroleum Act 1998 authorises the Secretary of State for Energy to grant licences - Petroleum Exploration and Development Licences (PEDL) - for ‘searching, boring and getting’ petroleum\(^{193}\) while the manner and form of application for a licence is set out in regulations (secondary legislation).\(^{194}\) Note that other consents are required before drilling can commence.

In addition, the Hydrocarbon Directive has since 1995 been implemented in the UK via the Hydrocarbons Licensing Directive Regulations 1995\(^{195}\) made under the Petroleum (Production) Act 1934.\(^{196}\) The 1995 regulations chiefly repeat the requirements imposed by the Hydrocarbon Directive, which was summarised in the accompanying explanatory note as follows:

“The Regulations restrict the criteria which the Secretary of State may take into account when considering an application for a licence [...] The Regulations provide that an application may be refused on the grounds of national security if the applicant is effectively controlled by nationals of a state which is not a member State but otherwise

\(^{184}\) ibid, art 49f.
\(^{185}\) ibid, art 49t.
\(^{186}\) ibid, art 49y.2.
\(^{187}\) ibid, art 49y.3.
\(^{188}\) ibid, art 49za.1.1-4.
\(^{189}\) ibid, art 49za.1.5.
\(^{191}\) Petroleum Act 1998 (185), section 1(a)
\(^{192}\) ibid, section 1(b).
\(^{193}\) ibid, art 3.1.
\(^{194}\) ibid, section 4.
\(^{196}\) An Act to vest in the Crown the property in petroleum and natural gas within Great Britain and to make provision with respect to the searching and boring for and getting of petroleum and natural gas, and for purposes connected with the matters aforesaid. (12th July 1934), ch 36.
the criteria may not be applied in a discriminatory manner. [...] The Regulations limit the terms and conditions which may be imposed on the grant of a licence and provide that such terms and conditions shall be applied in a non-discriminatory manner.” 197

“The Regulations provide that where the Secretary of State has invited applications for a licence he shall make available to interested parties the terms and conditions upon which the licence will be granted.” 198

“The Regulations require the Secretary of State to limit the term of any licence granted to the period necessary for the proper performance of the activities authorised by the licence and restrict the circumstances in which the Secretary of State may extend a licence. The Regulations also limit the Secretary of State’s powers to request information from a licensee and to monitor the activities of the licensee.” 199

The Hydrocarbons Licensing Directive Regulations 1995 do not specify periods for which the licenses shall be granted and merely provide that 1) “a licence only grants an entity exclusive rights for the period which is necessary for the proper performance of the activities authorised by the licence,” 200 and 2) “the duration of the licence does not exceed the period necessary to carry out the activities authorised by the licence”. 201

The subsequent Energy Act 2016 202 established the Oil and Gas Authority (OGA) 203 and transferred many of energy-related powers from the Secretary of State to the OGA, including granting licenses for the exploration and exploitation of hydrocarbon deposits. 204

The details, procedures and the general organisation of granting licenses in a competitive process is not to be found in the Energy Act 2016 but rather in a number of regulations including: 1) The Offshore Petroleum Licensing (Offshore Safety Directive) Regulations 2015, 205 2) The Petroleum Licensing (Exploration and Production) (Landward Areas) Regulations 2014, 206 and of course 3) the Hydrocarbons Licensing Directive Regulations 1995 – which has remained in force.

In practice, despite numerous secondary acts in place, the licensing process is carried out in a straightforward manner in so-called licensing rounds whereby “[u]sually the OGA issues general invitations in Licensing Rounds, either onshore or offshore, but exceptionally the OGA may invite out-of-round applications for small areas in response to a request from a company.” 207

198 ibid, Explanatory Note, para 3.
199 ibid, Explanatory Note, para 4.
200 ibid, art 6.1.a.
201 ibid, art 6.1.b.
202 An Act to make provision about the Oil and Gas Authority and its functions; to make provision about rights to use upstream petroleum infrastructure; to make provision about the abandonment of offshore installations, submarine pipelines and upstream petroleum infrastructure; to extend Part 1A of the Petroleum Act 1998 to Northern Ireland; to make provision about the disclosure of information for the purposes of international agreements; to make provision about fees in respect of activities relating to oil, gas, carbon dioxide and pipelines; to make provision about wind power; and for connected purposes. (12th May 2016), chap 20 (Energy Act 2016).
203 The OGA was originally established under private law and under the Companies Act 2006 as the Oil and Gas Authority Limited. It was granted a quasi public status and renamed as the OGA under the Energy Act 2016. See Energy Act 2016 (197), art 1.1.
204 Energy Act 2016 (197), schedule 1, part 1.
4. Factors in the Successful Exploitation of Shale Gas

There are many factors that policy-makers could take into account as being likely to contribute to the successful governance of the exploitation of shale gas in the MS of the EU. It is not for this report to canvass the technical and financial aspects; our focus is on the governance aspects.

4.1 The industry perspective

In search of initial guidance for the effective governance of shale gas, we started with the Canadian-based Fraser Institute’s 11th annual survey of petroleum industry executives and managers,\(^\text{208}\) which by surveying the industry concerning the barriers to investment in oil and gas exploration and production facilities in various jurisdictions around the globe, ranked countries for their attractiveness for investment. Thus, the survey results indicate the countries that are the most attractive based on the business conditions and regulatory environment. Respondents were asked to indicate how the following factors influence company decisions to invest in various jurisdictions: 1) fiscal terms, 2) taxation in general, 3) environmental regulations (stability, consistency and timeliness of the regulatory process), 4) regulatory enforcement (uncertainty regarding the administration, interpretation, stability, or enforcement), 5) cost of regulatory compliance, 6) protected areas (uncertainty about areas protected from exploration or exploitation), 7) trade barriers, 8) labour regulations and employment agreements, 9) quality of infrastructure, 10) quality of geological database, 11) labour availability and skills, 12) disputed land claims, 13) political stability, 14) security for personnel and assets, 15) regulatory duplication and inconsistencies (federal/provincial, federal/state, inter-departmental overlap), and 16) legal system (fair, transparent, non-corrupt and efficiently administered processes).\(^\text{209}\)

The responses were then scored to calculate a Policy Perception Index, and the 160 jurisdictions were ranked. According to the 2017 survey (conducted May-June 2017), for the industry the 10 most attractive jurisdictions for investment worldwide in order, are: Texas, Oklahoma, North Dakota, Newfoundland & Labrador, West Virginia, Kansas, Saskatchewan, Norway–Offshore (except North Sea), Wyoming and South Australia.\(^\text{210}\) Of course the industry’s perceptions regarding the attractiveness of a country for investment is not necessarily meaningful for our purposes, but might serve to indicate the importance of a certain factors relevant to policy, governance and regulation such as certainty in the laws and environmental regulation, timeliness of the permitting process, certainty about ‘no-go’ areas, absence of government level and agency overlap/conflict and a stable and secure working environment.

Before we go further, it is worthy of mention that industry is seemingly motivated to minimize shale gas development risks by conducting its activities appropriately and acting with due care, one of the drivers being liability as a result of harm to persons or the

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\(^{209}\) Ibid, 7-8

\(^{210}\) Ibid, 2
environment. Under a government regulatory system industry has additional motivation to act in accordance with its obligations to minimize risk under regulation and license commitments through the prospect of sanctions for breaching obligations. Further, motivation will be driven by the responsibility to shareholders, required annual reporting to the corporate regulator, a desire to uphold and maintain the reputation of the industry through adherence to best practice/industry standards, and adherence to the principles of corporate social responsibility in the interests of being a ‘good neighbour’ and achieving and maintaining a social license to operate.

4.2 The regulator’s perspective

The fact of the right to sub-surface minerals and hydrocarbons being held by private landowners in most parts of the United States of America, contrary to the situation in most of the rest of the world, is likely to have had a significant influence on the ease of doing oil and gas exploration and exploitation in that nation, so we do not propose to explore the USA jurisdictions.

The province of Saskatchewan, is Canada’s second largest producer of oil and sixth-largest oil-producer in Canada and the USA. It is also home to a large swathe of the Bakken Shale formation and the State has encouraged the exploitation of unconventional gas and oil by means of hydraulic fracturing by exempting oil and gas exploration activity from environmental assessment and approving fracking wells without requiring an impact statement. The province has a long history of oil production, as have a number of US states including Texas, Oklahoma and North Dakota.

Barry Goldstein, the Executive Director, Energy Resources Division of the South Australian Department for Energy and Mining, opines from experience that community trust and investor confidence are the keys to successful exploration and production of oil and gas in any jurisdiction. In Goldstein’s view, legislation, regulation, policies and programmes must address critical uncertainties to engender trust. The means of governance is certainty in the regulatory framework, a lead agency (one-stop-shop) regulator supported by administrative arrangements between relevant government agencies, transparent co-regulation (industry and regulator), identification and management of all environmental, cumulative and other risks, early and effective engagement with all potentially affected persons (by both industry and the regulator), and highly motivated officers within the regulator. The descriptors of the mode of delivery include transparency, openness and flexibility, with empathetic community engagement.

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214 Ibid, p 192
216 Ibid, pp 557-558. Goldstein elaborates on ‘effective engagement’: “Effective engagement requires respect for, and empathy with, people with deeply felt concerns. It is no longer enough for those entrusted to steward a one-stop-shop to be just technically focussed. Experience has demonstrated that an understanding of cognitive bias is helpful in being empathetic during consultation with people and enterprises potentially negatively affected by oil and gas [exploration and production] operations.” Also see: Barry Goldstein, Michael Malavazos, Alexandra Wickham, Michael Jarosz, Dominic Pepicelli, Mieka Webb and Dale Wenham, ‘Regulatory Nirvana for Hydraulic
engagement process, the Energy Resources Division maintains an Roundtable for Oil and Gas with membership freely open to all who register, and currently comprising >2000 individuals representing >1140 organisations, with 8 working groups established.217

4.3 The community perspective

Of course, there is no single perspective as to community expectations affecting the successful governance of shale gas. The attitudes in, for example, the UK, reveal that there is both an ambivalence, and a variety of attitudes to shale gas dependent on a number of factors, including the prior knowledge of those surveyed and attitude to environmental values.218 It is also of note that the public attention and disquiet concerning hydraulic fracturing for shale gas development, at least in the UK, has often related not to the aspects where the science is possibly less robust (than in relation to other aspects) and the regulatory regime in consequence not so established, but rather to concerns around the creation of fractures, namely induced seismicity and groundwater contamination, both of which are well-regulated.219

These ‘popular’ concerns perhaps arise from an awareness among concerned members of the community of the safeguarding nature of the precautionary principle and a desire to have the principle implemented to ban hydraulic fracturing and shale gas development in the face of potential risks. However, the fact is that the precautionary principle has been taken into account in the regulation of hydraulic fracturing, such that the risks from induced seismicity of seismic events and contamination of groundwater are in many circumstances negligible.220 Indeed, according to Pearson and Lynch-Wood, the regulations in relation to seismicity reflect an over-cautious approach in the interest of addressing high-profile public disquiet, which is arguably unfair and discriminatory against the shale gas industry given the seismicity risks are common to other forms of drilling, in other industries.221 In relation to groundwater contamination, while both UK and US regulators accept that the current level of risk (with regulatory requirements placed on industry) does not support the cessation of hydraulic fracturing, meaning that a sufficiently precautionary approach is in place through regulation, the regulators motivated by the level of public disquiet are suggesting continuing improvements in both monitoring and understanding of the processes involved and their impacts, which suggestions are being taken up by industry.222

Meanwhile, the disposal of waste from hydraulic fracturing, in relation to which the science is less robust, has not attracted the same outcry. There is a real concern that while the content of the regulatory framework is informed by a precautionary approach, the

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220 Ibid, p 676 ‘Both [potential sources of induced seismicity, first from initial fracturing and second, where applicable, from the storage of by-products from the process in the wells once they have been exploited] are regarded as satisfactorily mitigated …, and yet the bespoke approach to monitoring proposed … in the form of so-called traffic light monitoring system has been adopted by the industry. As such, despite the satisfactory nature of existing provisions and a ‘negligible’ risk in the regard, concerns have been raised rather than quelled by the presentation of existing data and information, met with proposals for reform and demands for increased monitoring which has been implemented at the controversial sites in Lancashire …’ (references omitted)
221 Ibid, p 676
222 Ibid, p 677
governance is burdened by excessive regulated requirements, having regard to the evidence, in the interests of quieting the public noise.\textsuperscript{223}

On the other hand there have been numerous examples over the years of supposedly scientifically proven ‘safe’ chemicals or techniques proving to be harmful as evidence has been collected indicating the negative impacts of their use. So while regulators and industry may be ‘assured’ of the safety of certain techniques and chemicals based on modelling or laboratory results and field trials, the consequences of use in a particular circumstance or location will be unknown until the results of regular monitoring of the impacts of use in that circumstance or place have been evaluated. Thus, it may be a risk-averse approach for the regulators, industry and their scientific advisors to further review their decisions regarding the use of the processes, etc., under question, and insist on improved monitoring of the impacts, for there may have been critical gaps in the evidence base upon which the decisions were made. Beebeejaun has argued that regulation of shale gas development has been shown to be a much more complex set of processes - than merely imposing governance on the use of transplanted (into the UK from the US) technology and equipment - mediated through localized discourses,\textsuperscript{224} but in reality this may be a reflection of the lack of public trust in either the regulator or the industry or both. As Goldstein has observed,\textsuperscript{225} public attitudes to the governance of shale gas development cannot be resolved through the presentation of facts and evidence.

5. Matters for Regulation

5.1 Reports of Other Projects

The final report of other projects in relation to shale gas development in Europe, namely M4ShaleGas, FracRisk and SHEER, to which reference has already been made above, concluded with recommendations/suggestions in relation to the regulation of shale gas in Europe and in some cases touched upon governance. We do not propose to repeat the recommendations/suggestions for the content of regulations here, but we commend their consideration in the interests of more robust and open and transparent governance of shale gas development, which if appropriately explained would enhance confidence in the regulator and the regulated.

The M4ShaleGas project\textsuperscript{226} made a general recommendation in relation to a regulatory framework, as follows: ‘... an effective regulatory framework is critical to minimising the footprint, risks and impacts. The regulatory framework needs to be clear, transparent, realistic and in place at the start of a shale gas project so that operators can plan the project to be in accordance with the regulations. Regulations and measures following violations need to be adequately communicated to all stakeholders, including the general public, and imposed, monitored and enforced by independent regulators.’\textsuperscript{227} By way of comment, we note that lessons could be learned, not only from the experiences in North America, but more particularly from the lessons learned in: a) Poland, where the principal legislation was

\textsuperscript{223} ibid

\textsuperscript{224} Yasminah Beebeejaun, “Exploring the intersections between local knowledge and environmental regulation: a study of shale has extraction in Texas and Lancashire’, Environment and Planning C: Politics and Space (2017) 35 (3) 417-433, 428

\textsuperscript{225} n 13

\textsuperscript{226} http://www.m4shalegas.eu/project.html (last accessed 30/8/18)

\textsuperscript{227} Jan ter Heege and Holger Creemer (eds) Recommendations from the M4ShaleGas project on mimimizing the environmental footprint of shale gas exploration and exploitation, D21.5 (December 2017, M4ShaleGas Consortium)
amended in 2015, and b) to a greater degree in the UK, where there has been a number of policy and legislative changes, most recently culminating in the Energy Policy Written Ministerial Statement announcements of May 2018.  

The above recommendation addresses content, style and timing of a regulatory framework in relation to the commencement of shale gas operations. It also addresses aspects of governance, indicating that there needs to be an openness and communication with all stakeholders including the general public, on the part of and by the regulator, who should be independent, i.e., not captured by industry, and have the capacity to both monitor licenced shale gas operations and enforce the regulations.

There were recommendations/suggestions in all project final reports that sought to recognise the criticality of engaging and developing and retaining the confidence and trust of the public – both from the regulatory perspective and that of the developer. These should be heeded. As indicated in D11.1, it is EU law that the public be engaged in decisions affecting the environment. As the SHEER Project Report commented: “governments have been slow to recognise that social acceptance and social pressure can be very significant factors in the success or otherwise of shale operations”.

6. A Reconsideration of the EU Approach

6.1 The 2014 EC Recommendation

The EC Recommendation 2014 on minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high-volume hydraulic fracturing, supplemented by the Communication from the European Commission is ‘soft law’, meaning it is not binding. That does not mean that it is without impact. At the very least it serves to remind MS of the relevant binding laws. It also has the ‘top-down’ effect of the transmission of ideas for policy direction, in circumstances where a number of binding ‘hard laws’ already apply and thus there is already some semblance of a level-playing field or consistency of approach. The Recommendation may also have impact through diffusion and by mimesis (encouragement to follow).

In addition the implementation of the Recommendation 2014 in MS, at least in relation to the implementation and enforcement of environmental law and related matters is bolstered by the influence, and networking and benchmarking potential of the European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL), an informal network of European regulators and authorities.

228 https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-05-17/HCWS690
229 Paolo Capuano and Raffaella Russo, D8.2 Guidelines for the monitoring of shale gas exploration and exploitation induced environmental impacts (29/5/2018) at 9
230 2014/70/EU
231 Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions on the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing in the EU, COM(2014) 23 final/2
233 https://www.impel.eu/
In further support of the principles of the Recommendation 2014, the EU in 2014 established the European Science and Technology Network on Unconventional Hydrocarbon Extraction (although it is not within its mandate to provide advice to the Commission on shale gas policy), and is in the process of creating a Best Available Techniques (BAT) reference document for upstream hydrocarbon exploration and production (Hydrocarbons BREF) to identify best available approaches for risk management and best available techniques for the mitigation of environmental risk and impacts of the hydrocarbons sector.

In issue is whether the Recommendation 2014 in its present form with the above-mentioned influences and support is sufficient to safeguard public and environmental health within MS in respect of shale gas development.

In its Deliverable D7.4, the FracRisk authors adopted the premise that hydraulic fracturing can be viewed as any other industrial activity, which should be subject to regulations to ensure its safety to human and environmental health. The report notes that there is mistrust on the part of some members of communities, but also economic interests of investors and political interests of governments to secure an energy base in-country, to be addressed. It is also noted that, although shale gas and unconventional hydrocarbons may present at least an equal hazard and risk as a carbon capture and storage facility (CCS), the latter is addressed by a Directive, while shale gas merits only a Recommendation. In the conclusion of the report it advises that a Directive or at least an upgraded Recommendation should be developed, addressing a number of matters, as specified, including public concerns and the right of local communities to benefit directly from shale gas extraction, the need for a step forward in risk assessment to make it a tool for effective assessment, monitoring, acknowledgement of induced seismicity risks, and the need for further research in certain areas.

The Recommendation 2014 foreshadows in its preamble the potential necessity of updating the Recommendation, or developing legally binding provisions.

While we are aware of the arguments concerning the competence of the EU to enact binding measures addressing shale gas, it is clear that the Recommendation 2014 left open the prospect of subsequent binding legislation. As the FracRisk report stated, there is little activity with respect to shale gas in MS presently, with the exception of the UK, but this may change and it would seem sensible to be prepared with binding EU legislation, particularly in light of the results of the research conducted through the recent projects. While there was no appetite for such a development prior to 2014, and given the competency issues likely to be encountered in the European Parliament enacting secondary legislation determining the conditions under which a MS might exploit shale gas, this might be difficult but it has been suggested that measures in relation to shale gas - in the interests of environmental protection - could be adopted by the European parliament under the environmental competence of article 192 TFEU.

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235 n 97
236 Directive 2009/31/EC “on the geological storage of carbon dioxide”
237 n 37 section 2
238 Paragraph(10)
239 See e.g.: Leonie Reins, Regulating Shale Gas (2018, Edward Elgar), 177; Ruven Fleming, Shale Gas, the environment and energy security: A new framework for energy security (2017, Edward Elgar)
6.2 The EIA Directive

There is a suggestion in some quarters that environmental impact assessment should be mandatory for shale gas exploration and exploitation, which is not presently the case. Mandatory EIA might enhance the confidence of the public that all potential environmental impacts of shale gas development have been considered and mitigation measures put in place, particularly given that the EIA process provides an opportunity for the public to be consulted and engaged.

In 2013 the European Parliament voted in favour of a new EIA Directive in which EIA for shale gas would be mandatory, but this was not adopted by the European Council.

The Environmental Impact Assessment Directive was amended in 2014, arguably improving the level of environmental protection while simplifying the rules for assessing the potential effects of projects on the environment, in line with the Council’s decision of 2013. However, it is argued that exploration for and exploitation of shale gas requires an EIA in any event, under Annex 11 of the EIA Directive. And in any event, MS have the right to impose more stringent measures than the Directive demands, so could amend their EIA legislation to ensure that EIA must be undertaken for any shale gas development.

Five years on from the 2013 Council decision, and with the results of the recently completed projects available for digesting, perhaps reconsideration of mandatory EIA for shale gas, is in order.

7. Policy Matters and Governance

As stated earlier, we regard shale gas governance as a collection of regulatory measures and the institutions and actors (established by those measures) in a position to affect the shale gas industry in the EU, including authorities within various levels of government responsible for the different aspects of the shale gas industry (exploration and exploitation permitting, environmental assessment, construction permitting, etc.) along with the procedural dimensions of addressing shale gas related energy policy.

7.1 Coordinating Authority / Lead Agency

In 2011, the Philippe Report stated:

“exploration/exploitation of shale gas activities requires the regulation of numerous aspects, e.g., in the field of environment, chemicals, civil law, law on worker’s health and safety. This leads to the situation where a diversified regulatory framework, requiring the involvement of different authorities, is applicable to shale gas activities. In order to lower the burden on the operators and the involved authorities as well as to ensure a coherent procedure, the core authorisation and permitting procedures on the one hand and the

242 Fleming, n 240 at 64
244 http://ec.europa.eu/environment/eia/review.htm
245 Ibid at 65-66
246 Based on the competence of TFEU 192: see Fleming n 239 at 66-67
environmental procedures and other permitting procedures on the other hand could be more integrated, as is already the case in Germany and Sweden. Such an integrated approach can take the form of holistic procedures wherein a limited number of authorities deal with all hydrocarbon-related activities, and not several independent authorities treating the different issues separately. Such an overall approach also can be realised by means of a coordination mechanism, allowing different authorities to keep their competences. They then would have to submit their analysis to one coordinating authority who takes into account these different assessments for deciding upon the grant of an authorisation and/or a permit (cf. one-stop-shop, as is the case in Germany). Such an approach has its pros and cons for companies. On the one hand, they would not have to deal with different authorities with potentially contradicting verdicts. On the other hand a more fragmented administrative structure may increase their influence on the permitting procedure by assuming a kind of coordination role between the different involved authorities. This could be of benefit to companies, especially if they have an advantage as regards knowledge on shale gas projects compared to the public authorities.

The ideal scenario would consist of a combination of the best of both worlds. Highly specialised organisations, having their own competence and making their own analysis, which will then be submitted to a coordinating body taking into account these detailed assessments...”

The suggested ‘ideal scenario’ has been adopted in several jurisdictions. Both the Canadian province of Alberta, and the Australian state of South Australia (SA) have adopted the approach of a ‘single regulator’ in the case of the Alberta Energy Regulator248 and a ‘lead regulator’ or ‘one-stop-shop’ in the case of the South Australian Energy Resources Division249 where this approach is supported by inter-departmental memoranda of agreement (enabling the regulator to call on the expertise of e.g. the Department of Environment and Water). It is of note that within the UK, England has decided to pursue the same path, albeit inter-agency agreements are in existence to enable the regulator to call on the expertise of other agencies. The Secretary of State for Business, Energy and Industrial Strategy (BEIS) announced in May 2018 that a Shale Environment Regulator would be established to bring together to act in one coherent single face, the Environment Agency, the Health and Safety Executive and the Oil and Gas Authority, all of which presently have responsibilities for the regulation of shale gas exploration and exploitation.250 In Poland also, a one-stop-shop exists since 1 January 2015, with the primary regulator and concession granting body being the Ministry of Environment.

There is great merit in the lead agency approach. The best expertise in all fields is unlikely to reside in one authority. A lead agency approach, with inter-agency agreements in place, is likely to overcome the problems of a diversified regulatory framework, with respect to licensing, monitoring and enforcement. In consequence, all stakeholders would deal through one agency/ regulator resulting in reduced confusion, duplication, potential for inconsistencies and perhaps less frustration.

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248 https://www.aer.ca/providing-information/about-the-aer/what-we-do
250 https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-05-17/HCWS690
7.2 New Governance

Prescriptive legal standards depend on a degree of specialised centralised knowledge (within the regulator) that is often either not available in complete form or is quickly superseded in an industry where technical advances are proceeding at a fast rate as with increasing financial impositions, industry seeks to reduce costs. To overcome this dilemma, the prescriptive approach is abandoned and replaced by a collaborative approach between a diversity of private, public and non-government stakeholders who, acting together toward mutually negotiated goals, endeavour to achieve far more collectively than they could achieve individually. This form of governance relies on participatory dialogue and deliberation, flexibility, transparency and consensus-building. Much of this was recognised in the FracRisk report D7.4, when it argued that regulations are potentially hindering innovation with a better approach being collaborative ‘goal-setting’ negotiated between regulators and the industry developer. That report also saw a role for collaboration between the regulator, industry and the community, in a true iteration of ‘new environmental governance’.

This may be manifest in an approach whereby the developer identifies all risks (potential impacts) - environmental, natural resources, social, cumulative, etc. – together with its assessment of the scale of potential harm and the measures it will take to avoid and/or mitigate the harm, in a statement of objectives/goals, for consideration by and subsequent negotiation with the regulator. This approach could also involve the community, if it is not involved at any other stage of the permitting process, such as planning permission. The resultant statement as agreed following negotiation, should be binding on the developer, publicly available and subject to amendment as new information/data becomes available. It is not necessary for us to detail such an approach. It is merely a suggested model, by which governance is practical, transparent and may involve the community. It involves an element of self-management by the developer, with oversight by the regulator. Such an approach one hopes would increase trust in both the developer and the regulator, on the part of the community.

8. A Stand-Alone Legislative Framework or Integration?

In our initial view, the need for separate legislation within MS governing shale gas exploration and exploitation is indicated if either one of two reasons exists. First, if the processes and activities involved are so different from the development of any other form of hydrocarbon that it is too difficult to adapt existing legislation purposed at the development of hydrocarbons, then stand-alone legislation is likely appropriate. This is a call to be made by the policy makers informed by the legislative drafters.

The second case for separate legislation, in our preliminary view, is where the lawmakers determine that the subject matter together with its potential impacts upon the communities likely to be affected is of such immense interest and significance that it deserves its own purposive legislation. However, there are potential issues arising for the administration of the law if the second case is followed, where the general legislation, adapted, will meet the
purpose. And further, it appears that our preliminary view is incorrect, although consistent with other expectations that the public would be reassured by the introduction of a specific regulatory regime believing it would guarantee greater safety, risk management and in consequence, protection.\textsuperscript{254} Industry now strongly argues against the introduction of sector/technology-specific legal regimes, on the basis that the public is likely to be reassured that if the sector/technology is ‘only’ subject to existing legislation, the potential adverse effects and risks cannot be ‘that bad’.\textsuperscript{255} As Reins points out, this line of argument is nonetheless, a dangerous one to use, as it can be misleading to the public where the risks are real.\textsuperscript{256}

Existing national legislation focussed on the development of conventional hydrocarbons (petroleum) would need to be adapted in a number of respects to cater for shale gas, “including provision for an ability to hold undeveloped acreage positions and drill as needed to provide hydrocarbon volumes for a period of 40-60 years”.\textsuperscript{257} Some modifications have been made in the UK legislation\textsuperscript{258} with the introduction of ministerial authority to approve Retention and Development Areas within a PEDL, while other modifications have been progressively adopted, having been developed on an ad hoc basis,\textsuperscript{259} as happened in the USA. In Poland, legislative amendments has seen the introduction of one concession for both exploration and exploitation of shale gas.\textsuperscript{260}

As regards the potential impacts of shale gas development on the environment and natural resources, they may already be addressed in existing general legislation addressing environmental protection, natural and/or water resources, and environmental impact assessment. Similarly public health laws and work, health and safety laws may already address, respectively, any potential public health consequences, and industry worker health and safety issues. There may be other laws that will require amendment, such as with respect to the use of chemicals. Secondary legislation (regulations in common law countries) will need to be reviewed, for example, to require baseline assessments where appropriate.

The M4ShaleGas report\textsuperscript{261} seems to infer that it would suffice to amend existing regulatory frameworks to encompass the development of hydrocarbons, rather than enact new, specific legislation for shale gas development. However the authors have qualified their approach (or any inference that might be drawn) by advising that while their analysis relies mainly on experience from, and current practices in USA and Canada, this should not be seen as a blueprint for Europe.

A comprehensive piece of stand-alone legislation addressing all aspects of shale gas development is in reality unlikely to be feasible; there will inevitably need to be reference to the general legislation on worker safety, to cite just one example. Taking into account all of the foregoing, we would not recommend a stand-alone approach or specific legislation addressing shale gas development, at the national level, while we do suggest a lead-agency governance approach for the regulation and oversight of shale gas development.

\textsuperscript{254} Leonie Reins, Regulating Shale Gas (2018, Edward Elgar), 177
\textsuperscript{255} ibid
\textsuperscript{256} ibid
\textsuperscript{257} n 12, 289
\textsuperscript{258} And in the legislation of some other MS.
\textsuperscript{259} n 12, 311, 316
\textsuperscript{260} The Geological and Mining Law 2011 (Poland), as amended 2014
\textsuperscript{261} n 226
9. **Recommendations**

This report was ambitious; perhaps too ambitious. It was seeking too much to expect to be able to deliver a comprehensive template for the governance of shale gas at either level of the EU or within the MS of the EU. We have avoided preparing for recommendation a list of matters that should form an integral element of regulations, although we support and endorse consideration of the suggestions and recommendations of the other projects (SHEER, FracRisk and M4ShaleGas), as well as those of ShaleXenvironmenT work packages, especially WP9. Instead, we have endeavoured to address matters in such a way as to stimulate thinking on the subject at both the EU and MS levels.

We have argued for consideration of a secondary EU legislation in the form of a Directive addressing shale gas exploration and exploitation. There are barriers to such an approach, but they may not be insurmountable and that route would result in certainty in some respects and uniformity, for industry and the community in MS if and when shale gas is again on the agenda. The process of environmental impact assessment is generally valued by communities and given the public angst concerning shale gas; there is merit in reconsidering making EIA mandatory for shale gas development.

With respect to governance at MS level, we would urge cooperative governance through a lead-agency approach with agreements being in place with other relevant agencies to ensure timely expert assistance in permitting, management and oversight of the industry together with necessary enforcement of the laws.

There are models of new governance which must be contemplated at MS level in the interests not only of more collaborative management, but attaining the benefit of ever-current information in a dynamic industry, and engendering confidence on the part of all stakeholders. Governments and industry must do more than hitherto not only in engaging with their communities, but also doing so in an empathetic manner. This necessarily involves understanding cognitive biases and the arts of communication.

Finally we have recommended that a policy of separate, stand-alone legislation for the oversight of shale gas development is not in the best interests of anyone, and probably not feasible.

There are many aspects of policy and governance that have not been addressed in this report; thus, there remain opportunities for further research in the future.