



Results of the public consultation on SCHEER's preliminary Opinion on the public health impacts and risks resulting from onshore oil and gas exploration and exploitation in the EU

A public consultation on this Opinion was opened on the website of the non-food scientific committees from 22 March to 6 May 2018. Information about the public consultation was broadly communicated to national authorities, international organisations and other stakeholders.

Twenty-eight submissions from 5 contributors (providing more than 80 comments and 20 documents) participated in the public consultation providing input to different chapters and subchapters of the Opinion. Most of the comments, by a large majority, came from industry.

Each submission was carefully considered by the SCHEER and the scientific Opinion has been revised to take account of relevant comments. The literature has been accordingly updated with relevant publications.

The SCHEER expresses its thanks to all contributors for their comments and for the literature references provided during the public consultation.

The table below shows all comments received on different chapters of the Opinion and SCHEER's response to them. It is also indicated if the comment resulted in a change of the Opinion.




SCHEER's replies to comments received during the public consultation on the SCHEER preliminary Opinion on public health impacts and risks resulting from onshore oil and gas exploration and exploitation in the European Union

No.	Name of individual/organisation	Table of contents	Submission	SCHEER's response
1.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	Acknowledgments	Page 3: We note that no expertise resource from the affected industry is listed, despite the open invitation to nominate these resources and our response to that by nominating Andre Holtrop, Industrial Hygienist of the NAM in Assen.	No change in the Opinion is needed.
2.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	Abstract	<p>Page 2, line 24, 25 - A 'centralised and harmonised well-based inventory of all oil and gas exploration and exploitation sites in the EU' - Why the inventory has been made well based? Some companies may have their production facilities away from the well pads there is therefore a need to consider both well pads and production facilities if the locations are different.</p> <p>Page 2, line 26, 27 - 'Analytical and modelling studies that identify, quantify and characterise exposure mixtures and their levels in the vicinity of these sites' - These studies could be done in-house (by individual companies). Alternatively, a common methodology should be proposed by SCHEER. Preliminary screening of actual pollutants (chemicals) is a key step. However, since chronic effect is the focus, it may not cover release from accidental events that can be managed within a short period.</p> <p>Page 2, line 28 - 'Large-scale epidemiological studies with accurate exposure assessment - This should be based on identified pollutants (chemicals) per location.</p>	<p>This is correct; the inventory should not be well-based but an inventory of all gas and oil sites in EU. Text of the Opinion has been changed accordingly.</p> <p>This is the abstract of the Opinion, not a detailed description. Moreover, it is not the task of the SCHEER to specify who needs to follow-up recommendations.</p> <p>This is the abstract of the Opinion not a detailed description. Moreover, exposure assessment can be realised in many ways (external measurements, internal – biomonitoring – measurements, individual or multiple compounds)</p>
3.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	Opinion and Conclusions	a) Page 9 - mentions that there are no relevant publications and documents in the EU, which is why the study is based mainly on the results of US research. They mostly concern shale gas. The analysis of the results of research and observations concerning occupational diseases of people involved in exploratory work - mainly drilling and hydrocarbon extraction, directly exposed to the potential impact of substances and mixtures used in works and hydrocarbons both in the USA and in Europe - was not included in the analysis. The presented effects of conducted	a) Not only USA-based publications were used, but not many EU-publications were identified.

		<p>observations, tests or statistical analyzes in the context of the increase in the incidence of people in the hydrocarbons exploration or production vicinity, does not show if they took into account other effects that could cause such state of health (eg obesity, allergies etc) different than factors related to exploration and extraction. There is no information on this subject in the study.</p> <p>b) Page 9, lines 11 and 16 Terminology used in the document is variable and Reference is made to 'hazardous substances', 'chemicals', but many of the listed products are mixtures.</p> <p>c) Page 9, line 13 more than 1300 different chemicals' may be emitted into the environment. It is unclear what each chemical represents. First, the Working Group relies heavily on the Faber et al., 2017 publication. A publication that does not represent the status of current industry activities: it is not original research but is a review of reviews. Secondly, the author fails to explain what the 1300 chemicals represent. The number may represent ALL the potential chemicals that have a possibility of being produced across the operators surveyed. It does not represent the footprint from a single well.</p> <p>d) Page.9, line 19 - Text inappropriately suggests that all VOCs have a 'high toxicological profile'. Many VOCs have very limited toxicity, e.g. simple alkanes other than n-hexane.</p> <p>e) Page 9, line 24 - What is a risk of accidental spillage of 5% per well per year? That on average each well has one spillage in 20 years? How large a spillage? Again, these figures are from the Faber et. al., 2017 publication which we have established as not authoritative. The industry in the US and Europe has developed guidelines on spill impact mitigation assessment (SIMA) designed to minimize impacts due to spills.</p> <p>f) Page 9, line 37 - There are existing studies that the working group did not take into consideration. For example: <i>Maskrey et al.</i>, conducted an exposure assessment at well site situated close to a school and concluded that all VOCs except benzene were at levels below screening levels and that while benzene exceeded the screening level at the time samples were taken, most background levels exceeded screening levels as well. <i>Seigel et al.</i>, conducted a predrilling study conducted in 2015 showed that saline water was naturally occurring in certain regions of the</p>	<p>b) Changes were made accordingly.</p> <p>c) It is correct that the list of 1300 chemicals as documented in Faber <i>et al.</i> do not have to be represented in the footprint of a single well, which is not suggested in the Opinion. For the spill volumes, Faber <i>et al.</i> was based on other resources, which are based on official statistics. See also other references in the Opinion such as Maloney <i>et al.</i>, (2017).</p> <p>d) Changes were made accordingly.</p> <p>e) As described in section '<i>Emissions of contaminants in the environment</i>' of the final Opinion, a spillage of 5% is a spillage of the operational yield per well per year. The text has been clarified.</p> <p>f) No specific references are included in this section, only more general conclusions. <i>Siegel et al.</i>, (2015) is not referred to in our Opinion. <i>Maskrey et al.</i> (2016) has been included in the document.</p>
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			<p>Marcellus along with elevated metal concentrations. The study looked at over 21,000 data points</p> <p>g) Page 9, line 39 - question whether biomarkers can be used effectively for exposure or effect. Biomarker results are difficult to interpret and are generally not very informative. Unless there are specific chemical or biological biomarkers which are specific to the oil and gas industry operations, then the measurement of biomarkers is premature. Many of the chemical stressors associated with oil and natural gas development are also associated with other common sources (mobile sources, combustion sources, point sources such as gasoline stations, etc.). Similarly, biomarkers of disease which may potentially be associated with oil and gas development activities, such as biomarkers of stress, may be commonly linked with other exposures.</p> <p>h) Page 9 line 41 - There are studies that have screened the relationship between exposure and the risk of health outcomes. <i>Peer-review-The Texas Commission on Environmental Quality (TCEQ) and Bunch et al., both assessed 4.7 million data points from broad network of air monitoring stations and activities in the Barnett region of Texas and deduced that the long-term measurement were below long-term health screening values, and only three exceedances were recorded that exceeded short-term health screening values. Manuscript in preparation-</i>Colorado Department of Public Health and Environment conducted a public health review that looked at both potential exposures and was as hazard threshold related to chemicals detected in the air monitoring samples and determined that detected chemicals were at levels below health thresholds values. A recent paper by <i>McKenzie et al.</i>, attempted a risk assessment. The data selected for the assessment was limited. The study found that there were no added non-cancer and cancer risks beyond 500 to oil and gas development facilities. The study did, however, determine that there were risks associated with living within a 500-foot buffer. A close review of the study showed that a limited data set (n=29) was used which in turn decreased the strength of the findings. In 2010, in response to citizen's concerns, the Texas Department of State Health Services (TDSHS) investigated cancer incidences in Flower Mound Texas and concluded while the numbers of female breast cancer were higher than expected there were other extenuating circumstances that may have led to the increase. Quoting the US Center for Disease Control, the TDSHS considered the relatively small risk of developing</p>	<p>g) See comment f) above. In addition, this has been clarified in the final text of the Opinion.</p> <p>h) No specific references are included in this section, only more general conclusions. The text has not been changed.</p>
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			<p>cancer from exposures to chemicals (<10%) when compared to factors related to lifestyle. There were other demographic changes that may have also resulted in the study findings.</p> <p>i) Page 9, 46 - The oil and gas industry routinely conduct HIAs as an internal tool which would explain why there are limited HIAs in peer reviewed literature.</p> <p>j) Page 9, line 48-50 - A reference is needed for the cited study.</p> <p>k) Page 10, line 6 - The SCHEER Opinion established criteria to assess the level of evidence presented by studies. However, the criteria used are not available and has yet to be published. The current epidemiological research represents hypothesis generating studies that do not support evidence for causality. The studies need to be reviewed along with the evidence provided by the exposure and air monitoring studies. Current epidemiology studies are not supported by "biological feasibility" when compared to air measurements and exposure findings.</p> <p>l) Page 11, line 14 - The WG did not conduct a comprehensive review of the literature—please refer to attached references compiled by API. There are other comprehensive reviews available, the HEI Biobibliography:</p> <p>m) Page 11, line 14-16 - Characterisation of the hazardous properties of individual chemicals is already done, through REACH dossiers etc.</p> <p>n) Page 11, line 16 - Most the oil and natural gas development that has raised concern is "enhanced" (as per the working group's definition). Previously development (conventional) occurred in rural regions with limited population therefore limited receptor exposure. It is important to note that these activities occurred in communities that were sparsely populated and that were accustomed to industry's activities.</p> <p>o) Page 11, line 20 - The numbers of spills reported in the US are misleading. Most of the well spills reported are contained on the well pad and do not reach surface or groundwater, air or the receptor population. In the study referenced, small spills were weighted similarly to larger spills</p>	<p>i) The Opinion has not been changed.</p> <p>j) See comment f) above.</p> <p>k) No change in the Opinion is needed.</p> <p>l) The SCHEER primarily based the current Opinion on peer-reviewed literature. The Opinion does not intend to redo the several recent reviews on the topic. The additional publications were reviewed.</p> <p>Ethridge <i>et al.</i>, (2015) is not referred to in this Opinion, but was considered during the preparation of the Opinion.</p> <p>McCallum <i>et al.</i> (2016) is not referred to in this Opinion, the underlying Intrinsic report was however considered during the preparation of the Opinion.</p> <p>Patterson <i>et al.</i>, (2017) is referred to in this Opinion.</p> <p>m – n – o) No change in the Opinion is needed.</p>
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4.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	4. DATA AND METHODOLOGIES	<p>a) Chapter 4 describes the method of data collection, in our Opinion the review of websites and the collection of data via the Internet is a very limited way. Were there any queries to universities, scientific institutes, Occupational Medicine Institutes, and other state units responsible for supervision over hygiene, diseases and Threats, etc.? The study discusses the impact of exploration and production activities on land on the local community, their health, diseases and also the state of the environment in their based entirely on the review of literature. The information from this review has been presented very briefly, without detailed analysis of specific cases. The analyzed documents are exclusively quoted literature and are not attachments to the document.</p> <p>b) Page 13, line 13 - API submitted a reference list is unclear as to whether the WG included the references in their draft Opinion. There is value in including Grey literature in literature reviews. A National Academy of Science report discusses the value of the grey literature that includes studies that may be relevant to the research question(?). Data and reports may be contained in various agency databases under various legislative mandates.</p> <p>c) Page 13, line 23 - The search terms used by the WG limited the number of the studies that could have been used to assess the health findings.</p> <p>d) Page 13, page 41 - "An excel table was built indicating the type of study" Is the spread sheet available for review?</p> <p>Reference: https://www.nap.edu/read/5804/chapter/2#4</p>	<p>a) As stipulated in Chapter 'Data and Methodologies' of the Final Opinion, the information was collected in several ways:</p> <ol style="list-style-type: none"> 1) Via structured searches using Find-er; 2) Through a call for information launched via the website of the Scientific Committees and also via contact (database of stakeholders); 3) It is collected by WG-members, including snowballing; 4) Information offered to the SCHEER in the mandate text; 5) Information offered during Public consultation. <p>b) All information that was sent to the SCHEER during the public consultation was reviewed and the validity (how the information could contribute to the Opinion) was verified (as described in the SCHEER's Memorandum on Weight of Evidence and uncertainty published in 2018).</p> <p>c) The main search string was very broad: "(Oil OR gas Or Hydrocarbons OR petroleum OR fossil fuel) extraction, development" in an attempt to cover all sites (production is not included since it was clear from the mandate that this should not be covered in the Opinion)."</p> <p>d) A table with all publications considered is provided</p> <div style="text-align: center;">  <p>All papers_Opinion_oi</p> </div>
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5.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.1.4. Scope of the report and limitations	<p>a) Page 17, Line 13, 14 - Targeted biomonitoring studies of populations potentially at risk - Workers have been left out in the biomonitoring plan.</p> <p>b) How does this affect the biomonitoring results of oil and gas workers who live in the surrounding community?</p> <p>c) Will their biomonitoring results be classified as a public health exposure or an occupational health exposure?</p> <p>d) I suggest that if workers who live in the surrounding community will be captured in the biomonitoring, then their status as workers (with a higher potential of exposure) should be flagged or else the results may be misleading.</p>	The mandate requested the SCHEER to address the public health risks from exposure via the environment to chemicals released from oil and gas activities, and explicitly not to cover occupational populations.
6.	Ekaterian Mirkova EC Risk Assessment Advisory Structure of Scientific Committees and Experts, Bulgaria	5.1.4. Scope of the report and limitations	<p>line # of the text,12-14; p.17</p> <p>The SCHEER decision not to include in its Opinion the occupational health studies should be considered a limitation. Worker health and safety should be an integral part of any public health assessment of fracking in terms of exposure to risks since it appears to provide the basis for a comprehensive assessment of fracking. It could involve large numbers of workers depending on wells drilled. Checking on occupational health and safety where exposures may be wider and higher and longer than those experienced by the rest of the population could provide a means of assessing possible longer-term impacts on local communities.(A.Watson and W.Dinan, 2018)</p>	The SCHEER's mandate is related to the public health risks resulting from onshore oil and gas exploration and the SCHEER understood it as corresponding to the risks incurred by the general population.
7.	Giambattista Mele Laboratorio per Viggiano - Associazione Politico- Culturale di promozione sociale, Italy	5.2. Environmental impacts and environmental risks related to onshore hydrocarbon exploration and exploitation	<p>On 22 September 2017, the first and only epidemiological study was presented to the citizens of Viggiano and Grumento Nova in the two municipalities of Viggiano and Grumento Nova in the province of Potenza - Basilicata Italy on the Impact Health Assessment in the areas adjacent to the Center Val d'Agri Oil owned by ENI-Shell, the largest refinery in Europe on land (on shore). The complete study can be found at this link:</p> <p>http://www.comune.grumentonova.pz.it/docvar/Sintesi_VIS_VdA_092017.pdf</p> <p>For more information, they are at your complete disposal. Dr. Giambattista Mele Surgeon - ISDE (International Society Doctors of the Environment) ITALIA Laboratorio per Viggiano - Associazione Politico-Culturale di promozione sociale Province of Potenza - Basilicata - ITALY mdmele@gmail.com</p>	This study deals with an oil refinery and is therefore out of the scope of the Opinion.

8.	Felice Santarcangelo noscorie trisaia - mediterraneo no triv Italy	5.2. Environmental impacts and environmental risks related to onshore hydrocarbon exploration and exploitation	<p>DIVIETO EUROPEO DI RICERCA PETROLIFERA VICINO CENTRI NUCLEARI APPLICAZIONE DEI CRITERI ISPRA 2014 SUL DIVIETO DI RICERCA PETROLIFERA VICINO I CENTRI NUCLEARI ESISTENTI</p> <p>I criteri elaborati da ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale) nella Guida Tecnica n. 29, in linea con gli standard della IAEA (International Atomic Energy Agency), rappresentano un insieme di requisiti fondamentali e di elementi di valutazione per arrivare, con un livello di dettaglio progressivo, all'individuazione delle aree potenzialmente idonee a ospitare il Deposito Nazionale.</p> <p>http://www.isprambiente.gov.it/files/nucleare/GuidaTecnica29.pdf</p> <p>Criteria di esclusione</p> <p>CE14. caratterizzate dalla presenza nota di importanti risorse del sottosuolo</p> <p>Lo sfruttamento di risorse del sottosuolo già individuate negli strumenti di pianificazione e vincolo territoriale [idriche, energetiche (gas, petrolio o di tipo geotermico) e minerarie] può essere compromesso dalla costruzione del deposito e può determinare insediamenti futuri di attività umane, compromettendo l'isolamento del deposito stesso.</p> <p>CE15. caratterizzate dalla presenza di attività industriali a rischio di incidente rilevante⁸, dighe e sbarramenti idraulici artificiali, aeroporti o poligoni di tiro militari operativi</p> <p>In presenza di dighe e sbarramenti idraulici artificiali devono essere escluse le aree potenzialmente inondabili in caso di rottura dello sbarramento</p> <p>Per analogia se i depositi non si possono realizzare vicino pozzi di petrolio e dighe allo stesso modo deve essere applicato lo stesso principio verso la ricerca petrolifera vicino i siti nucleari esistenti come nel caso del centro nucleare di III categoria Itrec</p> <p>https://www.sogin.it/it/chi-siamo/decommissioning-degli-impianti-nucleari/impianto-itrec-rotondella---matera. Html</p> <p>Vicino il sito nucleare itrec (Rotondella-Mt) insiste la concessione petrolifera POLICORO della Gas Plus</p> <p>Con pozzi attivi e in attesa di essere sfruttati</p> <p>http://unmig.sviluppoeconomico.gov.it/unmig/titoli/dettagli_o.asp?cod=859</p>	The SCHEER thanks the contributor for the interesting background information.
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9.	Felice Santarcangelo noscorie trisaia - mediterraneo no triv Italy	5.2. Environmental impacts and environmental risks related to onshore hydrocarbon exploration and exploitation	<p>ESTENSIONE DELLA DIRETTIVA SEVESO AI POZZI DI PETROLIO E DI GAS E NON LIMITARLI AL SOLO CENTRO OLI E ALLE CENTRALI DEL GAS</p> <p>Il 26 giugno 2015, con l'emanazione del decreto legislativo n° 105, l'Italia ha recepito la direttiva 2012/18/UE (cd. Seveso III), relativa al controllo del pericolo di incidenti rilevanti connessi con sostanze pericolose.</p> <p>I pozzi di gas e di greggio sono impianti a rischio di incidente rilevante e possono causare disastri ambientali, le norme di sicurezza vigenti tutelano i lavoratori diretti interessati ma non le popolazioni, la flora e la fauna che vivono nelle adiacenze dei pozzi. Non essendo rispettata alcuna distanza minima nella realizzazione dell'impianto petrolifero questi ultimi li ritroviamo a ridosso di case, ospedali, centri abitati, vicino le sponde dei fiumi e dei laghi.</p> <p>http://www.lagazzettadelmezzogiorno.it/news/home/218972/potenzapozzo-di-petrolio-a-ridosso-dell-ospedale.html</p> <p>Gli stessi pozzi di gas e greggio sono tenuti sotto pressione e in questi ultimi anni si sono verificati casi di scoppio delle teste di pozzo.</p> <p>Come l' esplosione del pozzo di gas Policoro 001 (Policoro Matera). il pozzo brucio per circa 15 giorni e nessuno riuscì a spegnere l'incendio. Il pozzo si richiuse da solo. Le istituzioni all'epoca non effettuarono alcun monitoraggio pubblico sugli effetti mentre ad oggi si attendono ancora da parte delle istituzioni adeguate indagini sull'impatto ambientale che quell'evento causò sulle falde acquifere. Altro scoppio nel 1994 e nel 2006 sul pozzo di Trecate (Novara) che brucio per 3 giorni e contaminò circa 100 Km2</p> <p>Rischi emissioni in aria</p> <p>Un pozzo di gas è un impianto industriale regolato da pressioni di esercizio, così come pure una centrale di trattamento. Il pozzo di gas o la centrale di trattamento in esercizio può avere delle emissioni controllate e incontrollate che causano emissioni in atmosfera al fine di</p>	The SCHEER thanks the contributor for the interesting background information.

			<p>regolare la pressione di esercizio del pozzo o della stessa centrale di trattamento del gas estratto attraverso valvole sulle teste pozzo e negli impianti del trattamento del gas (punto di rugiada) . Le emissioni in questione riguardano comunque idrocarburi allo stato gassoso e altre sostanze tossiche presenti nel pozzo che possono disperdersi nell'ambiente ,compreso il pericoloso idrogeno solforato. In Romania nel 2014 un ragazzo è morto a seguito delle esalazioni di un pozzo di gas di proprietà dell'austriaca OMV mentre si trovava nelle sue vicinanze.. fonte https://www.ilfattoquotidiano.it/2014/03/26/romania-la-omv-e-la-negligenza-sui-pozzi-petroliferi/926640/</p> <p>In Allegato stralcio progetto AUA Gas Plus (società petrolifera) centrale di trattamento Sinni – Policoro del 2016,dove si evince il funzionamento dei pozzi ,delle centrali gas e dei rilasci aeriformi incontrollati e controllati. Assoggettare i pozzi di petrolio e di gas alla normativa Seveso significa tutelare le popolazioni che vivono vicino i pozzi petroliferi anche con un piano di emergenza esterno, nonchè attivare tutte le misure cautelative e di prevenzione da tutti i rischi derivanti dalle sostanze pericolose del processo produttivo degli idrocarburi verso popolazione e ambiente.</p>	
10.	Felice Santarcangelo noscorie trisaia - mediterraneo no triv Italy	5.2. Environmental impacts and environmental risks related to onshore hydrocarbon exploration and exploitation	<p>GESTIONE DELLA RADIOATTIVITA' DEI REFLUI PETROLIFERI – NECESSITA' DI UNA NORMATIVA EUROPEA</p> <p>Nel sottosuolo sono presenti gli elementi naturali radioattivi legati alla catena dell'uranio 238, parliamo di Radium, Bismuto, Piombo etc. Questi elementi posti a grosse profondità resterebbero nelle viscere della terra senza alcun pericolo se non fosse che sono riportati in superficie a causa dell'estrazione petrolifera che fa uso di grandi quantità di acqua. Ricordiamo che la radioattività "alfa" può essere inalata o ingerita tramite la catena alimentare.Le quantità di reflui petroliferi che le compagnie petrolifere smaltiscono in pozzi di reiniezione e sui corsi d'acqua ,vedi il fiume Basento sono tante, parliamo di decine di tonnellate al giorno. Il problema della radioattività sui reflui petroliferi è già ben noto alla regione Basilicata dopo i controlli effettuati dalla stessa Arpab su campioni di reflui su autobotte provenienti dal COVA di Viggiano a Pisticci scalo già nel 2014 nell'impianto Tecnoparco fonte: http://www.arpab.it/comunicazione/comunicazione/rilievi_radiometrici_tecnoparco.asp</p>	The SCHEER thanks the contributor for the interesting background information.

			<p>http://www.confapimatera.it/wp-content/uploads/downloads/2014/11/nuova-stop-ai-reflui.pdf</p> <p>La radioattività è da considerare non solo nella semplice unità ma è indispensabile considerare anche il fattore del cumulo o meglio la formula di scarico della dose assorbita nell'ambiente esterno.</p> <p>La stessa ARPAB poi afferma che per dette "acque di deiezione" non sono disponibili livelli di riferimento specifici in tema di radioattività. Motivo per cui va applicato il principio di precauzione in mancanza di ulteriori dati scientifici imparziali e non di parte, in grado di escludere con certezza scientifica la potenziale pericolosità della radioattività dei reflui. Negli impianti nucleari che trattano elementi radioattivi per tutelare l'ambiente e la salute delle popolazioni utilizzano una formula di scarico al fine di evitare che le dosi assorbite dalle popolazioni siano inferiori ai 1 mSv/anno secondo quanto previsto dal D.lgs. 230/95 e succ.modif.</p> <p>Togliere i radionuclidi dalle acque e dai rifiuti è un processo costosissimo anche negli impianti nucleari.</p> <p>Non è stata prevista dalle istituzioni, allo stato attuale, nessuna analisi pubblica sulle matrici ambientali (aria, acqua, sedimenti, terreno) e alimentari (frutta, verdura, pesci, allevamento, uova, ecc) nelle aree degli impianti concernenti la presenza di probabili radionuclidi nella filiera dei rifiuti petroliferi. Per non parlare poi di un eventuale screening sanitario sulla salute delle popolazioni.</p>	
11.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.2.1. Emissions of contaminants in the environment	<p>a) Chapter 5 where referring to emissions to environments, the induced seismicity, and examples of negative actions relates mainly to the USA. In EU, research is conducted on the impact of exploration activities for shale gas on the environment and, in a way, on people under HORYZONT 2010 in projects: https://cordis.europa.eu/project/rcn/193758_en.html http://www.sheerproject.eu/ http://www.m4shalegas.eu/project.html</p> <p>b) Exploration and production activities in the EU have long tradition, eg in Poland hydrocarbon production began in the second half of the 19th century and therefore the effects of this activity should have an impact on the health of many generations and would be easily identified. At the same time, this activity is carried out in an environment rich in petroleum compounds due to natural oil excesses and gas exhalations.</p>	<p>a) The SCHEER took note of this information.</p> <p>b) The fact that an activity has existed under various forms since the 19th century does not in itself make it possible to conclude that it causes no risk. This is particularly true in a setting where relevant environmental and health monitoring are scarce. The SCHEER's review of the literature indicates that in parts of the world where efforts have been made to conduct specific research on this topic, conclusions cannot be</p>

			<p>c) In the publication other conditions were not included, like geological structure of Europe and North America, geographical conditions, variability of environmental conditions, e.g. the region of Podkarpacie in Poland has natural hydrocarbon exudations and these compounds are present in soils in waters in a natural way etc. It gives the same environmental effect as the occurrence of areas with naturally elevated radioactivity.</p> <p>d) Page 18 Line 11 - The draft Opinion references a 1997 publication by UNEP. There have been significant changes in how the industry operates since the publication of the UNEP document. API has developed and put standards in place to manage many of the risks raised in this draft Opinion.</p> <p>References: API Standards: API has standards in place to manage these risks: (Managing Environmental Aspects Associated with Exploration and Production Operations Including Hydraulic Fracturing) http://www.api.org/~media/Files/Policy/Exploration/100-2_e1.pdf (Isolating Potential Flow Zones During Well Construction - http://www.api.org/~media/Files/Policy/Exploration/Stnd_65_2_e2.pdf) Wellbore integrity: http://www.api.org/~media/Files/Oil-and-Natural-Gas/Hydraulic-Fracturing/Wellbore-Pressure-HF-B.pdf</p>	<p>drawn from the literature about a lack of public health risk.</p> <p>c) With reference to this comment, this is more epidemiological. We are considering additional risk over the natural background (from geology, etc.).</p> <p>d) The SCHEER took note of this additional information.</p>
12.	Felice Santarcangelo noscorie trisaia - mediterraneo no triv Italy	5.2.1. Emissions of contaminants in the environment	<p>RIDUZIONI LIMITI EMISSIONI ATMOSFERA IDROGENO SOLFORATO H2S - ELEVATI RISPETTO AI LIMITI DELL'OMS CARATTERISTICHE IDROGENO SOLFORATO: E' un gas incolore dall'odore caratteristico di uova marce, per questo definito gas putrido. è idrosolubile ed ha caratteristiche debolmente acide e riducenti. L' H2S è caratterizzato da una soglia olfattiva decisamente bassa. L'Organizzazione Mondiale della Sanità (rif."Air Quality Guideline for Europe" 2nd Edition - 2000) individua un valore guida contro gli odori molesti pari a 7 µg/m3, valore in corrispondenza del quale, la quasi totalità dei soggetti esposti distingue l'odore caratteristico, da non superare per più di 30 minuti di esposizione. Il valore limite applicato in Basilicata su 24 ore è di 32 µg/m3 (DGR della Regione Basilicata del 6 agosto 2013, n. 983 - efficace dal 08/2014) ORIGINE: Naturale: è presente nelle emissioni delle zone vulcaniche e geotermiche, è prodotto dalla degradazione</p>	This issue is outside of the scope of the Opinion.

			<p>batterica di proteine animali e vegetali.</p> <p>Antropica: è un coprodotto indesiderato nei processi di produzione di carbon coke, di cellulosa con metodo Kraft, di raffinazione del petrolio, di rifinitura di oli grezzi, di concia delle pelli (calcinaio e pickel), di fertilizzanti, di coloranti e pigmenti, di trattamento delle acque di scarico e di altri procedimenti industriali.</p> <p>EFFETTI SULL'UOMO E SULL'AMBIENTE: è una sostanza irritante e asfissiante. L'azione irritante, che si esplica a concentrazioni superiori ai 15.000 µg/mc ha come bersaglio le mucose, soprattutto gli occhi; a concentrazioni di 715.000 µg/mc, per inalazione, può causare la morte anche in 5 minuti (WHO 1981, Canadian Centre for Occupational Health and Safety 2001). L'inquinamento delle acque con idrogeno solforato provoca la moria di pesci; l'effetto sulle piante non è acuto, ma cronico per la sottrazione di microelementi essenziali per il funzionamento dei sistemi enzimatici</p> <p>Riferimenti</p> <ul style="list-style-type: none"> - WHO, 2000 - AIR Quality Guidelines - WHO, 1981 - "Canadian Centre for Occupational Health and Safety 2001" - www.ars.toscana.it <p>Limitare le emissioni di idrogeno solforato in aria limiterebbe l'impatto su persone e ambiente agendo sui processi industriali di desolforazione degli idrocarburi. In Val d'agri il monitoraggio su pubblico sulle estrazioni petrolifere è partito dopo anni dall'avviamento degli impianti estrattivi e di trattamento del greggio esattamente nel 2009 con la campagna 2009-2011 (http://www.arpab.it/aria/radielli2011.pdf), su richiesta di Noscorie Trisaia, Ola e delle associazioni del territorio alla regione Basilicata. L'Organizzazione mondiale della sanità (OMS) consiglia di fissare il limite di rilascio di idrogeno solforato a 0,005 parti per milione (ppm); negli Stati Uniti, il Governo federale raccomanda un limite di 0,001 ppm con limiti differenti fissati da Stato a Stato (ad esempio la California pone il limite dello 0,002 ppm ed il Massachusetts dello 0,006). In Italia, il limite massimo di rilascio di idrogeno solforato, secondo quanto stabilito dal decreto ministeriale del 12 luglio 1990, recante le "Linee Guida per il contenimento delle emissioni degli impianti industriali e la fissazione dei valori minimi di emissione", è di 5 ppm per l'industria non petrolifera e 30 ppm per quella petrolifera.</p> <p>MOTIVO PER CUI OCCORRE UNIFORMARE A LIVELLO EUROPEO I LIMITI DI QUESTO GAS NOCIVO E PERICOLOSO ALMENO AI LIMITI CONSIGLIATI DALL'ORGANIZZAZIONE MONDIALE DELLA SANITA</p>	
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			studio sugli effetti e danni alla salute umana dell'H2S di Maria Rita Dorsogna (non allegato perché superiore a un mb) http://www.csun.edu/~dorsogna/nodrigill/Bomba_ForestOil/h2s.pdf	
13.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.2.2. Seismic activity	<p>a) This section relies almost exclusively on Foulger et al (2017) which is a literature review/compilation of every instance in which a cluster of earthquakes was “possibly” induced by anthropogenic activity in a journal article without regard to the credibility of that supposition nor whether the proposal was controversial (in many instances it is). See quotes from Foulger et al. (2017).</p> <p>“... HiQuake, is a comprehensive record of earthquake sequences postulated to be induced by anthropogenic activity” “Because it is currently impossible to determine with 100% certainty which earthquakes are induced and which not, HiQuake includes all earthquake sequences proposed on scientific grounds to have been human induced regardless of credibility.”</p> <p>b) Page 19, Line 29 This section also does not appropriately emphasize that even if all “700 events” in the HiQuake data base are induced (some probably are not and in many cases the data are insufficient to ever know with certainty) this still represents a very small percentage of seismicity associated with O&G activities.</p> <p>Studies that do make this point (and would be a counterbalance to Foulger et al (2017)) include: van der Baan, M., and F. J. Calixto (2017), Human-induced seismicity and large-scale hydrocarbon production in the USA and Canada, <i>Geochem. Geophys. Geosyst.</i>, 18, 2467–2485 doi:10.1002/2017GC006915.</p> <p>“We find that increased seismicity in Oklahoma, likely due to salt-water disposal, has an 85% correlation with oil production. Yet, the other areas do not display State/Province-wide correlations between increased seismicity and production, despite 8–16-fold increases in production in some States. However, in various cases, seismicity has locally increased.”</p> <p>Atkinson et al., (2016) <i>Seismol. Res. Let.</i>, 87, 631-647. “For western Canada, an entire basin-wide average of this activation probability in regions that are also coincident with viable HF plays appears to be less than 0.3%”.</p>	<p>a) The SCHEER would like to draw attention to a recent overview on the Groningen earthquakes and their still problematic risks even after reduction of the gas extraction by Vlek <i>et al.</i>, (2018), <i>Risk Analysis</i> 38:1455.</p> <p>No change in the Opinion is needed.</p> <p>b) The text has been changed accordingly</p> <p>c) The text has been changed accordingly</p> <p>d) The text has been changed accordingly</p> <p>e) No change in the Opinion is needed</p> <p>f) No change in the Opinion is needed</p> <p>g) No change in the Opinion is needed</p>

			<p>c) Page 19 Line 26 - Document puts “inferred” in first sentence but then treats conclusions of Foulger et al (2017) as fact rather than a compilation of POSTULATED induced seismicity events. See quotes from Foulger et al (2017) above.</p> <p>d) Page 19 Line 41- This is a pretty old statement. There has been a LOT of more recent work on Groningen that would be much or relevant (including a special volume that came out this month in Netherlands Journal of Geosciences). Also, the statement is broad. There are some instances where seismicity has occurred in association with natural gas extraction/subsidence. There are many, many more cases where natural gas extraction has no association with seismicity. “In the Netherlands, ~300 gasfields are produced. Of these, just a few percent are seismically Active” quote from Foulger et al. (2017) Page 19 Line 36 Foulger et al (2017) detail that some of these are controversial based on focal depths (10 km) or lack of an obvious mechanism or are older events with limited information on seismicity and/or O&G operations.</p> <p>e) Page 20 Line 10 - What is the significance of this statement? Seismicity (natural or induced) with magnitudes of 3 or less are under-reported/undetected in many areas depending on population density and/or density of seismic stations. In almost all cases, earthquakes of that size cause no damage and often are not felt.</p> <p>f) Page 20 Line 14-15 - This is a speculative statement - Spatial correlation is NOT causation.</p> <p>g) Page 20 Line 18 - Note from van der Baan, M., and F. J. Calixto (2017), that in some parts of U.S. and Canada O&G activity has increased by factor of 8-16 times with no increase in seismicity.</p>	
14.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.3. Human exposure assessment	<p>a) The section seems to be a compilation of worse-case findings without context of the likelihood of these things happening, i.e., how frequently do releases to air or water occur, what proportion of wells have measured VOC emissions, do ambient concentrations translate to increased risk?</p> <p>b) • ‘pollutants released to the atmosphere’ - Suggest bringing in some additional sources to make this more balanced, pulling in reports from monitoring campaigns in shale areas (i.e, in the US, Texas, Pennsylvania, Colorado) [see ref. Etheridge et al., Bunch et</p>	<p>a) The Opinion is not just a worst case finding. It is true that no likelihood calculation is done – which is outside the mandate – and which is probably not possible, based on the scarce data (but this has not been examined in detail).</p> <p>b) The text has not been changed.</p>

			<p>al.] Witter 2013 is a hazard assessment, listing hazards associated with onshore O&G exploration without actual measurement data; would recommend referring to Field et al (2014) for discussion of potential exposures during various phases of well development. Brown et al (2015) is a hypothetical case study designed to "assist physicians in the evaluation of individual exposures." The cited text from Zielinska excluded important context; only the highlighted text below was included by SCHEER:</p> <p>"Overall, the study results indicate that air quality impacts due to individual gas wells and compressor stations are not likely to be discernible beyond a distance of approximately 100 m in the downwind direction. However, source apportionment results indicate a significant contribution to regional VOCs from gas Production sources, particularly for lower-molecular-weight alkanes (<C6). Although measured ambient VOC concentrations were well below health-based safe exposure levels, the existence of urban-level mean concentrations of benzene and other mobile source air toxics combined with soot to total carbon rations that were high for an area with little residential or commercial development may be indicative of the impact of increased heavy-duty vehicle traffic related to gas production."</p> <p>c) • Page 21 Line 30 – check source, typical well development period isn't 5 years.</p> <p>d) • Page 21 Lines 43-48 – these are very general statements that would benefit from some context...concentrations can be increased without posing a risk to nearby residents. And not clear what an 'unfracked' well is...an unconventional well that hasn't been fractured? a conventional well? Air concentrations should be considered within the context of exposures</p> <p>e) • Page 22 Line 37 - The study being referenced (Kassotis et al.) did not measure background. It is difficult to determine the sources of the chemicals found in the water.</p> <p>f) • Page 22 line 39 - API has developed standards to address this concern Fracture lengths ANSI/API</p> <p>Standards http://www.api.org/~media/Files/Policy/Exploration/100-1_e1.pdf</p>	<p>c) The text has been changed accordingly.</p> <p>d) An unfracked well is indeed a well where no fracking activities have been used.</p> <p>e-g-f) No change in the Opinion is needed.</p>
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			<p>g) • Page 24 line 16 - Regarding NORM: Please refer to API's content paper on the subject: http://www.api.org/~media/Files/Oil-and-Natural-Gas/Hydraulic-Fracturing/Environmental-Stewardship/NORM-In-the-Oiland-Natural-Gas-Industry.pdf</p> <p>References:</p> <ul style="list-style-type: none"> • Ethridge et al. The Barnett Shale: from problem formulation to risk management. Journal of Unconventional Oil and Gas Resources 2015(11);95-110. • Bunch et al. Evaluation of impact of shale gas operations in the Barnett Shale region on volatile organic compounds in air and potential human health risks. Science of the Total Environment 2014; 832-842. • Field RA et al. Air quality concerns of unconventional oil and natural gas production. Environ. SciProcess, Impacts, 16(2014), pp. 954-969. • Content paper on Reduced emissions: http://www.api.org/~media/Files/Oil-and-Natural-Gas/Hydraulic-Fracturing/Environmental-Stewardship/Reduced-Emissions-of-Greenhouse-Gases.pdf • Groundwater concerns addressed in content paper: http://www.api.org/~media/Files/Oil-and-Natural-Gas/Hydraulic-Fracturing/Environmental-Stewardship/Groundwater-is-Protected.pdf 	
15.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.4. Human hazard assessment related to onshore hydrocarbon exploration and exploitation	<p>Page 25, line 5-8 - Evaluation of carcinogenicity by IARC is not expected for all chemicals; IARC appears to prioritise their evaluations based on a set of criteria. Hence the statement that 'over 80% of the compounds were not evaluated' is meaningless and potentially misleading.</p>	<p>Elliot <i>et al.</i>, (2017) deals with chemicals used in unconventional O&G (fracturing fluids). In previous Opinion versions this screening exercise was extensively quoted explaining the methodology used by the authors. It is said "Of the 1177 potential water contaminants assessed, 1066 compounds (91%) had not been evaluated for carcinogenicity by IARC. The 111 potential water contaminants evaluated included 14 (13%) known human carcinogens (Group 1), 6 (5%) probable human carcinogens (Group 2A), and 29 (26%) possible human carcinogens (Group 2B), and 62 (56%) compounds were not classifiable with respect to their carcinogenicity (Group 3). Further it is said: of the 143 potential air pollutants, 114 compounds (80%) had not been evaluated for carcinogenicity by IARC. Of the 29 potential air pollutants evaluated, 7 (24%) were considered carcinogenic to</p>

				<p>humans (Group 1), 2 (7%) were considered probably carcinogenic to humans”.</p> <p>In the Opinion, it is said “Over 80% of the compounds of a list of onshore hydrocarbon exploration and exploitation related water contaminants and air pollutants were not evaluated for their carcinogenicity potential by IARC (Elliott <i>et al.</i>, 2017).</p> <p>The text has been clarified.</p>
16.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.5. Health effects identified in the population living around of onshore hydrocarbon production sites	<p>a) Page 27, line 4 - Reference is made to ‘exhaust from onshore oil and gas production sites’; usually the term exhaust refers to combustion products, but the authors of this section presumably intended to cover emissions to air, water, etc. of hydrocarbons, chemicals etc. It would be beneficial if the terminology used in the document is consistent and aligns with regulatory systems such as REACH.</p> <p>b) Page 28 Line 29 - The Opinion relies on WOE criteria to assess the level of evidence presented by studies. However, the criteria is not available for public review (has yet to be published). We counter that the current epidemiological research represents hypothesis generating studies that do not support evidence for causality. The studies need to be reviewed with the context of the evidence provided by the exposure and air monitoring studies. Current epidemiology studies are not supported by “biological feasibility” when compared to air measurements and exposure.</p> <p>c) Page 28, lines 31-47 – to be useful long-term, data collection on exposure will need to include sources other than O&G also. The issue with US studies is not only that HF exposure is represented by imprecise proxies, but also that the pollutants of interest can come from various sources (can’t do adequate source apportionment).</p> <p>d) Page.28, line 51 - “... quantify, qualify and characterize exposure”. SCHEER may want to add: “and relevant confounders such as employment in jobs with similar exposures.”</p> <p>e- Page. 29, line 8 – biomonitoring can be hard to interpret because exposures rarely have unique sources</p>	<p>a) Change proposed in the text.</p> <p>b) The SCHEER's Memorandum on WoE has been finalised in the meantime and will be available upon publication of this Opinion.</p> <p>c) Some adjustments were made in the text. The comment is of general nature and is not relevant for our Opinion.</p> <p>d) Text has been changed to take this valid comment into account.</p> <p>e) The SCHEER believes that biomonitoring studies in well-characterised populations can be informative. Comparisons in exposure</p>

				levels between before and after the start of specific activities can for example be undertaken, or according to the distance from the site, or from an exposure index modeling dispersion in the air or other media. Some markers have specific meaning and in any case contribute to characterising internal exposure. No change in the Opinion is needed.
17.	Felice Santarcangelo noscorie trisaia - mediterraneo no triv Italy	5.5. Health effects identified in the population living around of onshore hydrocarbon production sites	<p>http://www.ambiente-salute.it/index.php/en/news2/180-vis-viggiano-grumento-nova-risultati-informativi-perdecisioni-e-approfondimenti</p> <p>Su incarico dei Comuni di Viggiano e Grumento Nova è iniziato nel 2014 lo studio "VIS Viggiano-Grumento Nova in Val d'Agri", con un cofinanziamento tra i Comuni e il gruppo di ricerca*, coordinato dall'Istituto di fisiologia clinica del Consiglio nazionale delle ricerche. I risultati conseguiti durante 4 anni di studio, integrando le evidenze maturate sul piano ambientale e epidemiologico, mostrano eccessi di rischio per alcune cause di mortalità e ricoveri per malattie del sistema circolatorio in donne e donne + uomini, e di ospedalizzazione per malattie respiratorie nelle donne e per malattie respiratorie croniche per donne e uomini, quando residenti in aree più esposte ad inquinamento rispetto ad aree meno esposte ad emissioni industriali. In considerazione del disegno evoluto di studio (di coorte residenziale basato su dati individuali), del modello avanzato di ricostruzione della diffusione degli inquinanti sulla base dei dati meteorologici, e delle evidenze epidemiologiche solide sulle relazioni causali tra inquinamento dell'aria e malattie cardiopolmonari, riteniamo che risultati dello studio VIS mostrino una associazione chiara tra esposizione a inquinanti industriali e decessi o ricoveri.</p> <p>studio completo allegato e disponibile sul sito del comune di Viggiano http://www.comuneviggiano.it/avvisi/doc/Rapporto_VIS_VdA_092017.pdf (non allegato perché troppo pesante) Allegato comunicato dei medici per l'ambiente http://www.isde.it/wp-content/uploads/2017/10/2017.10.04-Comunicato-stampa-ISDE-Italia-VIS-Cova.pdf</p>	This study deals with an oil refinery and is therefore out of the scope of the report.

18.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.6. Health impact assessment studies	<p>a) Need to explain the concept of a hazard index and contrast it with a risk estimate from an epidemiology study.</p> <p>b) • p. 31, lines 22-33 – I think this is an unfair criticism of the Bunch study. McKenzie didn't use any measure of actual health outcomes either – they estimated effects based on risk assessment values. I disagree that their methodology was 'questionable' and 'poorly described.' Can SCHEER give more of an explanation of the basis for this conclusion?</p> <p>c) • The discussion of human health effects could be strengthened by grouping/labelling the types of studies more precisely (epidemiology, hazard assessment, systematic review and causal assessment), and clarifying the strength and purpose of the various types of reports. They've mixed hazard assessments (Bunch, McKenzie) with systematic reviews/causal assessments (Public Health Scotland report – need the citation added to bibliography) and they are actually very different. I agree with their overall conclusions, but this aspect of the health section could be tightened.</p> <p>d) • HIA's have been conducted by industry as an internal tool but are not available in the peer-review literature.</p> <ul style="list-style-type: none"> • McCallum, L. C., Souweine, K., McDaniel, M., Koppe, B., McFarland, C., Butler, K., & Ollson, C. A. (2016). Health Impact Assessment of an oil drilling project in California. <i>International journal of occupational medicine and environmental health</i>, 29(2), 229-253. • Health Impact Assessment E&B Oil Drilling and Production Project http://intrinsik.com/wp-content/uploads/2017/10/Health-Impact-Assessment-EB-Drilling-and-Production-Project.pdf 	<p>a) The concept of hazard index is described in the Opinion on pages 38-39.</p> <p>b) The concluding paragraph describing the study by Bunch <i>et al.</i> has been reworded.</p> <p>c) We appreciate the comment and the proposal. However, we believe that the current grouping used (which is actually quite close to the suggested one, as epidemiological studies and risk assessment studies are discussed separately) is relevant and provides enough elements for a proper assessment.</p> <p>d) Studies not openly available were not considered in this assessment.</p>
19.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	5.6. Health impact assessment studies	<p>a) Page 31 Line 32-33 - Bunch et al conducted a robust assessment of the available 4.5 million data points collected in the Barnett Shale region. The data predates and spans the industry and includes pre-uptick data from TCEQ's comprehensive network of air monitors. The researchers conducted a conservative screening level health-based comparison values as well as a both deterministic and probabilistic assessment of human health.</p> <p>The methods are described comprehensively with a focus on VOCs how they measured constituents within the TCEQ monitoring network and utilizes robust and state of the science methodologies to include both deterministic assessments of long-term cancer risk and non-cancer</p>	The SCHEER appreciates the description made by Dr De Matteis on the study by Bunch <i>et al.</i>

			<p>hazard, in addition to assessment of acute health risks via comparison to conservative screening level health-based comparison values that were developed by government agencies. Unlike the Opinion's criticism of the report and conclusion, the study did assess 105 VICs but close to assess only 7 (as noted in the text).</p> <ul style="list-style-type: none"> • "Despite the tremendous amount of data evaluated in this assessment, none of the maximum hourly autoGC measurements, nor any of the maximum 24-hour canister measurements exceeded the respective acute HBACVs for any of the up to 105 VOCs at any of the sites, across the entire period of record for each site. This includes all of the potentially relevant VOCs as shown in Tables 5 and 6, as well as all other chemicals available in the dataset" • "Out of 105 VOCs included in this analysis, only one chemical, 1,2-dibromoethane, had an annual average concentration that exceeded its respective chronic HBACV in a single year." <p>For the deterministic risk assessment, the researchers looked at all monitored VOCs as well as focused specifically on those that were known to be associated with natural gas operations (it's important to note that this air monitoring network is one that they use across the state and it's not specific to emissions from natural gas so many of the VOCs measured are not associated with or relevant to natural gas; but we looked at everything nonetheless to be super conservative):</p> <p>"In Run 1 of the DRA, which included all monitored VOCs, total hazard indices for both CTE and RME scenarios were less than 1.0 for all monitors (Table 7). Similarly, in Run 2, which was focused on the six potentially relevant VOCs, the hazard indices for both CTE and RME scenarios were all below 1.0 for all monitors (Table 7)."</p> <p>For the probabilistic risk assessment, the researchers focused on the 6 relevant VOCs. The deterministic and probabilistic risk assessments did in fact look at total cancer risk and total non-cancer hazard across all chemicals evaluated. The deterministic and probabilistic risk assessment estimated risk and hazards for both upper-end (reasonably maximally exposed individuals) and for typical (central tendency) individuals</p>	
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20.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	Reference list	<p>References to our submission: http://www.ipieca.org/resources/awareness-briefing/guidelines-on-implementing-spill-impact-mitigationassessment-sima/ *Siegel, D. I., Smith, B., Perry, E., Bothun, R., & Hollingsworth, M. (2015). Pre-drilling water-quality data of groundwater prior to shale gas drilling in the Appalachian Basin: Analysis of the Chesapeake Energy Corporation dataset. <i>Applied Geochemistry</i>, 63, 37-57) *Maskrey, J. R., Insley, A. L., Hynds, E. S., & Panko, J. M. (2016). Air monitoring of volatile organic compounds at relevant receptors during hydraulic fracturing operations in Washington County, Pennsylvania. <i>Environmental monitoring and assessment</i>, 188(7), 410. * Ethridge, S., Bredfeldt, T., Sheedy, K., Shirley, S., Lopez, G., & Honeycutt, M. (2015). The Barnett Shale: From problem formulation to risk management. <i>Journal of Unconventional Oil and Gas Resources</i>, 11, 95-110. (https://www.sciencedirect.com/science/article/pii/S2213397615000270) * Flower mound cancer occurrence: https://www.scribd.com/document/235472973/Texas-2014-Flower-Mound-Cancer-Study *McCallum, L. C., Souweine, K., McDaniel, M., Koppe, B., McFarland, C., Butler, K., & Ollson, C. A. (2016). Health Impact Assessment of an oil drilling project in California. <i>International journal of occupational medicine and environmental health</i>, 29(2), 229-253.</p>	The SCHEER thanks the contributor for the information.
21.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	Reference list	<p>References: Health Impact Assessment E&B Oil Drilling and Production Project http://intrinsic.com/wp-content/uploads/2017/10/Health-Impact-Assessment-EB-Drilling-and-Production-Project.pdf * Unconventional Oil and Gas Development Bibliography: https://www.healtheffects.org/system/files/HEIBibliography28-Apr-2018.pdf * Unconventional Oil and Gas Spills: Risks, Mitigation Priorities, and State Reporting Requirements. Patterson et al., https://pubs.acs.org/doi/full/10.1021/acs.est.6b05749</p>	The SCHEER thanks the contributor for the information.

22.	Caterina de Matteis Joint response IOGP (International Association of Oil & Gas Producers) & API (American Petroleum Institute)	References	<p>Dear Sir and Madam,</p> <p>IOGP (the International Association of Oil & Gas Producer) has submitted its contribution to the above-mentioned public consultation through the survey online. We would like to contribute with some additional reports which unfortunately exceed the maximum size allowed for files to be uploaded.</p> <p>Please find attached the reports:</p> <ul style="list-style-type: none"> • As a reference document for chapter 5.3.1: IOGP Report Managing NORM in the oil and gas industry – 412 • As a reference document for chapter 5.5: Generic exposure scenario for the use of chemicals in the exploration and production of hydrocarbons using high volume hydraulic fracturing; <p>I trust these documents can be taken into account in addition our submissions to the single chapters.</p>	The SCHEER thanks the contributor for the information.
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