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COM(2016) 794 final

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND  
THE COUNCIL**

**on the effectiveness of Recommendation 2014/70/EU on minimum principles for the  
exploration and production of hydrocarbons (such as shale gas) using high-volume  
hydraulic fracturing**

## 1. Introduction

In January 2014, the Commission adopted a Communication and a Recommendation<sup>1</sup> on the exploration and production of hydrocarbons (such as shale gas) using high-volume hydraulic fracturing (HVHF). As a complement to existing EU legislation, the Recommendation lays down minimum principles for such activities, with a view to help safeguarding public health, the climate and the environment, using resources efficiently and informing the public. Member States that had chosen to carry out such activities were asked to give effect to the Recommendation by 28 July 2014. The Recommendation proposed that the Commission should review its effectiveness 18 months after its publication.

## 2. Current state of development of hydrocarbons using well stimulation and enhanced recovery techniques in the EU

A survey<sup>2</sup> of the Member States revealed that 11<sup>3</sup> have granted, or plan to grant, authorisations for the development of hydrocarbons that may require the use of HVHF. The remaining Member States either have no known resources or have introduced moratoria or bans. Most of the Member States interested in shale gas development are in the planning phase or in the process of issuing permits for exploration projects. A total of around 80 exploratory wells have been drilled, of which at least 16 were fractured with high volumes of fluids.<sup>4</sup>

In contrast to shale gas, the development of coalbed methane has already resulted in production. Member States have issued permits for at least 137 wells for coal bed methane exploration or production.<sup>5</sup> Coalbed methane production does not necessarily require hydraulic fracturing, but entails the pumping of high volumes of water with a potentially higher risk for groundwater contamination.

The extraction of tight gas follows processes that are comparable to those used for shale gas. In recent decades, over 600 tight gas wells have been drilled and hydraulically fractured on- and offshore in Member States.<sup>6</sup> Tight gas development typically requires lower volumes for hydraulic fracturing than shale gas.

Conventional gas or oil wells do not require hydraulic fracturing to induce flow in the primary recovery phase. However, as fields become depleted, enhanced recovery techniques are being applied increasingly in the EU to extend the production period. These techniques are constantly evolving, but can involve the injection of steam, gases and other chemical substances into the well.<sup>7</sup> A total of 11 Member States<sup>8</sup> confirmed that they had granted or

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<sup>1</sup> COM/2014/023 final/2 and Recommendation 2014/70/EU

<sup>2</sup> 2015 overview of Member States' replies on the application of the Recommendation : [http://ec.europa.eu/environment/integration/energy/unconventional\\_en.htm](http://ec.europa.eu/environment/integration/energy/unconventional_en.htm)

<sup>3</sup> AT, DE, DK, ES, HU, LT, NL, PL, PT, UK, RO.

DE decided in 2016 to prohibit hydraulic fracturing in shale, clay, marl and coal seam rocks, except for up to four tests for scientific purposes.

<sup>4</sup> Polish Geological Institute (April 2016) and Commission studies

<sup>5</sup> <https://ec.europa.eu/jrc/en/uh-network>

<sup>6</sup> Production in DE, NL, DK, UK; exploration in HU; assessment of potential in PL; <http://ec.europa.eu/environment/integration/energy/pdf/fracking%20study.pdf>

<sup>7</sup> [http://ec.europa.eu/environment/integration/energy/pdf/Study\\_on\\_the\\_management\\_of\\_environmental\\_impacts\\_and\\_risks\\_of\\_conventional\\_oil\\_and\\_gas%20.pdf](http://ec.europa.eu/environment/integration/energy/pdf/Study_on_the_management_of_environmental_impacts_and_risks_of_conventional_oil_and_gas%20.pdf)

<sup>8</sup> AT, DE, DK, FR, HR, HU, IT, LT, NL, PL, UK.

plan to grant authorisations for conventional oil and gas extraction using well stimulation or enhanced recovery techniques.<sup>9</sup>

### 3. Effectiveness of the Recommendation

This review assesses the effectiveness of the Recommendation in:

- preventing, managing and reducing environmental impacts and risks;
- providing competent authorities and operators with legal certainty and predictability;
- responding to public concerns; and
- taking account of technical progress and of the use of techniques other than HVHF.

Member States were asked to inform the Commission of the measures they had put in place in response to the Recommendation in 2014 and 2015.

The review was supported by the following studies<sup>10</sup> and consultation processes:

- a study on the application of the Recommendation and relevant EU legislation, including interviews with stakeholders;
- studies on the management of environmental impacts and risks of oil and gas extraction using enhanced recovery techniques, as well as of tight gas, tight oil and coalbed methane extraction;
- a stakeholder event on unconventional fossil fuels;
- a Flash Eurobarometer survey<sup>11</sup>, which examined citizens' attitudes in European regions where shale gas projects have been granted permits or may be planned; and
- feedback from Member States in meetings of the technical working group on environmental aspects of unconventional fossil fuels.

#### 3.1. Effectiveness of the Recommendation in preventing, managing and reducing environmental impacts and risks

The Recommendation suggests carrying out a **strategic environment assessment** (SEA) before granting hydrocarbon licences and an **environmental impact assessment** (EIA) for projects that may lead to the use of HVHF. Following the adoption of the Recommendation, the UK<sup>12</sup> completed a SEA prior to the granting of new licences, taking into account the risks of hydraulic fracturing, while Poland continued to grant licences without carrying out a SEA. Several of the Member States concerned require by law an EIA prior to activities involving the use of hydraulic fracturing, while others call for an EIA only where a project meets specific criteria.

The Recommendation invites Member States to lay down **rules on possible restrictions of activities**. A few have rules that apply specifically to hydraulic fracturing, for instance in Lithuania and Germany in water protection areas, while others have general rules applicable to a wide range of activities or establish rules case by case.

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<sup>9</sup> See footnote 2

<sup>10</sup> [http://ec.europa.eu/environment/integration/energy/uff\\_studies\\_en.htm](http://ec.europa.eu/environment/integration/energy/uff_studies_en.htm)

<sup>11</sup> <http://ec.europa.eu/COMMFrontOffice/PublicOpinion/index.cfm/Survey/getSurveyDetail/instruments/FLASH/surveyKy/2066>

<sup>12</sup> Only permits for sites located in England were examined. This review refers to the UK when it comes to the nationwide application of provisions and to England where specific provisions are applied there.

The application of the principle regarding **site selection** could be assessed for exploration sites in Poland, England and to some extent, Spain. In Poland and in England, site-specific risk assessments were carried out. The preliminary EIA documents assessed in Spain suggest that risk assessments will be carried out.

In Denmark and England, **well integrity** tests must be reviewed by an independent third party. No evidence of such review could be found at the sites examined in Poland.

The Recommendation calls for a **baseline study** addressing ten parameters, such as water and air quality. This principle does not specify the precise data to be collected. Overall, most of the parameters were taken into account at the sites for which permits had been issued since the adoption of the Recommendation.

**Monitoring** was carried out or is planned on the basis of the parameters determined in the baseline. Not all environmental monitoring results are systematically reported by the operators to competent authorities. In Lithuania, specific monitoring requirements applicable to shale oil and gas exploration and production are enshrined in national legislation.

A more comprehensive overview of the application of all principles of the Recommendation in Member States is available in the study supporting this review.

### **3.2. Effectiveness of the Recommendation in providing competent authorities and operators with legal certainty and predictability**

The Recommendation is intended to complement Union legislation that was developed at a time when HVHF was not used in the EU. This section focuses on three pieces of legislation which can be of relevance for the early phase of shale gas projects and which Member States apply differently. A more detailed analysis of this and other relevant legislation can be found in the study supporting this review.

The **Water Framework Directive**<sup>13</sup> prohibits the direct discharge of pollutants into groundwater. Competent authorities have differing interpretations of its applicability to shale gas operations. Some consider hydraulic fracturing as an activity that may result in an input of pollutants that would require specific permit conditions, while others consider that no such conditions are required, as injection would not be taking place in groundwater.

Waste resulting from shale gas exploration or production activities includes extractive waste, which must be managed in compliance with the **Extractive Waste Directive (EWD)**.<sup>14</sup> While most Member States investigated consider drilling cuttings and muds as extractive waste, different interpretations are applied to fluids that emerge at the surface after hydraulic fracturing and to residuals of fracturing fluids remaining underground after the closure of a well. Some Member States do not classify these fluids as extractive waste, while others do. This has implications on the number of waste facilities permitted under the EWD.

The **Industrial Emissions Directive (IED)**<sup>15</sup> does not specifically cover the extractive industries, but projects may involve activities (e.g. incineration and storage of waste,

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<sup>13</sup> Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

<sup>14</sup> Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC.

<sup>15</sup> Directive 2010/75/EU of the European Parliament and of the Council laying down provisions on industrial emissions applies to installations within which activities listed in Annex I to that Directive are operated.

combustion of fuels) that are covered. Specific IED activities require a permit based on best available techniques (BATs) covering all activities on such an installation. Member States' interpretations differ on whether gases to be flared are to be considered as waste gases that are incinerated.

### 3.3. Effectiveness of the Recommendation in responding to public concerns

The Recommendation suggests that competent authorities **publish relevant information** on a publicly available internet site. Romania and the UK publish environmental permits on the internet, while permit conditions are not publicly available in Germany and Lithuania, and not systematically in Poland. In Spain, an online tool provides access to relevant documentation on projects falling under the competence of the central government but not of autonomous regions. A more detailed analysis is provided in the study supporting this review.

As regards the dissemination of **information on the chemical substances** intended to be used for the fracturing of each well, EIA documents and environmental reports examined from Spain, England and Poland referred to an illustrative composition. Operators in Germany, England and Poland provided information on the substances actually used for fracturing without necessarily disclosing all details which are suggested in the Recommendation. In Germany, it will become compulsory to publish information on the substances used for hydraulic fracturing.<sup>16</sup>

The Recommendation calls on Member States to ensure that files for chemical substances used in hydraulic fracturing refer to 'hydraulic fracturing' when being registered under the **REACH Regulation**.<sup>17</sup> A search in the database of REACH registrations for substances used<sup>18</sup> in the period of 2008-2014 in the EU for hydraulic fracturing found that few registrations make an explicit reference to hydraulic fracturing. Substances used in this period have been registered under more generic use names such as "mining chemicals" or may not have required registration under REACH due to low tonnages<sup>19</sup> or exemptions. In order to facilitate searches for information on substances registered for use in oil and gas exploration or production, the REACH database was adjusted in April 2016 with a new category for 'oil and gas exploration or production products'.<sup>20</sup> (see also section 5.1)

The **Eurobarometer survey** assessed respondents' awareness of shale gas projects in their region and what potential challenges they perceive in this field. Among those who have heard of shale gas projects, a minority in 10 out of 12 regions say they feel sufficiently informed about them. Only in the two regions in Poland did a majority of citizens contacted feel sufficiently informed. Water and air pollution was the challenge mentioned most often in a majority of regions, while the negative impact on other sectors, such as agriculture or tourism, and risks to health was also cited.

A **survey of stakeholders** was conducted as part of the Commission study on the application of the Recommendation. Of the 19 organisations that responded, 12 respondents from all categories of stakeholder (six from the oil and gas industry, one from the water industry, four from NGOs, and one from a geological survey) replied that it did not help alleviate public

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<sup>16</sup> Entry into force of the new legislation in February 2017.

<sup>17</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

<sup>18</sup> Substances disclosed by the industry with a CAS number.

<sup>19</sup> Substances manufactured or imported into the EU above 1 t but not more than 100 t per year are required to be registered under REACH by 31 May 2018.

<sup>20</sup> [https://echa.europa.eu/documents/10162/13632/information\\_requirements\\_r12\\_en.pdf](https://echa.europa.eu/documents/10162/13632/information_requirements_r12_en.pdf)

concerns, while six (four from the oil and gas industry, one from a geological survey, and one NGO) replied that it did in part.

### **3.4. Effectiveness of the Recommendation in taking account of technical progress and the use of techniques other than high-volume hydraulic fracturing**

A study carried out for the Commission assesses technological developments since the adoption of the Recommendation and emerging technologies likely to be taken up more widely by the industry in the short to medium term. It does not identify developments that would significantly change the overall risk profile of the way shale gas is developed. For some emerging technologies, however, including nanotechnologies, it is not possible fully to assess associated risks. Although some licences targeting shale formations offshore have been issued in several Member States, no operational activities have been reported to date.

As far as fracturing technologies are concerned, the European Science and Technology Network on Unconventional Hydrocarbon Extraction<sup>21</sup> expects **water-based fracturing** to remain the most commonly used technique in the sector in the coming years.

As regards the development of unconventional fossil fuels other than shale gas, the licensing, exploration or assessment of **coalbed methane** resources have taken place or are under way in a number of Member States<sup>22</sup>. Many coalbeds are at a shallower depth than shale formations and are located in ground or drinking water reserves. If hydraulic fracturing is necessary, the risks associated with groundwater contamination are potentially more significant for coalbed methane than for shale gas.<sup>23</sup> Equally, the risk of fugitive emissions is potentially greater. At the production stage, coalbed methane development requires the pumping of water in volumes that present an increased risk of water-resource depletion. Where there is a hydrogeological connection to overlying or lateral formations, groundwater flows might be induced that negatively affect the quality of drinking water.<sup>24</sup>

The production of **tight gas** requires hydraulic fracturing with volumes that are in most cases not great enough to fall within the scope of the Recommendation. Studies for the Commission indicate that the risks and impacts of tight gas development are similar to those of shale gas, with the exception of impacts and risks associated with the hydraulic fracturing process, well completion and production stages linked to water resource depletion, which are potentially less significant as less water is typically required for the fracturing process.

Generally, the public does not distinguish between low- and high-volume hydraulic fracturing. Many citizens are now concerned about the potential use of any well stimulation technique in oil or gas extraction projects, even though some such techniques have been used for several years.

**Enhanced recovery** techniques are increasingly used to maximise the production of fossil fuels that initially did not require stimulation. The key risks stem from the construction and drilling of additional wells to provide injection points and the injection of substances, with impacts relating to land-take, traffic and emissions to air, and risks of ground and water pollution.<sup>25</sup>

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<sup>21</sup> <https://ec.europa.eu/jrc/en/uh-network>

<sup>22</sup> e.g. BE; BG; CZ; FR; DE; HU; IT; PL; RO; UK; SWD/2014/021 final

<sup>23</sup> [http://ec.europa.eu/environment/integration/energy/pdf/risk\\_mgmt\\_fwkw.pdf](http://ec.europa.eu/environment/integration/energy/pdf/risk_mgmt_fwkw.pdf)

<sup>24</sup> [http://ec.europa.eu/environment/integration/energy/pdf/study\\_management\\_ei.pdf](http://ec.europa.eu/environment/integration/energy/pdf/study_management_ei.pdf)

<sup>25</sup> Ibid

In view of the interest in several Member States in further developing coalbed methane and tight gas and using well stimulation or enhanced recovery techniques, the Commission commissioned studies that compare the risks and impacts from the extraction of such resources with those of shale gas. Overall, it concludes that the main risk management practices identified for shale gas could be equally applied to the practices mentioned above.

#### 4. Stakeholders' views

In December 2015, the **European Parliament** adopted, in plenary session, a Resolution<sup>26</sup> calling on Member States that intend to pursue hydraulic fracturing to respect Recommendation 2014/70/EU and comply with the 'highest climate, environmental and public health standards'.

In its opinion of June 2014, the **European Economic and Social Committee**<sup>27</sup> considers that the current framework 'if correctly implemented, is sufficient for use at local community level', although it points to the need to reconsider the matter 'should activities increase substantially in volume'. It also stresses the need for a high level of transparency in both exploration and exploitation projects in order to address public acceptance issues.

From the feedback received at the stakeholder event in June 2015, **stakeholders** appear to be divided in their views. The oil and gas industry considers that the Recommendation is sufficient and that no further legislative action is needed. Several water-producing associations called for additional regulatory safeguards to ensure drinking water protection. Environmental NGOs consider that the Recommendation has not been effective and called for additional regulation or a ban on shale gas, shale oil and coalbed methane projects.

The **Eurobarometer** survey also elicited divergent views, ranging from 'no need for EU involvement' to pointing to a need for regulatory action or a ban on hydraulic fracturing. The current approach of providing recommendations without adopting new legislation was the least popular option.

No formal **Council** position was adopted after the publication of the Recommendation. At a meeting of the Environment Working Party, a number of delegates welcomed the fact that the Commission had opted for a Recommendation, while others considered legally binding measures preferable. Several competent authorities called on the Commission to clarify the applicability of relevant EU environmental legislation, as part of the EU network for the implementation and enforcement of environmental law (IMPEL).

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<sup>26</sup> <http://www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=P8-TA-2015-0444&language=EN&ring=A8-2015-0341>

<sup>27</sup> <http://www.eesc.europa.eu/?i=portal.en.nat-opinions.32331>

## 5. Conclusions and way forward

Availability of shale gas and interest in its development vary widely across the Member States. Of those Member States interested, some are in the early planning phase while others have launched exploration projects. The analysis of selected planning documents, permit applications and operating permits indicates that several of the principles set out in the Recommendation were applied in a few Member States before it was adopted. Following its adoption, a few Member States changed their permit practices or developed national legislation that reflected some of the principles of the Recommendation, while others lowered their environmental ambitions in an effort to simplify the issuing of permits or focused on incentives for investors. One Member State simplified environmental legislation to such an extent that the Commission launched infringement proceedings<sup>28</sup> on account of a failure to fulfil obligations under the EIA Directive. Some of the principles of the Recommendation are currently applied in some Member States without being enshrined in national legislation and it remains to be seen whether this continues, in particular in view of efforts in these countries to attract investment.

This report assesses the first two and a half years of application of the Recommendation in a limited number of projects in a few Member States. To date, the Recommendation has been applied unevenly across Member States and unsatisfactorily in some. On the basis of the findings of this review, it is thus impossible to confirm at this stage the effectiveness of the Recommendation in preventing, managing and reducing environmental impacts and risks. The variety of ways in which the Member States have followed the Recommendation is also a result of its legally non-binding status. The Commission therefore encourages Member States to take greater account of the principles of the Recommendation if they plan to develop hydrocarbons that require HVHF.

Member States differ in their interpretations of some provisions of relevant Union environmental legislation. Operators who are active in more than one Member State may face inconsistent application of these provisions. While existing legislation establishes a legal framework for shale gas activities, the objective of providing legal certainty and predictability to competent authorities and operators is thus not fully met.

If applied thoroughly, the Recommendation can be a useful tool for managing the risks of using HVHF for hydrocarbon development in a transparent manner. More progress is necessary, both in the application of the Recommendation in the relevant Member States and in the correct and uniform application of the EU environmental *acquis*.

To this end, the Commission plans to focus on:

- increasing transparency and monitoring;
- fostering the correct and uniform application of relevant provisions across Member States;
- addressing the environmental impacts and risks of hydrocarbon exploration and extraction; and
- filling research gaps on health impacts and risks of hydrocarbon extraction.

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<sup>28</sup> [http://europa.eu/rapid/press-release\\_IP-16-1454\\_en.htm](http://europa.eu/rapid/press-release_IP-16-1454_en.htm)

## 5.1. Increasing transparency and monitoring

The Commission will continue to monitor technical developments as well as the application of the Recommendation and relevant EU environmental legislation. Reporting from Member States on the application of the Recommendation will continue and results will be made publicly available on an annual basis. In this context, findings from the ongoing fitness check on environmental monitoring and reporting<sup>29</sup> will be duly taken into account.

The Commission intends regularly, and at the latest every three years, to reassess the effectiveness of the approach taken, in particular in the light of the overall development of the sector in the EU and any incidents and accidents around the world.

Although the Recommendation has triggered changes in permit practices in several Member States, the principles that foster transparency are insufficiently applied. Continued opposition to shale gas projects in most Member States suggests that the Recommendation has not changed public attitudes. Public scrutiny has expanded from shale gas projects to all onshore and coastal oil and gas developments.

In order to enhance the overall level of transparency and enable close monitoring of environmental impacts, the Commission will set up an internet platform aimed at providing an EU-wide inventory and a map of planned and existing unconventional oil and gas wells. This will be publicly accessible and reflect 'better regulation' principles, also taking into account the INSPIRE Directive.<sup>30</sup> It will aim to make available data as called for in the Recommendation, using *inter alia* information published by Member States and operators. A prototype will be made publicly available in the first half of 2017 and further elaborated in the coming years.

In order to facilitate searches for information on chemical substances registered under REACH for use in hydraulic fracturing, searching functionalities will be further enhanced on the webpage<sup>31</sup> of the European Chemicals Agency, which should enable keyword searches by the first half of 2017. The Commission will contact Member States to reiterate that REACH registration files for substances used in hydraulic fracturing should include a specific reference to this activity. The Commission also encourages the oil and gas industry associations to develop use-maps<sup>32</sup> to support registrants in their assessment and reporting.

In addition, the Commission will draft a technical report by the end of 2017 exploring methodological approaches for monitoring water quality near unconventional oil and gas exploration and production sites.

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<sup>29</sup> [http://ec.europa.eu/environment/legal/reporting/fc\\_overview\\_en.htm](http://ec.europa.eu/environment/legal/reporting/fc_overview_en.htm)

<sup>30</sup> Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) (OJ L 108, 25.4.2007, p. 1).

<sup>31</sup> <https://echa.europa.eu/information-on-chemicals/registered-substances>

<sup>32</sup> <https://echa.europa.eu/csr-es-roadmap/use-maps>

## 5.2. Fostering a correct and uniform application of relevant environmental legislative provisions across Member States

To this end, the Commission plans to:

- pursue dialogue with Member States, where necessary using available platforms and assistance mechanisms, such as the Environmental Implementation Review<sup>33</sup>; committees working on the implementation of EU environmental law and IMPEL; and the technical working group on environmental aspects of unconventional fossil fuels.
- develop support documents in the form of frequently asked questions and based on queries to the Commission on EU legislation on protected areas, planning, waste management, water protection and industrial emissions;
- investigate possible failures to apply EU law correctly and take appropriate action.

## 5.3. Addressing the environmental impacts and risks of hydrocarbon exploration and extraction activities

The Recommendation calls on Member States to ensure that operators use best available techniques (BATs) in order to prevent or minimise environmental impacts and risks. Two BAT reference documents (BREFs) currently under development and relevant for hydrocarbon activities using HVHF relate to the management of waste resulting from extractive industries<sup>34</sup> and to waste treatment<sup>35</sup>. These BREFs are currently being revised and should be finalised in 2017 and 2018 respectively. In addition, a non-binding summary of BATs in the hydrocarbons sector<sup>36</sup> will be finalised in 2018.

Section 3.4 identified the environmental impacts and risks of other activities beyond shale gas extraction. The principles of the Recommendation are suitable to manage such impacts and risks. Therefore the Commission encourages Member States to apply the relevant principles of the Recommendation to other forms of hydrocarbon exploration and extraction activities where they involve hydraulic fracturing, pumping high volumes of water or enhanced recovery.

## 5.4. Filling research gaps on health impacts and risks

Five research projects on the environmental impacts and risks of shale gas extraction have been funded under the Horizon 2020 programme for research and innovation<sup>37</sup>, and an additional research topic was recently published.<sup>38</sup>

In addition, researchers<sup>39</sup> pointed to a lack of reliable exposure and epidemiological studies, in particular to assess possible long-term effects, and called for further investigation of the public health impacts and risks associated with oil and gas extraction using hydraulic

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<sup>33</sup> [http://ec.europa.eu/environment/eir/index\\_en.htm](http://ec.europa.eu/environment/eir/index_en.htm)

<sup>34</sup> <http://susproc.jrc.ec.europa.eu/activities/waste/index.html>

<sup>35</sup> <http://eippcb.jrc.ec.europa.eu/reference/>

<sup>36</sup> [http://ec.europa.eu/environment/integration/energy/hc\\_bref\\_en.htm](http://ec.europa.eu/environment/integration/energy/hc_bref_en.htm)

<sup>37</sup> <http://www.m4shalegas.eu/project.html>;

<http://www.sheerproject.eu/objective.html>;

<https://shalexenvironment.wordpress.com/>;

<http://www.fracrisk.eu/>;

[https://ec.europa.eu/easme/sites/easme-site/files/FTI-projects-2015\\_participants%20websites\\_corrected.pdf](https://ec.europa.eu/easme/sites/easme-site/files/FTI-projects-2015_participants%20websites_corrected.pdf)

<sup>38</sup> <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lce-27-2017.html>

<sup>39</sup> <http://dx.doi.org/10.1371/journal.pone.0154164>; <http://dx.doi.org/10.1016/j.scitotenv.2014.10.084>;

<http://jech.bmj.com/content/70/3/221>; <http://pubs.acs.org/doi/abs/10.1021/es404621d>

fracturing. In this context, the Commission organised a technical workshop in 2016 aimed at identifying possible knowledge gaps. The Commission will consider addressing identified gaps in the Horizon 2020 work programmes for 2018 and 2019.

The Commission will also consider mandating the scientific committee on health and environmental risks (SCHER) to produce an opinion on impacts and risks to human health resulting from the exploration and production of hydrocarbons.