GEmeinnütziges **N**etzwerk
für **U**mwelt**K**ranke e.V.

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Nachrichtlich an:
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Offener Brief zum Fracking-Gesetzesentwurf und zu mangelnder Vorsorge im Gesundheitsschutz

Sehr geehrte Frau Ministerin Hendricks,

nachdem wir als „Gemeinnütziges Netzwerk für Umweltkranke“, GENUK e.V., maßgeblich zur Aufdeckung der erschreckenden Verdoppelung der Lymphdrüsenkrebs-Rate bei Männern in der Samtgemeinde Bothel[1], in einem Kerngebiet der niedersächsischen Erdgasförderung beigetragen haben, sind wir über einige Ihrer öffentlichen Äußerungen zum Fracking-Gesetzentwurf äußerst befremdet. Auf die Frage einer WAZ-Journalistin „Warum verbietet man eine so riskante Technik nicht einfach?“ lautete Ihre Antwort: „Es gibt so was wie eine Wissenschafts- und Gewerbefreiheit. Wir können nicht alles verbieten, was potenziell gefährlich ist, dann müssten wir ja auch das Autofahren verbieten“. Am 23.03.2015 wiederholen Sie dieses Argument (Morgenmagazin) und fügten hinzu: "Wenn wir jede abstrakte Gefährdung grundsätzlich vollständig verbieten würden, würden wir nicht vor dem Bundesverfassungsgericht durchkommen"

Die Frage muss in diesem Kontext erlaubt sein, ob unter „Gewerbefreiheit“ zu verstehen ist, dass die Wirtschaft, von der Kontrolle des Staates unbehelligt, hochtoxische Gefahrstoffe emittieren darf, die die Gesundheit der Menschen und unsere Umwelt nachhaltig und irreversibel schädigen? Ebenso sei die Frage erlaubt, warum diese Vorhaben der Wirtschaft noch mit Steuergeldern für „Forschungszwecke“ öffentlich unterstützt werden. Da auch neuere Gutachten (Zittel für Energy Watchgroup, 2015[2]) von einer wirtschaftlichen Ausbeutung der offenbar doch geringen Vorkommen in Deutschland abraten, fragt man sich doch, in welchem Verhältnis der Nutzen zu den enormen und langfristigen Belastungen für Umwelt und Gesundheit steht.

In dem vorliegenden Fracking-Gesetzentwurf (BMUB WR I 2 – 21111/8 Stand: 19.03.2015) wird die Gesundheit einzig **an 2 Stellen** und nur beiläufig erwähnt (S. 2, S. 35). Auf Seite 35 heißt es: „Hiernach sind Gefahren für die

[1] „Auswertung des EKN zur Häufigkeit von Krebsneuerkrankungen in der Samtgemeinde Bothel“, Registerstelle des EKN Oldenburg, September 2012
[2] „Fracking – eine Zwischenbilanz“, Dr. Werner Zittel, 2015, siehe www.energywatchgroup.org

menschliche Gesundheit zu vermeiden“. Mehr als eine unspezifische, somit auslegbare und unkonkrete Bedeutung misst dieser Gesetzentwurf der Gesundheit der Bevölkerung in Deutschland nicht zu.
Dabei dürfte Ihnen die verfassungsrechtliche Anfechtbarkeit derartiger Ansichten doch bekannt sein (siehe das „Apotheken-Urteil“ von 1958[3], wo mit der „Volksgesundheit“ als überragend wichtigem Gemeinschaftsgut argumentiert wird). Ein grundsätzliches **„Frackingverbot“** wäre nämlich voraussichtlich und unter Abwägung der Verhältnismäßigkeit ein gerechtfertigter Eingriff in die „Gewerbefreiheit“ (Art. 12 Abs. 1 GG), da die „körperliche Unversehrtheit“ (Art. 2 Abs. 2 GG) und der Schutz der natürlichen Lebensgrundlagen (Art. 20 a GG) einen höherwertigen Verfassungsrang einnehmen, als das Recht der Unternehmen, in missbräuchlicher Inanspruchnahme der Gewerbefreiheit ihren Geschäften nachzugehen.

Auch möchten wir Ihnen angesichts der Bedrohung durch die Folgen der Atomwirtschaft und ihres Menetekels „Asse“ und angesichts der furchtbaren Szenarien im Kontext des Klimawandels weitere Fragen stellen:

- welche Berechtigung hätte noch ein Umweltministerium, wenn es die Gewerbefreiheit höher stellen würde als den Schutz der Umwelt und aller in ihr lebenden Organismen – darunter auch des „Schutzgutes Mensch“ – vor struktureller und konkreter Verletzung durch Noxen inklusive Strahlen?
- Welche Berechtigung hätte noch ein „Bundesinstitut für Risikobewertung“, hätten sämtliche mühsam errungenen Umweltprüfungs- und Umweltschutzgesetze, wenn wir Bürger, wie Sie suggerieren, durch gewerblich betriebene Produktion, Energiewirtschaft, Abfallbeseitigung u.v.m. nur noch völlig zu vernachlässigende Risiken zu erwarten hätten?
- Warum werden die europaweit gültigen Vorgaben der „Aarhus Konvention“ (der Deutschland beigetreten ist)[4] - darunter SUP, UVP, bedingungslose und frühestmögliche Herstellung von öffentlicher Transparenz – im Rahmen dieses vorliegenden Gesetzesentwurfs nicht berücksichtigt?
- Stellen Sie die gesamte mühsam erworbene Umweltschutzgesetzgebung in Frage, nur damit die Förderindustrie ihren Geschäften nachgehen kann? Überwiegende Teile der Bevölkerung lehnen ohnehin diese Hochrisikotechnologie Fracking zutiefst ab, bei der nicht einmal deren wirtschaftliche Berechtigung nach Auswertung aller Erkenntnisse erkennbar ist.

Mit welcher Berechtigung soll dieser ohnehin nur geringe zu erwartende Beitrag zur Deckung des deutschen Energiebedarfs zu einer Niederbringung von 48.000 Bohrungen bis 2050 (UBA Gutachten, Teil 2[5]) mit unabsehbaren Folgen für Gewässer-, Gesundheits- und Naturschutz führen?

Statt gemeinsam mit dem Gesundheitsministerium eine gesetzliche Verbesserung des Schutzes vor Schädigung, beispielsweise durch die unzähligen toxischen Gefahrenpotenziale in der konventionellen und besonders der unkonventionellen Öl- und Gasförderung anzustreben, erklärten Sie zudem noch über den Radiosender NDR-Info: „Ich kann doch Fracking nicht verbieten. Ich weiß doch gar nicht, ob es gesundheitsschädlich ist!“
Gestatten Sie uns dann bitte, nach dem Umkehrschluss zu fragen: Würden Sie, sehr geehrte Frau Ministerin, denn Fracking verbieten, wenn sich ausreichende wissenschaftlich fundierte Nachweise für die Gesundheitsschädlichkeit von Fracking finden?

Worin könnte denn unter anderem eine medizinische Grundlage für ein potenzielles Verbot bestehen? Dafür ist eine Prüfung der international gültigen wissenschaftlichen Nachweislage hilfreich. Um diese Prüfung zu erleichtern, haben wir uns erlaubt, Ihnen einen Teil der umfangreichen wissenschaftlichen Literatur im Anhang zur Kenntnis zu bringen. Daraus wird sich Ihnen überdeutlich erschließen, warum im US-Bundesstaat New York aus einem Fracking-Moratorium ein Fracking-Verbot geworden ist.

Im Folgenden fordern wir die Anerkennung bereits erbrachter wissenschaftlicher Nachweise über die Unkalkulierbarkeit und Gefährlichkeit der Fracking-Technologie:
Es ist bereits wissenschaftlich erwiesen, dass

- die Fracking-Technologie sowie die Praxis der Lagerstättenwasser-Verpressung **Erdbeben** auslösen kann – in den USA bis zu 5,7 auf der Richterskala[6], im Raum Rotenburg/Wümme bis 4,5[7]. Im holländischen Groningen rechnet sogar das örtliche Förderunternehmen nach 196 kleinen mit einem gefährlichen Erdbeben[8].

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[3] BVerfGE 7, 377 - Apotheken-Urteil
[4] http://www.aarhus-konvention.de/umsetzung-in-deutschland.html
[5] UBA, Umweltauswirkungen von Fracking bei der Aufsuchung und Gewinnung von Erdgas insbesondere aus Schiefergaslagerstätten, Teil 2, 2014
[6] http://concernedhealthny.org/compendium/, siehe auch Liste wiss. Literatur/Hinweise im Anhang unter: **Earthquakes and seismic activity**
[7] http://www.rotenburger-rundschau.de/rrarchiv/lokales/rotenburg-wuemme/exxon-und-co-wollen-messen-und-viele-daten-fuer-sich-behalten-von-roland-meyer-55142.html und http://www.zdf.de/ZDFmediathek/beitrag/video/1710862/Riskante-Gasf%C3%B6rderung-in-Deutschland#/beitrag/video/1710862/Riskante-Gasfoerderung-in-Deutschland
[8] http://www.welt.de/wirtschaft/article138375930/Warum-Gazprom-von-Erdbeben-in-Holland-profitiert.html

- Bohrungen und deren angeblich abdichtende **Ummantelungen nicht dauerhaft dicht** bleiben können (diese sind bis zu 6% von Anfang an nicht dicht und mit zunehmendem Alter steigt der Anteil an. Bereits nach 15 Jahren sind bis zu 50% der Ummantelungen undicht!). Die umfangreiche Literatur lässt Zweifel aufkommen, ob eine dauerhafte Dichtigkeit bzw. Bohrlochintegrität überhaupt möglich ist.[9]
- **große Mengen an Methan** – kurzfristig bis zu 100fach und langfristig 25fach schädlicher auf die Atmosphäre wirkend als CO2 – über Gas- und Ölfeldern gemessen wurden, womit auch diese Art der fossilen Rohstoff-Förderung zum „Klimakiller" erklärt werden muss![10]
- es in Bezug auf **Gewässerschutz** keine sichere Möglichkeit gibt vorauszusagen, **welche Wegsamkeiten** sich einmal in die Tiefe gepresste und aus ihr hochsteigende hochtoxische Chemie bahnt (Vertikalrisse, Kapillarwirkungen u.a., siehe auch Versalzung hessischer Felder im Kontext der Kalisalz-Verpressungspraxis auf 400 m Tiefe, siehe auch Gutachten HLUG, Juli 2014)[11]. Im Gegenteil mussten in Pennsylvania nach Intervention eines Auditors 234 Verunreinigungen von Trinkwasserbrunnen in Fracking-Gebieten von den Behörden bestätigt werden[12]
- an Frackingbohrstellen **hohe Mengen an krebserregenden Stoffen (u.a. PAKs) in die Atemluft** ausgetreten sind. Im Rahmen einer Studie der Universität Albany[13] gemessene Benzolwerte rangierten von 35-fachen bis zu 777.000-fachen Überschreitungen des zulässigen Grenzwertes! In Arkansas enthielten 7 Luftproben 60mal höhere Mengen an Formaldehyd, als der Level, der als krebserregend gilt.[14] In Deutschland liegen bestätigte Messungen überhöhter Emissionen von Quecksilber und Benzol (bzw. PAKs wie BTXE) in Rotenburg/Wümme vor. In Salzwedel, Sachsen-Anhalt, wurden extreme Belastungen der damaligen Mitarbeiter/Anwohner der Gasförderung dokumentiert.[15]
- **Radioaktivität** (Radon, Radium 222, 226, 228, Blei-210 u.a.) in den USA bis zu 3.600 mal höher ausgetreten ist, als der maximale durch die EPA zugelassene Grenzwert in Trinkwasser zulässt. Eine ähnliche Zusammensetzung radioaktiver Strahlung ist bereits in Europas ehemals zweitgrößter Gasförderregion, in Salzwedel/Altmark gemessen worden.[16]
- **Gesundheitsschäden** im Hinblick auf Atemwegserkrankungen, Haut- und Schleimhautreizungen, Unfruchtbarkeit, Fehlgeburten, Kindersterblichkeit, Geburtsschäden, niedriges Geburtsgewicht, neurologische Störungen, Krebs, mehr Krankenhausaufenthalte, höhere Notfall- und Todesraten u.v.m. in den USA besonders im Umkreis von bis zu 16 km von einer Bohrstelle erhöht nachgewiesen wurden, mit steigender Tendenz, je näher der Wohnort der Betroffenen zu den Förderplätzen und anderen Emissionsstellen der Fracking-Öl- und Gasförderung liegen.[17]
- in der Samtgemeinde Bothel im Landkreis Rotenburg/Wümme, mit ca. 20 konventionellen Gasförderbohrungen, die schon länger produzieren, eine bisher **ungeklärte Verdoppelung von Non Hodgkin-Lymphomen/Multiplem Myelomen** bei Männern existiert, eine Kombination von Krebsarten, die im Zusammenhang mit toxischen bzw. Strahlen-Expositionen häufig genannt werden.[18]

Erschreckt sind wir darüber, wie nach Bekanntwerden dieser EKN-Auswertung mit der dramatischen Lymphomrate in Bothel auch von Seiten der Bundesregierung scheinbar nahtlos zur Tagesordnung übergegangen wurde.
Nach dieser eindeutig festgestellten Signifikanz stellt dieses Nicht-Verhalten der Bundespolitik aber nicht nur einen allgemeinen ethisch-moralischen Verstoß dar. Auch im Sinne einer grundgesetzlich dem Bürger verpflichteten Politik ist dies von den Betroffenen bereits als deutlicher Verlust der Verantwortlichkeit gegenüber der Wahrung des Menschenrechts auf körperliche Unversehrtheit verstanden worden! Denn wie auch immer man es betrachten mag: eine derartig auffällige Häufung genau dieser Kombination aus Non

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[9] http://concernedhealthny.org/compendium/, Liste wiss. Literatur/Hinweise im Anhang unter dem Abschnitt: **Inherent engineering problems that worsen with time**
[10] http://concernedhealthny.org/compendium/, Liste wiss. Literatur/Hinweise im Anhang unter den Abschnitten: **Water Contamination, Air Pollution** sowie **PSE Database Appendix 2014**
[11] http://www.fnp.de/rhein-main/K-S-will-auch-nach-2015-Abwasser-im-Boden-Verpressen;art1491,1283365
[12] http://concernedhealthny.org/compendium/, Liste wiss. Literatur/Hinweise im Anhang unter dem Abschnitt: **Water Contamination**
[13] Macey, G.P., Breech, R., Chernaik, M., Cox, C., Larson, D., Thomas, D., Carpenter, D.O. (2014). Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. *Environmental Health, 13*(82). doi: 10.1186/1476-069X-13-82
[14] http://concernedhealthny.org/compendium/, Liste wiss. Literatur/Hinweise im Anhang unter den Abschnitten: **Occupational health and safety hazards, Water Contamination** und **Air Pollution**
[15] Siehe auch Hermann Bubke, „Studie zur Kontamination von Arbeitnehmern mit Quecksilber bei der Erdgasförderung in der Altmark", Berlin, September 2010
[16] http://concernedhealthny.org/compendium/, Liste wiss. Literatur/Hinweise im Anhang unter dem Abschnitt: **Radioactive releases**
[17] http://concernedhealthny.org/compendium/, Liste wiss. Literatur/Hinweise im Anhang unter den Abschnitten: **Occupational health and safety hazards, Public Health Effects Measured Directly, PSE Database Appendix 2014** sowie http://concernedhealthny.org/category/documentation/peer-reviewed/
[18] Siehe Fußnote 1

Hodgkin-Lymphom und Multiplem Myelom entsteht nicht ohne Einfluss von Umweltnoxen (einer im Übrigen sehr übersichtlichen Anzahl, im Wesentlichen: Radioaktivität, Benzol, Dioxin, bestimmte Pestizide u.a.).

Wenn es auch schwierig ist, eine vollständige Kausalkette von den Verursachersubstanzen und deren Emittenten bis zur individuellen Erkrankung nachzuweisen, dürfte eins klar sein: ein "Weiter so!" mit Unbedenklichkeitsbescheinigung auch in der konventionellen Gasförderung kann nicht mehr möglich sein. Eine ernsthafte Bezugnahme auf die Zusicherung der „körperlichen Unversehrtkeit“ (Art. 2 Abs. 2 GG) hierzu erfordert eine klare Definition umfassender Gesundheitsschutz-, Gesundheitsüberwachungs- und Gesundheitssicherungs-Maßnahmen. Dazu gehören auch konstante Umweltmonitoring-Maßnahmen (Boden, Oberflächen- und Grundwasser, Luft in Bodennähe, Kopfhöhe sowie verschiedene Höhenbereichen - erste Ergebnisse partieller Bodenmessungen sind in Niedersachsen erst in 2019 zu erwarten!) sowie epidemiologische und umweltmedizinische Überwachungsmaßnahmen (u.a. Human-Biomonitoring), aber auch begleitende Gesundheitsstudien u.v.m., wozu es derzeit unverständlicherweise noch keinerlei Ansatz gibt.

Seit den „Grenzen des Wachstums“ des Club of Rome von 1972 ist weltweit eine heftige Debatte um die Endlichkeit unserer physiologischen Belastbarkeit und der unserer Mitwelten entbrannt. Wir unterliegen alle denselben Naturgesetzlichkeiten und die zeigen uns überdeutlich die „Grenzen des Überlebens“ auf. Seitdem kämpfen weltweit Menschen um den Schutz bzw. um die Wiederherstellung ihrer durch Chemikalien und Strahlen angegriffenen Gesundheit, soweit sie denn überleben konnten. Die unzähligen Stimmen dieser Opfer sind bisher weitgehend ungehört und unberücksichtigt verhallt. In Deutschland wurde die besondere Qualität des Leidens der Umweltkranken zwar festgestellt (u.a. MCS-Studie, Robert Koch Institut, 2000), was aber bisher nicht zu ihrer sozialrechtlichen Anerkennung als „durch schädliche Umwelteinflüsse krank gemachte“ geführt hat.

Dies alles erfordert in der Konsequenz eine tiefgreifende Veränderung in der staatlichen Umsetzung des Vorsorgeprinzips[19] wie auch einer Fülle weiterer Maßnahmen.

Die jahrzehntelange Vernachlässigung dieser Überwachungs- und Regulationsaufgaben zu Sicherstellung der Gesundheit der Bevölkerung hat zu einer Auftürmung eines beträchtlichen Regelungsbedarfs geführt. Wir nehmen diese bisher ungeklärte Gefahrenlage in den Kernzonen der Gasförderung in Niedersachsen zum Anlass, um die Bildung einer interministeriellen Arbeitsgruppe zwischen dem Bundesumwelt-, dem Bundesgesundheits- und dem Bundeswirtschaftsministerium vorzuschlagen - analog zur Zusammenarbeit der drei niedersächsischen Ministerien.

<u>Hier nur ein exemplarischer Auszug aus der Liste längst überfälliger Maßnahmen:</u>

- Vornahme einer realistischen und langfristigen Gefahrenabschätzung für Umwelt, Klima, Gesundheit durch die konventionelle sowie unkonventionelle Gas- und Ölförderung aufgrund der umfangreichen wissenschaftlichen Faktenlage
- Einrichtung einer Meldestelle zwecks Sammlung und Aufarbeitung von Daten zur Gesundheitsbelastung inklusive Neubewertung von Versäumnissen in der Chemikalien- und Strahlenüberwachung
- Einrichtung von Ad-Hoc-Gruppen in Bund und Ländern zur Feststellung der konkreten gesundheitlichen Gefahrenlage (Bewertung des krankmachenden Potenzials der bisher bekannten o.g. 135.000 Altlasten, Beseitigungs- und zukünftige Verhinderungsstrategien etc.)
- Personelle Aufstockung in Landes- und örtlichen Gesundheitsämtern mit Fokus auf dem Gesundheitsschutz statt wie bisher eher "Gesundheitsverwaltung"
- Auflage von Forschungsprogrammen zur Feststellung der Auswirkungen von Chemikalien und Strahlen auf die Entwicklung und Chronifizierung von Volkskrankheiten wie Krebs, Neurodegeneration, Herz-Kreislauf-Krankheiten (siehe Feinstaub/Lärm u.a.) sowie die stark ansteigende Zahl der Autoimmunkrankheiten, Allergien, Immunschwächen, „Environmental Illnesses/Diseases“ bzw. Umweltkrankheiten, sowie der zunehmenden Anzahl von chronisch Erkrankten im letzten Lebensdrittel (siehe WHO-Programm HALE)[20] unter Hinzuziehung der internationalen wissenschaftlichen Literatur

[19] Mitteilung der Kommission, „Die Anwendbarkeit des Vorsorgeprinzips“, 2000:… „Bei dieser Prüfung sind der allgemeine Grundsatz und die Rechtsprechung des Gerichtshofes zu berücksichtigen, wonach der Gesundheitsschutz wirtschaftlichen Erwägungen vorgeht.“

[20] (früher Disability- jetzt) Health-Adjusted Life Expectancy (DALE, jetzt HALE), http://www.who.int/trade/glossary/story036/en/

- Tatsächliche Einhaltung aller bisherigen Standards zum Schutz von Umwelt und Gesundheit, (beispielsweise Pflanzenschutzmittelgesetz §1, 3.[21], Chemikaliengesetz: Wiedereinführung und Strafbarkeit der Nicht-Meldung von chemisch bedingten Verletzungen, ehemals in §16 enthalten)
- Zwingende Vorlage eines nachhaltigen, umwelt- und gesundheitsverträglichen Abfallkonzepts bei allen zu genehmigenden Industrievorhaben. Unterirdische Verpressung wie oberflächliche Klärung der hochtoxischen wie radioaktiven Elemente des Lagerstättenwassers sind keineswegs sicher.
- Aktive Förderung des Bewusstseins über die Dimension von Gesundheitsschädigungen durch Chemikalien/Strahlung durch die Bundespolitik in allen medizinischen, juristischen, sozialen Institutionen sowie der damit assoziierten Erkrankungen und ihrer Erforschung (siehe Resolution der World Medical Association, Vancouver 2010)[22]
- Ausbau der Versorgung der Patienten mit "Klinischer Umweltmedizin", die die Aufwertung echter umweltmedizinischer Qualifikation gegenüber der „politikberatenden Umweltmedizin“ einschließt
- Integration der „Klinischen Umweltmedizin“ in das GKV-System. Patienten können und sollten nicht die gesamte finanzielle Last der medizinischen Kosten einer durch Umweltnoxen erworbenen Erkrankung tragen
- Besetzung der „Umweltambulanzen“ sowie des Medizinstudium-Pflichtfachs „Umweltmedizin“ mit ausgebildeten Fachkräften der „Klinischen Umweltmedizin“
- Entwicklung von diagnostischen Methoden, um die Ursache von durch Chemikalien- bzw. Strahleneinwirkung verursachten Erkrankungen, im Einzelfall zu finden und zu therapieren
- Reaktivierung, Aktualisierung und Ausweitung von APUG, „Aktionsprogramm Umwelt und Gesundheit“[23]
- Berechnung der volkswirtschaftlichen Schäden an Natur, Landwirtschaft, Mensch und Tier durch kaum mehr bezifferbaren Schäden an Gesundheit und Umwelt (siehe UNEP, 2013, „Costs of Inaction of the Sound Management of Chemicals“[24])
- Entwicklung von Struktur- und Finanzierungsmodellen für die umweltmedizinische Therapie unter Berücksichtigung potenzieller umfangreicher Einsparungen durch den zu erwartenden Rückgang von Kosten bei chronischen Krankheiten und bei den sog. „Non Communicable Diseases“[25].
- Berechnung der potenziellen Einsparungen im Gesundheitswesen durch Einbeziehung des Faktors „Umweltnoxen als Krankheitsauslöser“ in die bisher ausschließlich auf „Lifestyle“-bezogenen Präventions- und Therapieansätze
- Schaffung von Anreizen zur Entwicklung einer umwelt- und gesundheitsverträglichen Energiegewinnung

<u>Darüber hinaus fordern wir die Einleitung historisch überfälliger Gesetzesregelungen</u> als Anerkenntnis der tatsächlichen Auswirkungen von Chemikalien und Strahlung:

- Beweislastumkehr auch in Bezug auf Gesundheitsschädigung (siehe japanische Gesetzgebung nach Minimata 1984) sowie einer Entschädigungsregelung durch die verursachende Industrie
- Gesetzlich bindende Einführung der auf aktuellem wissenschaftlichen Erkenntnisstand zu definierenden „Gesundheitsverträglichkeitsprüfung“, GVP – nicht nur in Sachsen-Anhalt
- Reform des Gutachterwesens zur Gewährleistung der Unabhängigkeit der Gutachter und zur Verbesserung eines Qualitätsstandards, der sich am Stand der Wissenschaft orientiert
- medizinisch und rechtlich relevante Anerkennung der durch toxische/subtoxische, niedrigschwellige und synergistisch-wirkenden Belastungen verursachten Erkrankungen (MCS, EHS u.v.m.)
- Einrichtung von Schutzzonen und Schutzräumen für Menschen mit erworbener Chemikalien- und Elektromagnetischer Sensibilität (MCS, EHS, u.a.)
- Maßnahmen der Judikative zur Einführung eines Straftatbestands i.S. „Verletzungen durch Umweltnoxen“ in das Strafgesetzbuch, bzw. konsequente Strafverfolgung der diesbezüglichen Straftatbestände wie z.B. §223 StGB „Körperverletzung“[26], §340 „Körperverletzung im Amt“[27]

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[21] Pflanzenschutzmittelgesetz §1, 3.: „Gefahren, die durch die Anwendung von Pflanzenschutzmitteln oder durch andere Maßnahmen des Pflanzenschutzes, insbesondere für die Gesundheit von Mensch und Tier und für den Naturhaushalt, entstehen können, abzuwenden.“

[22] ”WMA Statement on Environmental Degradation and Sound Management of Chemicals”, Adopted by the WMA General Assembly, Vancouver, Canada, October 2010, http://www.wma.net/en/30publications/10policies/e17/Environmental_Degradation-Oct2010.pdf

[23] http://www.apug.de/

[24] UNEP, 2013, http://www.unep.org/chemicalsandwaste/Portals/9/Mainstreaming/CostOfInaction/Report_Cost_of_Inaction_Feb2013.pdf

[25] Non Communicable Diseases, http://www.who.int/mediacentre/factsheets/fs355/en/

[26] StGB §223, 1. „Wer eine andere Person körperlich misshandelt oder an der Gesundheit schädigt, wird mit Freiheitsstrafe bis zu fünf Jahren oder mit Geldstrafe bestraft.“ 2. „Der Versuch ist strafbar.“

[27] StGB §340, 1. „Ein Amtsträger, der während der Ausübung seines Dienstes oder in Beziehung auf seinen Dienst eine Körperverletzung begeht oder begehen lässt, wird mit Freiheitsstrafe von drei Monaten bis zu fünf Jahren bestraft.“, 2. „Der Versuch ist strafbar.“

- umgehende Ratifizierung des Minimata-Abkommens[28] zur drastischen Quecksilber-Reduktion (Beitritt Deutschlands zum Abkommen am 10.10.2013), Initiative zur Erweiterung des Abkommens auf Quecksilberemissionen aus der Öl- und Gasförderung bzw. – bisher nur Kohleförderung benannt – auf alle fossilen Energieträger. Einbeziehung von Amalgam und Thiomersal in Impfstoffen in die Verbotsliste
- Grenzwerte-Anpassung an strengere Emissionsvorgaben beispielsweise aus USA und China
- Neubewertung der krankmachenden Wirkungen von Substanzen in sehr niedrigen Konzentrationen (EDCs[29], in vielen der chemischen Bestandteile der Fracfluids vorkommen[30] u.a.)
- Entwicklung konkreter Präventionsansätze, Primär- wie Sekundärprävention zu Gefahren durch Noxen
- Einbeziehung der Gefahren durch Umweltschadstoffe und –Strahlen in den aktuellen Gesetzentwurf zur Prävention (BMG 2015)
- Aktive Verbesserung und Weiterentwicklung der EU-Gesetzgebung (REACh, Siebtes Umweltaktionsprogramm (UAP) bis 2020, Wiederaufnahme von EPHIA[31](„on hold“ seit 2004) u.a.m.)

Wegen der bereits hinreichend nachgewiesenen großen gesundheitlichen Gefährdungspotentiale der Kohlenwasserstoff-Förderung unter Einsatz des sogenannten „Fracking-Verfahrens“, mit der flächenhaften Aufbrechung der Untergrundschichten ganzer Landstriche, fordern wir von Ihnen, diese Förderungsart in unserem eng besiedelten Deutschland zu verbieten, anstatt sie gesetzlich zuzulassen. Zugleich sind die Vorgaben für die konventionelle Förderung zum Schutz der Gesundheit der Bevölkerung wesentlich zu verschärfen. Die bisher völlig vernachlässigte notwendige Berücksichtigung genügend großer Sicherheitsabstände zwischen Siedlungen und Förder- und/oder Aufbereitungsplätzen ist umgehend zu ändern.

Bei uns in Europa gilt aus gutem Grund der Besorgnisgrundsatz. Bei hinreichend begründeten Verdachtsmomenten ist der Gesetzgeber aufgerufen, vorsorgend durch Gesetze und Verordnungen dafür Sorge zu tragen, dass die Gesundheitsgefährdung der Bevölkerung vermieden wird.

Sehr geehrte Frau Umweltministerin, aus unserer Sicht gibt es nur eine verantwortungsvolle Handlungsoption: verbieten Sie das „Fracking-Verfahren“ rechtssicher.

Beschleunigen Sie das Ende der fossilen Energiewirtschaft und legen Sie den Schwerpunkt auf eine nachhaltige, zukunftsweisende und gesunde Energieförderung.

Mit freundlichen Grüßen

Kathrin Otte

<u>Anhang wissenschaftlicher Referenzen und Indikationen aus den USA im Kontext Öl-und Gasförderung:</u>

Themenbezogene Hinweise und wissenschaftliche US-Studien zu vielfältigen Gefährdungen, Materialschäden, Belastungen, Vergiftungen, Gesundheitsschäden, Wasser- und Luftkontaminationen durch Fracking:

COMPENDIUM OF SCIENTIFIC, MEDICAL, AND MEDIA FINDINGS DEMONSTRATING RISKS AND HARMS OF FRACKING (UNCONVENTIONAL GAS AND OIL EXTRACTION), „Concerned Health Professionals of New York” ,2nd edition, December 11, 2014

Occupational health and safety hazards

168 Lombardi, K. (2014, December 4). Benzene and worker cancers: 'An American tragedy.' The Center for Public Integrity. Retrieved from http://www.publicintegrity.org/2014/12/04/16320/benzene-and-worker-cancers-american-tragedy

[28] Minimata-Konvention, siehe http://www.bmub.bund.de/themen/gesundheit-chemikalien/gesundheit-und-umwelt/die-quecksilber-konvention-der-vereinten-nationen/

[29] Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union, Philippe Grandjean et al., 2015, http://press.endocrine.org/doi/10.1210/jc.2014-4324

[30] Colborn, T., Kwiatkowski, C., Schultz, K., & Bachran, M. (2011). Natural gas operations from a public health perspective. *Human and Ecological Risk Assessment: An International Journal, 17*(5), 1039-1056. doi: 10.1080/10807039.2011.605662

[31] European Policy Health Impact Assessment, ISBN 1 874038 75 9, MAI 2004

169 Kremer, R. (2014, November 11). High levels of super-fine dust are detected around Wisconsin frac sand mines. *Wisconsin Public Radio*. Retrieved from http://www.wpr.org/high-levels-super-fine-dust-are-detected-around-wisconsin-frac-sand-mines?utm_content=buffer8947f&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer
170 Paul, J.. (2014, November 11). Brighton man ID'd as victim in fatal Weld County fracking blast. *The Denver Post.* Retrieved from http://www.denverpost.com/news/ci_26937782/brighton-man-idd-victim-fatal-weld-county-fracking?source=pkg
171 Strandberg, S. (2014, October 6). U of I researcher informs supervisors about frac-sand impact. *Decorah Newspapers*. Retrieved from http://www.decorahnewspapers.com/Content/Home/Home/Article/U-of-I-researcher-informs-supervisors-about-frac-sand-impact/-2/-2/35735
172 Chapman, E., Hopkins, L., Jasset, A., Sheldon, S., Smith, G. (2014, September 25). Communities at risk: Frac sand mining in the Upper Midwest--A report by Boston Action Research (a project of Civil Society Institute). Retrieved from http://216.30.191.148/fracsandmining/ and www.bit.ly/fracsandmining
173 Gallucci, M. (2014, September 25). US oil & gas fracking boom could drive silica sand mining operations in 12 more states, environmental groups say. *International Business Times.* Retrieved from http://www.ibtimes.com/us-oil-gas-fracking-boom-could-drive-silica-sand-mining-operations-12-more-states-1695246
174 Esswein, E., Snawder, J., King, B., Breitenstein, M., Alexander-Scott, M., and Kiefer, M. (2014). Evaluation of some potential chemical risks during flowback operations in unconventional oil and gas extraction: Preliminary results. *Journal of Occupational and Environmental Hygiene*, *11*, D174-0184.
175 Bamberger, M., & Oswald, R. (2014). The shale gas revolution from the viewpoint of a former industry insider. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy.* Early Online View. doi: 10.2190/NS.EOV.1
176 Witter, R.Z., Tenney, L., Clark, S., and Newman, L.S. (2014). Occupational exposures in the oil and gas extraction industry: State of the science and research recommendations. *American Journal of Industrial Medicine, 57*(7), 847-856. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/ajim.22316/full
177 O'Neill, R. (editor). (July 2014). Chemicals, dust and deaths and the new rush for oil and gas. *Hazards Magazine*. Special Online Report. Retrieved from http://www.hazards.org/oil/fracking.htm#top
178 Richards, J. S. (2014, June 29). Glitch sparks smoky fire at gas well. *The Columbus Dispatch.* Retrieved from http://www.dispatch.com/content/stories/local/2014/06/29/glitchsparks-smoky-fire-at-gas-well.html
179 Arenschield, L. (2014, August 31). Fracking fire points out failings. *The Columbus Dispatch* Retrieved from http://www.dispatch.com/content/stories/local/2014/06/29/glitchsparks-smoky-fire-at-gas-well.html
180 Snawder, J., Esswein, E., King, B., Breitenstein, M., Alexander-Scott, M., Retzer, K., ... Hill, R. (2014, May 19). Reports of worker fatalities during flowback operations [Web log post]. *NIOSH Science Blog.* Retrieved June 9, 2014, from http://blogs.cdc.gov/niosh-science-blog/2014/05/19/flowback/
181 Iafolla, R. (2014, May 20). Four fatalities linked to used fracking fluid exposure during 'flowback,' NIOSH reports. *Bloomberg BNA*. Retrieved June 9, 2014, from http://www.bna.com/four-fatalities-linked-n17179890610/
182 Esswein, E. J., Breitenstein, M., Snawder, J., Kiefer, M., & Sieber, W. K. (2013). Occupational exposures to respirable crystalline silica during hydraulic fracturing. *Journal of Occupational and Environmental Hygiene, 10*(7), 347-356. doi: 10.1080/15459624.2013.788352
183 University of Iowa Environmental Health Sciences Research Center. (2012). Exposure assessment and outreach to engage the public on health risks from frac sand mining. Retrieved June 10, 2014, from http://cph.uiowa.edu/ehsrc/fracsand.html
184 Picchi, A. (2014, May 8). The most dangerous U.S. state for workers. *CBS News*. Retrieved June 10, 2014, from http://www.cbsnews.com/news/the-most-dangerous-us-state-for-workers/
185 Ghahremani, Y. (2014, April 24). Fractured Healthcare: Pumping Resources Back into the Eagle For Shale Communities/Executive Summary: Methodist Healthcare Ministries and Center for Community and Business Research at the University of Texas San Antonio. Retrieved June 20, 2014, from http://www.joomag.com/en/newsstand/fractured-healthcare-pumping-resources-back-into-the-eagle-ford-shale-communities-apr-2014/0368470001398347080
186 Hicks, I. (2014, April 10). Gas workers risk silica exposure. *The Intelligencer, Wheeling News-Register*. Retrieved June 10, 2014, from http://www.news-register.net/page/content.detail/id/598589/Gas-Workers-at-Risk-Of-Silica-Ex---.html
187 Olsen, L. (2014, February 22). Houston Chronicle exclusive: Drilling boom, deadly legacy. Retrieved June 10, 2014, from http://www.houstonchronicle.com/news/special-reports/article/Houston-Chronicle-exclusive-Drilling-boom-5259311.php#/0
188 Hsieh, S. (2014, February 25). Why are so many workers dying in oil fields? Retrieved June 10, 2014, from http://www.thenation.com/blog/178523/why-are-so-many-workers-dying-oil-fields
189 Schneider, A., & Geewax, M. (2013, December 27). On-the-job deaths spiking as oil drilling quickly expands. Retrieved June 10, 2014, from http://www.npr.org/2013/12/27/250807226/on-the-job-deaths-spiking-as-oil-drilling-quickly-expands
190 American Public Health Association. (2012, October 30). The environmental and occupational health impacts of high-volume hydraulic fracturing of unconventional gas reserves. Retrieved June 10, 2014, from http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1439
191 Steinhäusler, F. (2005). Radiological impact on man and the environment from the oil and gas industry: Risk assessment for the critical group. *Nato Science Series: IV: Earth and Environmental Sciences.* DOI: 10.1007/1-4020-2378-2_19. http://rd.springer.com/chapter/10.1007/1-4020-2378-2_19

Public Health Effects, Measured Directly

192 Skrapits, E. (2014, October 2). Study: More gas wells in area leads to more hospitalizations. *The Citizen's Voice*. Retrieved from http://citizensvoice.com/news/study-more-gas-wells-in-area-leads-to-more-hospitalizations-1.1763826
193 Olsen,L. (2014, 11 September). Fatal truck accidents have spiked during Texas' ongoing fracking and drilling boom. *Houston Chronicle.* Retrieved from http://www.houstonchronicle.com/news/article/Fracking-and-hydraulic-drilling-have-brought-a-5747432.php?cmpid=email-premium&cmpid=email-premium&t=1a9ca10d49c3f0c8a9#/0
194 Rabinowitz, P.M., Slizovskiy, I.B., Lamers, V., Trufan, S.J., Holford, T.R., Dziura, J.D., Peduzzi, P.N., Kane, M.J., Reif, J.S., Weiss, T.R. and Stowe, M.H. (2014). Proximity to natural gas wells and reported health status: Results of a household survey in Washington County, Pennsylvania. *Environmental Health Perspectives.* Advance online publication. http://dx.doi.org/10.1289/ehp.1307732
195 Bryan, K.J. (2014, August 3). Drugs, oilfield work, traffic pushing more people through doors of Watford City ER. *Bakken Today.* Retrieved from http://www.bakkentoday.com/event/article/id/37101/
196 S Schlanger, Z. (2014, May 21). In Utah boom town, a spike in infant deaths raises questions. *Newsweek*. Retrieved June 10, 2014, from http://www.newsweek.com/2014/05/30/utah-boom-town-spike-infant-deaths-raises-questions-251605.html
197 American Lung Association. (2013). American Lung Association state of the air 2013. Retrieved June 10, 2014, from http://www.stateoftheair.org/2013/states/utah/uintah-49047.html
198 McKenzie, L. M., Guo, R., Witter, R. Z., Savitz, D. A., Newman, L. S., & Adgate, J. L. (2014). Birth outcomes and maternal residential proximity to natural gas development in rural Colorado. *Environmental Health Perspectives, 122*, 412-417. doi: 10.1289/ehp.1306722
199 Whitehouse, M. (2014, January 4). Study shows fracking is bad for babies. *Bloomberg*. Retrieved June 10, 2014, from http://www.bloombergview.com/articles/2014-01-04/study-shows-fracking-is-bad-for-babies
200 Hill, E. L. (2013, October). The impact of oil and gas extraction on infant health in Colorado. Retrieved June 10, 2014, from http://www.elainelhill.com/research
201 Hill, E.L. (2013, December). Shale gas development and infant health: Evidence from Pennsylvania (under review). Retrieved June 23, 2014 from http://www.elainelhill.com/research.
202 Abrams, L. (2013, August 26). Fracking's real health risk may be from air pollution. *Salon*. Retrieved June 10, 2014, from http://www.salon.com/2013/08/26/frackings_real_health_risk_may_be_from_air_pollution/
203 Dyrszka, L., Nolan, K., & Steingraber, S. (2013, August 27). *Statement on preliminary findings from the Southwest Pennsylvania Environmental Health Project study* [*Press release*]. Concerned Health Professionals of NY. Retrieved June 10, 2014, from http://concernedhealthny.org/statement-on-preliminary-findings-from-the-southwest-pennsylvania-envir...
204 Steinzor, N., Subra, W., & Sumi, L. (2013). Investigating links between shale gas development and health impacts through a community survey project in Pennsylvania. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy, 23*(1), 55-83. doi: 10.2190/NS.23.1.e
205 Phillips, S. (2013, May 14). Poll shows support for a drilling moratorium in Pennsylvania. *StateImpact*. Retrieved June 10, 2014, from http://stateimpact.npr.org/pennsylvania/2013/05/14/poll-shows-support-for-a-drilling-moratorium-in-pennsylvania/

Water contamination

55 Darrah, T.H., Vengosh, A., Jackson, R.B., Warner, N.R., and Poreda, R.J. (2014). Noble gases identify the mechanisms of fugitive gas contamination in drinking-water wells overlying the Marcellus and Barnett Shales. *Proceedings of the National Academy of Sciences, 111* (39), 14076-14081. doi: 10.1073/pnas.1322107111
56 Jackson, R. (2014, December 1). Reopen Barnett Shale water probe. *The Texas Tribune.* Retrieved from http://tribtalk.org/2014/12/01/reopen-barnett-shale-water-probe/

57 Board, G. (2014, November 3). September drilling accident contaminated water in Doddridge County. *West Virginia Public Broadcasting*. Retrieved from http://wvpublic.org/post/dep-september-drilling-accident-contaminated-water-doddridge-county
58 Schaeffer, E. and Bernhardt, C. (2014, October 22). Fracking's toxic loophole. The Environmental Integrity Project. Retrieved from http://environmentalintegrity.org/wp-content/uploads/FRACKINGS-TOXIC-LOOPHOLE.pdf
59 Warner, N.R., Darrah, T.H., Jackson, R.B., Millot, R., Kloppmann, W., and Vengosh, A. (2014). New tracers identify hydraulic fracturing fluids and accidental releases from oil and gas operations. *Environ. Sci. Technol.*, *48*(21), 12552–12560. doi: 10.1021/es5032135
60 Hopey, D. (2014, October 15). Waynesburg officials investigate dumping of fracking wastewater. *Pittsburgh Post-Gazette*. Retrieved from http://powersource.post-gazette.com/news/environment/2014/10/15/Waynesburg-investigates-dumping-of-fracking-wastewater/stories/201410150056
61 Hopey, D. (2014, October 6). Testimony: obsolete tests tainted shale analysis. *Pittsburgh Post-Gazette.* Retrieved from http://powersource.post-gazette.com/powersource/companies-powersource/2014/10/06/Testimony-Obsolete-tests-tainted-shale-analysis/stories/201410060075
62 U.S. Government Accountability Office. (2014, September 23). Drinking water: characterization of injected fluids associated with oil and gas production. GAO-14-657R. Retrieved from http://www.gao.gov/products/GAO-14-857R.
63 Sadasivam N. (2014, July 29). Report criticizes EPA oversight of injection wells, *ProPublica* Retrieved from http://www.propublica.org/article/report-criticizes-epa-oversight-of-injection-wells
64 U.S. Government Accountability Office. (June 27, 2014). EPA program to protect underground sources from injection of fluids associated with oil and gas production needs improvement. GAO-14-555. Retrieved from http://www.gao.gov/products/GAO-14-555
65 Hopey, D. (2014, September 18). Range resources to pay $4.15M penalty. *Pittsburgh Post-Gazette*. Retrieved from http://www.post-gazette.com/local/2014/09/18/DEP-orders-Range-Resources-to-pay-4-million-fine/stories/201409180293
66 Brittingham, M.C., Maloney, K.O., Farag, A.M., Harper, D.D., Bowen, Z.H. (2014). Ecological risks of shale oil and gas development to wildlife, aquatic resources and their habitats. *Environmental Science & Technology*, *48*(19), 11034–11047. doi: dx.doi.org/10.1021/es5020482
67 Parker, K.M., Zeng, T., Harkness, J., Vengosh, A., and Mitch, W.A. 2014. Enhanced formation of disinfection byproducts in shale gas wastewater-impacted drinking water supplies. *Environ. Sci. Technol.*, *48*(19), 11161–11169. doi: 10.1021/es5028184
68 Pennsylvania Department of Environmental Protection. (2014 August 29). Water supply determination letters. Retrieved from http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf
69 Legere, L. (2014, September 9). DEP releases updated details on water contamination near drilling sites: some 240 private supplies damaged by drilling in the past 7 years. *Pittsburgh Post-Gazette.* Retrieved from http://powersource.post-gazette.com/powersource/policy-powersource/2014/09/09/DEP-releases-details-on-water-contamination/stories/201409090010
70 Greene, M. (2014, August 13). Fracking beyond the law: Despite industry denials, investigation reveals continued use of diesel in hydraulic fracturing. The Environmental Integrity Project. Retrieved from http://environmentalintegrity.org/wp-content/uploads/Fracking-Beyond-the-Law.pdf
71 Maguire-Boyle, S.J., and Barron, A.R. (2014). Organic compounds in produced waters from shale gas wells. *Environ. Sci.: Processes Impacts*, *16,* 2237-2248. doi: 10.1039/C4EM00376D
72 Stringfellow, W.T., Domen, J.K., Carmarillo, M.K., Sandelin, W.L., Tinnacher, R., Jordan, P., Houseworth, J., and Birkholzer, J. (August 13, 2014). Characterizing compounds used in hydraulic fracturing: a necessary step for understanding environmental impacts. Presentation before the American Chemical Society conference, San Francisco. Abstract retrieved from http://abstracts.acs.org/chem/248nm/program/view.php?obj_id=262051&terms=
73 Robinson, P. (2014, August 19). Fracking fluid survey shows missing information. *Scientific American.* Retrieved from http://www.scientificamerican.com/article/fracking-fluid-survey-shows-missing-information/
74 Banerjee, N. (2014, August 12). Oil companies fracking into drinking water sources, new research finds. *Los Angeles Times.* Retrieved from http://www.latimes.com/nation/la-na-fracking-groundwater-pavillion-20140811-story.html#page=1
75 Hamill, S.D. (2014, August 3). Drillers did not report half of spills that led to fines. *Pittsburgh Post-Gazette*. Retrieved from http://www.post-gazette.com/news/state/2014/08/03/Drillers-did-not-report-half-of-spills-that-led-to-fines/stories/201408020142
76 Arenschield, L. (2014, July 21). Halliburton delayed releasing details on fracking chemicals after Monroe County spill. *The Columbus Dispatch*. Retrieved from http://www.dispatch.com/content/stories/local/2014/07/21/details-on-chemicals-trickle-in-after-spill.html
77 Burton Jr., G.A., Basu, N., Ellis, B.R., Kapo, K.E., Entrekin, S. and Nadelhoffer, K. (2014). Hydraulic "fracking": are surface water impacts an ecological concern? *Environmental Toxicology and Chemistry*, *33*(8), 1679-1689.
78 Lustgarten, A. (2014, July 18). California halts injects of fracking waste, warning it may be contaminating aquifers. *ProPublica.* Retrieved from http://www.propublica.org/article/ca-halts-injection-fracking-waste-warning-may-be-contaminating-aquifers
79 Sang, W., Stoof, C., Zhang, W., Morales, V., Gao, B., Kay, R., et al. (2014). Effect of hydrofracking fluid on colloid transport in the unsaturated zone. *Environmental Science & Technology*, *48*(14), 8266–8274. Retrieved from http://pubs.acs.org/doi/abs/10.1021/es501441e
80 The Endocrine Society (2014). Hormone-disrupting activity of fracking chemicals worse than initially found. *Science Daily,* June 23, 2014 Retrieved from: http://www.sciencedaily.com/releases/2014/06/140623103939.htm?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+sciencedaily%2Ftop_news%2Ftop_health+%28ScienceDaily%3A+Top+Health+News%29
81 Yen, H. (2014, May 11). Fed govt failed to inspect h
82 Louis, S. (2012, May 4). Potential health hazards from shale gas exploration and exploitation–Drinking water and ambient air. Presented to Health Canada by SANEXEN Environmental Services; 0/Ref.: RA11-410. Document released under the (Canadian) Access to Information Act.
83 Davies, R. J., Almond, S., Ward, R. S., Jackson, R. B., Adams, C., Worrall, F., ... Whitehead, M. A. (2014). Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation. *Marine and Petroleum Geology, 56*, 239-254. doi: 10.1016/j.marpetgeo.2014.03.001
84 Vengosh, A., Jackson, R. B., Warner, N., Darrah, T. H., & Kondash, A. (2014). A critical review of the risks to water resources from unconventional shale gas development and hydraulic fracturing in the United States [Abstract]. *Environmental Science & Technology*. doi: 10.1021/es405118y
85 Gibbons, B. (2014, February 19). Woman wins case against Chesapeake Jaqueline Place of Terry Township to receive compensation for well contamination. *Thedailyreview.com*. Retrieved June 9, 2014, from http://thedailyreview.com/news/woman-wins-case-against-chesapeake-jaqueline-place-of-terry-township-to-receive-compensation-for-well-contamination-1.1636832 igher risk oil wells. *Associated Press*. Retrieved June 9, 2014, from http://bigstory.ap.org/article/fed-govt-failed-inspect-higher-risk-oil-wells
86 Tomasic, J. (2014, January 16). Colorado drilling data: More than a spill a day. *The Colorado Independent*. Retrieved June 9, 2014, from http://www.coloradoindependent.com/145629/colorado-drilling-data-more-than-a-spill-a-day
87 Drajem, M. (2014, January 9). Duke fracking tests reveal dangers driller's data missed. *Bloomberg*. Retrieved June 9, 2014, from http://www.bloomberg.com/news/2014-01-10/epa-s-reliance-on-driller-data-for-water-irks-homeowners.html
88 Drajem, M. (2014, January 27). EPA needs fracking review: 'Gasland' maker, environmentalists. *Bloomberg*. Retrieved June 9, 2014, from http://go.bloomberg.com/political-capital/2014-01-27/epa-needs-fracking-review-gasland-producer-environmentalists-say/.
89 Begos, K. (2014, January 05). 4 states confirm water pollution from drilling. *USA Today*. Retrieved June 9, 2014, from http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-from-drilling/4328859/
90 Banjeree, N. (2013, December 24). EPA report on fracking in Texas raises new concerns. *Los Angeles Times*. Retrieved June 9, 2014, from http://www.latimes.com/nation/la-na-epa-fracking-20131225,0,6042944.story#ixzz2oVB9FXVY
91 Miedema, D. (2013, December 25). The EPA screwed up when it dropped this fracking investigation. *Business Insider*. Retrieved June 9, 2014, from http://www.businessinsider.com/epa-criticized-for-dropping-fracking-investigation-2013-12
92 Kassotis, C. D., Tillitt, D. E., Davis, J. W., Hormann, A. M., & Nagel, S. C. (2013). Estrogen and androgen receptor activities of hydraulic fracturing chemicals and surface and ground water in a drilling-dense region. *Endocrinology*. doi: 10.1210/en.2013-1697
93 Banerjee, N. (2013, December 16). Hormone-disrupting chemicals found in water at fracking sites. *Los Angeles Times*. Retrieved June 11, 2014, from http://articles.latimes.com/2013/dec/16/science/la-sci-fracking-health-20131217
94 Endocrine Society. (2013, December 16). Fracking chemicals disrupt hormone function. ScienceDaily. Retrieved June 11, 2014 from www.sciencedaily.com/releases/2013/12/131216140428.htm
95 Hirst, C., & Fuquay, J. (2013, December 7). Second leak reported at east Fort Worth gas well site. *Star-Telegram*. Retrieved June 9, 2014, from http://www.star-telegram.com/2013/12/07/5399740/second-leak-reported-at-east-fort.html?rh=1
96 MacPherson, J. (2013, October 28). Nearly 300 pipeline spills in North Dakota have gone unreported to the public since January 2012. *Huffington Post*. Retrieved June 9, 2014, from http://www.huffingtonpost.com/2013/10/28/pipeline-spills-north-dakota_n_4170133.html?ncid=edlinkusaolp00000003
97 Kappel, W. M., Williams, J. H., & Szabo, Z. (2013). Water resources and shale gas/oil production in the Appalachian Basin - Critical issues and evolving developments. *U.S. Geological Survey*. Retrieved June 9, 2014, from http://pubs.usgs.gov/of/2013/1137/pdf/ofr2013-1137.pdf
98 Mall, A. (2013, November 26). New USGS analysis: Threats to water, wildlife, and health from oil and gas development in the Appalachian basin [Web log post]. Retrieved June 9, 2014, from http://switchboard.nrdc.org/blogs/amall/new_usgs_analysis.html
99 A freshwater shortage is expected in the US by 2030. (2013, September 8). *MSN Now*. Retrieved June 11, 2014, from http://now.msn.com/freshwater-shortage-in-us-will-reach-a-worrying-stage-by-2030-1#scpshrtu

100 Vaidyanathan, G. (2013, November 22). Bakken shale: As oil production sets in, pollution starts to migrate -- scientists. *E&E Publishing, LLC*. Retrieved June 9, 2014, from http://www.eenews.net/stories/1059990892
101 Maykuth, A. (2013, September 13). Shale criminal charges stun drilling industry. *Philly.com*. Retrieved June 9, 2014, from http://articles.philly.com/2013-09-13/news/42012429_1_xto-energy-inc-criminal-charges-attorney-general
102 Letter from George Hawkins, General Manager, DC Water, to U.S. Secretary of Agriculture, Thomas Vilsack, (Sept. 10, 2013), http://www.washingtoncitypaper.com/blogs/housingcomplex/2013/09/20/dc-water-chief-urges-agriculture-secretary-not-to-allow-fracking-near-d-c/
103 Wiener, A. (2013, September 20). DC Water Chief urges Agriculture Secretary not to allow fracking near D.C. *Washington City Paper*. Retrieved June 11, 2014, from http://www.washingtoncitypaper.com/blogs/housingcomplex/2013/09/20/dc-water-chief-urges-agriculture-secretary-not-to-allow-fracking-near-d-c/
104 Sun Staff. (2013, September 3). More blowouts a concern for N.D. *The Jamestown Sun*. Retrieved June 9, 2014, from http://www.jamestownsun.com/content/more-blowouts-concern-nd
105 Papoulias, D., & MacKenzie, T. (2013, August 28). Hydraulic fracturing fluids likely harmed threatened Kentucky fish species. *USGS Newsroom*. Retrieved June 9, 2014, from http://www.usgs.gov/newsroom/article.asp?ID=3677
106 Fontenot, B. E., Hunt, L. R., Hildenbrand, Z. L., Jr., D. D., Oka, H., Walton, J. L., ... Schug, K. A. (2013). An evaluation of water quality in private drinking water wells near natural gas extraction sites in the Barnett Shale formation. *Environmental Science & Technology, 47*(17), 10032-10040. doi: 10.1021/es4011724
107 Lustgarten, A. (2013, July 3). EPA's abandoned Wyoming fracking study one retreat of many. *ProPublica*. Retrieved June 9, 2014, from http://www.propublica.org/article/epas-abandoned-wyoming-fracking-study-one-retreat-of-many
108 Efstathiou, J., Jr., & Drajem, M. (2013, June 5). Drillers silence fracking claims with sealed settlements. *Bloomberg*. Retrieved June 9, 2014, from http://www.bloomberg.com/news/2013-06-06/drillers-silence-fracking-claims-with-sealed-settlements.html
109 Environmental Protection Agency. (1987). *Report to Congress: Management of wastes from the exploration, development, and production of crude oil, natural gas, and geothermal energy* (Rep.). 137-138. Washington, D.C.: U.S. Environmental Protection Agency.
110 Jackson, R. B., Vengosh, A., Darrah, T. H., Warner, N. R., Down, A., Poreda, R. J., ... Karr, J. D. (2013). Increased stray gas abundance in a subset of drinking water wells near Marcellus shale gas extraction. *Proceedings of the National Academy of Sciences*, 110(28), 11250-11255. doi: 10.1073/pnas.1221635110
111 CBS/AP. (2013, June 25). Methane found in Pa. drinking water near fracked wells. *CBS News*. Retrieved from http://www.cbsnews.com/news/methane-found-in-pa-drinking-water-near-fracked-wells/
112 Legere, L. (2013, May 19). Sunday Times review of DEP drilling records reveals water damage, murky testing methods. *The Times-Tribune*. Retrieved June 9, 2014, from http://thetimes-tribune.com/news/sunday-times-review-of-dep-drilling-records-reveals-water-damage-murky-testing-methods-1.1491547
113 Gross, S. A., Avens, H. J., Banducci, A. M., Sahmel, J., Panko, J. M., & Tvermoes, B. E. (2013). Analysis of BTEX groundwater concentrations from surface spills associated with hydraulic fracturing operations. *Journal of the Air & Waste Management Association, 63*(4), 424-432. doi: 10.1080/10962247.2012.759166
114 Ferrar, K. J., Michanowicz, D. R., Christen, C. L., Mulcahy, N., Malone, S. L., & Sharma, R. K. (2013). Assessment of effluent contaminants from three facilities discharging Marcellus shale wastewater to surface waters in Pennsylvania. *Environmental Science & Technology, 47*(7), 3472-3481. doi: 10.1021/es301411q
115 Finley, B. (2012, December 9). Drilling spills reaching Colorado groundwater; state mulls test rules. *The Denver Post*. Retrieved June 9, 2014, from http://www.denverpost.com/environment/ci_22154751/drilling-spills-reaching-colorado-groundwater-state-mulls-test#ixzz2EihHU2fg
116 Hammer, R., & VanBriesen, J. (2012, May). *In fracking's wake: New rules are needed to protect our health and environment from contaminated wastewater* (Rep.). Natural Resources Defense Council. Retrieved June 11, 2014, from http://www.nrdc.org/energy/files/fracking-wastewater-fullreport.pdf
117 U.S. Geological Survey, New York Water Science Center. (2012, January 11). *Comments on the revised draft supplemental generic environmental impact statement*. (Rep.). Retrieved June 11, 2014, from http://www.ewg.org/sites/default/files/report/ReviseddraftSGEIS_USGScomments_Version3_0.pdf
118 Jacobus, T. P. (2012, April 25). Draft environmental impact statment for the George Washington National Forest [Letter written October 17, 2011 to K. Landgraf]. Retrieved June 11, 2014, from http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5366331.pdf
119 Murray, C. M. (n.d.). Draft environmental impact statement for the George Washington National Forest [Letter written October 11, 2013 to K. Landgraf]. Retrieved June 11, 2014, from http://www.svnva.org/wp-content/uploads/fairfax-wash-aquaduct-gwnf-comments.pdf
120 New York State Department of Environmental Conservation. (2011). *Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program, well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* (6-62, Rep.).
121New York State Department of Environmental Conservation. (2011). *Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program, well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* (6-57 through 6-63, Rep.).
122New York State Department of Environmental Conservation. (2011). *Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program, well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* (6-64, Rep.).
123 United States Government Accountability Office. (1989, July 5). Drinking water: Safeguards are not preventing contamination from injected oil and gas wastes. Retrieved June 10, 2014, from http://www.gao.gov/products/RCED-89-97
124 Fountain, H. (2012, January 1). Disposal halted at well after new quake in Ohio. *The New York Times*. Retrieved June 10, 2014, from http://www.nytimes.com/2012/01/02/science/earth/youngstown-injection-well-stays-shut-after-earthquake.html
125 Colborn, T., Kwiatkowski, C., Schultz, K., & Bachran, M. (2011). Natural gas operations from a public health perspective. *Human and Ecological Risk Assessment: An International Journal, 17*(5), 1039-1056. doi: 10.1080/10807039.2011.605662
126 Urbina, I. (2011, August 4). A tainted water well, and concern there may be more. Retrieved June 11, 2014, from http://www.nytimes.com/2011/08/04/us/04natgas.html
127 U.S. Environmental Protection Agency. (1987). *Report to Congress: Management of wastes from the exploration, development, and production of crude oil, natural gas, and geothermal energy* (Rep.). 4-22, 4-23. Retrieved June 11, 2014, from http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=20012D4P.PDF
128 Horwitt, D. (2011, August 3). Cracks in the facade. *Environmental Working Group*. Retrieved June 11, 2014, from http://www.ewg.org/research/cracks-façade
129 Levy, M. (2011, May 18). DEP fines Chesapeake $1 million. *Pressconnects.com*. Retrieved June 9, 2014, from http://www.pressconnects.com/viewart/20110517/NEWS01/105170345/DEP-fines-Chesapeake-1-million
130 Duke University. (2011). Methane levels 17 times higher in water wells near hydrofracking sites, study finds. *ScienceDaily*. Retrieved June 11, 2014, from http://www.sciencedaily.com/releases/2011/05/110509151234.htm
131 Waxman, H.A., Markey, E. J., & DeGette, D. (2011, April 18). Committee on Energy & Commerce (U.S.A., Congress, Committee on Energy & Commerce). Retrieved December 9, 2014, from http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic-Fracturing-Chemicals-2011-4-18.pdf.
132 Urbina, I. (2011, April 17). Chemicals Were Injected Into Wells, Report Says. *The New York Times*. Retrieved December 9, 2014, from http://www.nytimes.com/2011/04/17/science/earth/17gas.html.
133 Entrekin, S., Evans-White, M., Johnson, B., & Hagenbuch, E. (2011). Rapid expansion of natural gas development poses a threat to surface waters. *Frontiers in Ecology and the Environment, 9*(9), 503-511. doi: 10.1890/110053
134 Waxman, H. A., Markey, E. J., & DeGette, D. (2011, October 25). *Committee on Energy & Commerce* (U.S.A., Congress, Committee on Energy & Commerce). Retrieved December 9, 2014, from http://democrats.energycommerce.house.gov/index.php?q=news/reps-waxman-markey-and-degette-report-updated-hydraulic-fracturing-statistics-to-epa.
135 Webb, D. (2010, April 29). Record fine, second one against Oxy approved. *Grand Junction Sentinel*. Retrieved June 11, 2014, from http://www.gjsentinel.com/news/articles/record-fine-second-one-against-oxy-approved
136 The Associated Press. (2011, April 22). Crews stop flow of drilling fluid from Pennsylvania well. *Syracuse.com*. Retrieved June 9, 2014, from http://www.syracuse.com/news/index.ssf/2011/04/crews_stop_flow_of_drilling_fl.html
137 Waxman, H. A., Markey, E. J., & DeGette, D. (2011, January 31). *Committee on Energy & Commerce* (U.S.A., Congress, Committee on Energy & Commerce). Retrieved June 9, 2014, from http://democrats.energycommerce.house.gov/index.php?q=news/waxman-markey-and-degette-investigation-finds-continued-use-of-diesel-in-hydraulic-fracturing-f
138 Pittsburgh Post-Gazette. (2009, June 5). Waste from Marcellus shale drilling in Cross Creek Park kills fish. *Pittsburgh Post-Gazette*. Retrieved June 9, 2014, from http://www.post-gazette.com/washington/2009/06/05/Waste-from-Marcellus-shale-drilling-in-Cross-Creek-Park-kills-fish/stories/200906050136
139 Lustgarten, A. (2009, April 26). Officials in three states pin water woes on gas drilling. *ProPublica*. Retrieved June 9, 2014, from http://www.propublica.org/article/officials-in-three-states-pin-water-woes-on-gas-drilling-426
140 Lustgarten, A. (2008, November 13). Buried secrets: Is natural gas drilling endangering U.S. water supplies? *ProPublica*. Retrieved June 9, 2014, from http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113
141 Ohio Department of Natural Resources Division of Mineral Resources Management. (2008, September 1). *Report on the investigation of the natural gas invasion of aquifers in Bainbridge Township of Geauga County, Ohio*. (Rep.). Retrieved June 9, 2014, from http://www.ohiodnr.com/mineral/bainbridge/tabid/20484/default.aspx
142 Bair, E. S., Freeman, D. C., & Senko, J. M. (2010, June). *Expert panel technical report, subsurface gas invasion Bainbridge Township, Geauga County, Ohio* (Rep.). Retrieved June 11, 2014, from http://oilandgas.ohiodnr.gov/portals/oilgas/pdf/bainbridge/DMRM%200%20Title%20Page,%20Preface,%20Acknowledgements.pdf

143 Ohio Dep't of Natural Res., Order Number 2009-17 (Apr. 14, 2009) (see attachments A, B).

Air pollution

3 Davis, Barry. (2014, November 20). TCEQ memo proves toxic chemicals are being released in the Eagle Ford Shale. KENS 5 Eyewitness News. Retrieved Nov. 25, 2014 from http://www.kens5.com/story/news/investigations/i-team/2014/11/20/benzene-oil-toxic-fumes/70020596/.
4 Thompson C.R., Hueber J., Helmig D. (2014). Influence of oil and gas emissions on ambient atmospheric non-methane hydrocarbons in residential areas of Northeastern Colorado. *Elementa: Science of the Anthropocene, 2*. doi: 10.12952/journal.elementa.000035
5 Macey, G.P., Breech, R., Chernaik, M., Cox, C., Larson, D., Thomas, D., Carpenter, D.O. (2014). Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. *Environmental Health, 13*(82). doi: 10.1186/1476-069X-13-82
6 Neuhauser, A. (2014, October 30). Toxic chemicals, carcinogens skyrocket near fracking sites. *U.S. News and World Report*. Retrieved from http://www.usnews.com/news/articles/2014/10/30/toxic-chemicals-and-carcinogens-skyrocket-near-fracking-sites-study-says
7 Environmental Health Sciences Center, Oregon State University. (2014). List of 62 PAH analyzed in Carroll County, OH. Retrieved November 15, 2014 from http://ehsc.oregonstate.edu/air/62PAH
8 Warneke, C., Geiger, F., Edwards, P. M., Dube, W., Pétron, G., Kofler, J., Zahn, A., Brown, S. S., Graus, M., Gilman, J. B., Lerner, B. M., Peischl, J., Ryerson, T. B., de Gouw, J. A., and Roberts, J. M. (2014). Volatile organic compound emissions from the oil and natural gas industry in the Uintah Basin, Utah: oil and gas well pad emissions compared to ambient air composition. *Atmospheric Chemistry and Physics, 14*, 10977-10988. doi:10.5194/acp-14-10977-2014
9 Hasemyer, D. and Hirji, Z. (2014, October 2). Open piles offer cheap disposal for fracking sludge, but health worries mount. InsideClimate News and the Center for Public Integrity. Retrieved on November 15, 2014 from http://www.publicintegrity.org/2014/10/02/15826/open-pits-offer-cheap-disposal-fracking-sludge-health-worries-mount
10 Edwards, P. M., Brown, S. S., Roberts, J. M., Ahmadov, R., Banta, R. M., deGouw, J. A., . . Zamora, R. (2014). High winter ozone pollution from carbonyl photolysis in an oil and gas basin. *Nature, 514*(7522), 351-354. doi: 10.1038/nature13767
11 Stamford, L. and Azapagic, A. (2014). Life cycle environmental impacts of UK shale gas. *Applied Energy* 134, 506-518. doi:10.1016/j.apenergy.2014.08.063
12 ShaleTest Environmental Testing. (2014, September). Project playground: Cleaner air for active kids. Retrieved from http://www.shaletest.org/wp-content/uploads/2014/09/ProjectPlaygoundPatagoniaReport-5-1.pdf
13 Maffly, B. (2014, August 24). Utah grapples with toxic water from oil and gas industry. *Salt Lake City Tribune*. Retrieved on November 15, 2014 from http://www.sltrib.com/sltrib/news/58298470-78/danish-flats-ponds-company.html
14 Hiller, J. and Tedesco, J. (2014, August). Up in flames: Flare in Eagle Ford Shale wasting natural gas. *San Antonio Express News.* Retrieved from: http://www.expressnews.com/business/eagleford/item/Up-in-Flames-Day-1-Flares-in-Eagle-Ford-Shale-32626.php
15 McMahon, J. (2014, June 26). Air pollution spikes in homes near fracking wells. *Forbes*. Retrieved July 4, 2014, from http://www.forbes.com/sites/jeffmcmahon/2014/06/26/air-pollution-spikes-in-homes-near-fracking-wells/
16 Finley, B. (2014, May 8). Scientists flying over Colorado oil boom find worse air pollution. *The Denver Post*. Retrieved June 10, 2014, from http://www.denverpost.com/environment/ci_25719742/scientists-flying-over-colorado-oil-boom-find-worse
17 Morris, J. (2014, April 26). Texas family plagued with ailments gets $3M in 1st-of-its-kind fracking judgment. *CNN*. Retrieved June 10, 2014, from http://www.cnn.com/2014/04/25/justice/texas-family-wins-fracking-lawsuit/
18 Shonkoff, S. B., Hays, J., & Finkel, M. L. (2014). Environmental public health dimensions of shale and tight gas development. *Environmental Health Perspectives*, *122,* 787–795. doi: 10.1289/ehp.1307866
19 Morris, J., Song, L., & Hasemayer, D. (2014, April 11). Report: Air quality to worsen in Eagle Ford shale. *The Texas Tribune*. Retrieved June 10, 2014, from http://www.texastribune.org/2014/04/11/report-air-quality-worsen-eagle-ford-shale/
20 Brown, D., Weinberger, B., Lewis, C., & Bonaparte, H. (2014). Understanding exposure from natural gas drilling puts current air standards to the test. *Reviews on Environmental Health, 0*(0). doi: 10.1515/reveh-2014-0002
21 Rawlins, R. (2013). Planning for fracking on the Barnett shale: Urban air pollution, improving health based regulation, and the role of local governments. *Virginia Environmental Law Journal, 31*, 226-306. Retrieved June 10, 2014, from http://www.velj.org/uploads/1/2/7/0/12706894/2._rawlins_-_barnett_shale.pdf
22 University of Texas at Austin. (2014, March 27). Air pollution and hydraulic fracturing: Better monitoring, planning and tracking of health effects needed in Texas. Retrieved June 10, 2014, from http://www.utexas.edu/news/2014/03/27/hydraulic-fracturing-texas/
23 Helmig, D., Thompson, C. R., Evans, J., Boylan, P., Hueber, J., & Park, J. (2014). Highly elevated atmospheric levels of volatile organic compounds in the Uintah Basin, Utah [Abstract]. *Environmental Science & Technology, 48*(9), 4707-4715. doi: 10.1021/es405046r
24 Lockwood, D. (2014, March 25). Harmful air pollutants build up near oil and gas fields. *Chemical & Engineering News*. Retrieved June 10, 2014, from http://cen.acs.org/articles/92/web/2014/03/Harmful-Air-Pollutants-Build-Near.html
25 Moore, C. W., Zielinska, B., Petron, G., & Jackson, R. B. (2014). Air impacts of increased natural gas acquisition, processing, and use: A critical review. *Environmental Science & Technology*. doi: 10.1021/es4053472
26 Morris, J., Song, L., & Hasemayer, D. (2014, February 18). Fracking the Eagle Ford Shale. *The Weather Channel*. Retrieved June 10, 2014, from http://stories.weather.com/fracking
27 Rich, A., Grover, J. P., & Sattler, M. L. (2014). An exploratory study of air emissions associated with shale gas development and production in the Barnett Shale. *Journal of the Air & Waste Management Association, 64*(1), 61-72. doi: 10.1080/10962247.2013.832713
28 Junkins, C. (2013, December 10). Health dept. concerned about benzene emissions near local gas drilling sites. *The Intelligencer, Wheeling News-Register*. Retrieved June 10, 2014, from http://www.theintelligencer.net/page/content.detail/id/593209/Health-Dept--Concerned-About-Benzene-Emissions-Near-Local-Gas-Drilling-Sites.html?nav=510
29 Colborn, T., Schultz, K., Herrick, L., & Kwiatkowski, C. (2014). An exploratory study of air quality near natural gas operations. *Human and Ecological Risk Assessment: An International Journal, 20*(1), 86-105. doi: 10.1080/10807039.2012.749447
30 Wilson, S., Sumi, L., & Subra, W. (2013, September 19). Reckless endangerment while fracking the Eagle Ford shale. *Earthworks*. Retrieved June 10, 2014, from http://www.earthworksaction.org/library/detail/reckless_endangerment_in_the_eagle_ford_shale#.UkGi-4Y3uSo.
31 Blake, D. R. Air quality in the Industrial Heartland of Alberta, Canada and potential impacts on human health. *Atmospheric Environment*, 702-709. Retrieved June 16, 2014, from http://concernedhealthny.org/wp-content/uploads/2013/07/Simpson2013-AE-in-press.pdf
32 Grossman, D. (2013, April 29). Clean air report card: CO, WY Counties get F's due to oil and gas pollution. *Environmental Defense Fund*. Retrieved June 10, 2014, from http://blogs.edf.org/energyexchange/2013/04/29/clean-air-report-card-co-wy-counties-get-fs-due-to-oil-and-gas-pollution/#sthash.FXRV6Nxi.dpuf
33 Litovitz, A., Curtright, A., Abramzon, S., Burger, N., & Samaras, C. (2013). Estimation of regional air-quality damages from Marcellus Shale natural gas extraction in Pennsylvania. *Environmental Research Letters, 8*(1). doi: 10.1088/1748-9326/8/1/014017
34 Concerned Health Professionals of NY. (2013, February 27). Letter to Governor Cuomo. Retrieved June 10, 2014, from http://concernedhealthny.org/letters-to-governor-cuomo/
35 Campbell, J. (2013, April 17). Fracking roundup: Gas prices up; Medical society wants moratorium. *Politics on the Hudson*. Retrieved June 10, 2014, from http://polhudson.lohudblogs.com/2013/04/17/fracking-roundup-gas-prices-up-medical-society-wants-moratorium/
36 Tollefson, J. (2013). Methane leaks erode green credentials of natural gas. *Nature, 493*(7430), 12-12. doi: 10.1038/493012a
37 American Lung Association. (2013). American Lung Association state of the air 2013 - Ozone pollution. Retrieved June 10, 2014, from http://www.stateoftheair.org/2013/health-risks/health-risks-ozone.html
38 Song, L. (2012, December 3). Hazardous air pollutants detected near fracking sites. *Bloomberg*. Retrieved June 10, 2014, from http://www.bloomberg.com/news/2012-12-03/hazardous-air-pollutants-detected-near-fracking-sites.html
39 Olaguer, E. P. (2012). The potential near-source ozone impacts of upstream oil and gas industry emissions. *Journal of the Air & Waste Management Association, 62*(8), 966-977. doi: 10.1080/10962247.2012.688923
40 Kelly, D. (2012, March 19). Study shows air emissions near fracking sites may pose health risk. *University of Colorado Denver*. Retrieved June 10, 2014, from http://www.ucdenver.edu/about/newsroom/newsreleases/Pages/health-impacts-of-fracking-emissions.aspx
41 McKenzie, L. M., Witter, R. Z., Newman, L. S., & Adgate, J. L. (2012). Human health risk assessment of air emissions from development of unconventional natural gas resources. *Science of the Total Environment, 424*, 79-87. doi: 10.1016/j.scitotenv.2012.02.018
42 Banerjee, N. (2012, March 20). Study: 'Fracking' may increase air pollution health risks. *Los Angeles Times*. Retrieved June 11, 2014, from http://articles.latimes.com/2012/mar/20/local/la-me-gs-fracking-increases-air-pollution-health-risks-to-residents-20120320
43 Physicians, Scientists & Engineers for Healthy Energy. (2011, December 12). Appeal to Gov. Cuomo to consider cancer risks re: High volume hydraulic fracturing for natural gas [Letter to A. Cuomo].
44 Physicians, Scientists & Engineers for Healthy Energy. (2011, October 5). Letter to Governor Cuomo [Letter to A. Cuomo].

45 Streater, S. (2011, April 21). Air pollution: Winter ozone problem continues to mystify regulators, industry. *E&E Publishing, LLC*. Retrieved June 11, 2014, from http://www.eenews.net/stories/1059948108
46 Gruver, M. (2011, March 8). Wyoming is beset by a big-city problem: Smog. *USA Today*. Retrieved June 11, 2014, from http://usatoday30.usatoday.com/money/industries/energy/2011-03-08-natural-gas-ozone-wyoming_N.htm
47 Kemball-Cook, S., Bar-Ilan, A., Grant, J., Parker, L., Jung, J., Santamaria, W., ... Yarwood, G. (2010). Ozone impacts of natural gas development in the Haynesville Shale. *Environmental Science & Technology, 44*(24), 9357-9363. doi: 10.1021/es1021137
48 U.S. Environmental Protection Agency. (2013). Integrated science assessment for ozone and related photochemical oxidants. Retrieved June 11, 2014, from http://www.epa.gov/ncea/isa/ozone.htm
49 Kemball-Cook, S., Bar-Ilan, A., Grant, J., Parker, L., Jung, J., Santamaria, W., ... Yarwood, G. (2010). Ozone impacts of natural gas development in the Haynesville Shale. *Environmental Science & Technology, 44*(24), 9357-9363. doi: 10.1021/es1021137
50 McKenzie, L. M., Witter, R. Z., Newman, L. S., & Adgate, J. L. (2012). Human health risk assessment of air emissions from development of unconventional natural gas resources. *Science of the Total Environment, 424*, 79-87. doi: 10.1016/j.scitotenv.2012.02.018
51 Myers, O., Flowers, H., Kang, H., Bedrick, E., Whorton, B., Cui, X., & Stidley, C. A. (2007). The association between ambient air quality ozone levels and medical visits for asthma in San Juan County. New Mexico Department of Health, Environmental Health Epidemiology Bureau Epidemiology and Response Division. Retrieved from http://www.nmenv.state.nm.us/aqb/4C/Documents/SanJuanAsthmaDocBW.pdf
52 Witter, R., McKenzie, L., Towle, M., Stinson, K., Scott, K., Newman, L., & Adgate, J. (2010). Health impact assessment for Battlement Mesa, Garfield County Colorado. *Colorado School of Public Health*. Retrieved June 10, 2014, from http://www.garfield-county.com/public-health/documents/1%20%20%20Complete%20HIA%20without%20Appendix%20D.pdf
53 Battlement Mesa HIA/EHMS. (2013, November 30). Retrieved June 10, 2014, from http://www.garfield-county.com/environmental-health/battlement-mesa-health-impact-assessment-draft2.aspx
54 The Associated Press. (2010, January 27). Texas agency finds high benzene levels on Barnett Shale. Retrieved

Radioactive releases

155 Dusseault, M. B., Gray, M. N., & Nawrocki, P. A. (2000). Why oil wells leak: Cement behavior and long-term consequences. *Society of Petroleum Engineers*. Retrieved June 10, 2014, from http://www.hydrorelief.org/frackdata/references/65704543-Casing-Leaks.pdf
156 Campbell, J. (2014, May 8). Fracking critics keep pushing for state-backed health study. *Politics on the Hudson*. Retrieved June 9, 2014, from http://polhudson.lohudblogs.com/2014/05/08/fracking-critics-keep-pushing-state-backed-health-study/
157 Nelson, A. W., May, D., Knight, A. W., Eitrheim, E. S., Mehrhoff, M., Shannon, R., ... Schultz, M. K. (2014). Matrix complications in the determination of radium levels in hydraulic fracturing flowback water from Marcellus shale. *Environmental Science & Technology, 1*(3), 204-208. doi: 10.1021/ez5000379
158 Kelly, S. (2014, March 24). Research shows some test methods miss 99 percent of radium in fracking waste. *Desmogblog.com*. Retrieved June 9, 2014, from http://www.desmogblog.com/2014/03/23/some-testing-methods-can-miss-99-percent-radium-fracking-waste-new-research-reports
159 Brown V.J. (Feb 2014). Radionuclides in fracking wastewater. *Enviro. Health Perspect*. *122*(2), A50-A55.
160 Warner, N. R., Christie, C. A., Jackson, R. B., & Vengosh, A. (2013). Impacts of shale gas wastewater disposal on water quality in Western Pennsylvania. *Environmental Science & Technology, 47*(20), 11849-11857. doi: 10.1021/es402165b
161 Efstathiou, J., Jr. (2013, October 2). Radiation in Pennsylvania creek seen as legacy of fracking. *Bloomberg*. Retrieved June 11, 2014, from http://www.bloomberg.com/news/2013-10-02/radiation-in-pennsylvania-creek-seen-as-legacy-of-frackin.html
162 Rich, A. L., & Crosby, E. C. (2013). Analysis of reserve pit sludge from unconventional natural gas hydraulic fracturing and drilling operations for the presence of technologically enhanced naturally occurring radioactive material (TENORM). *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy, 23*(1), 117-135. doi: 10.2190/NS.23.1.h
163 Environmental Protection Agency. (2012, January 11). *EPA comments on revised draft NYSDEC revised dSGEIS for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* [Press release]. Retrieved June 10, 2014, from http://www.epa.gov/region2/newsevents/pdf/EPA%20R2%20Comments%20Revised%20dSGEIS%20Enclosure.pdf
164 Rowan, E. L., & Kraemer, T. F. (2012). *Radon - 222 content of natural gas samples from upper and middle Devonian sandstone and shale reservoirs in Pennsylvania: Preliminary data*. United States Geological Survey. (Rep.). Retrieved June 10, 2014, from http://pubs.usgs.gov/of/2012/1159/ofr2012-1159.pdf
165 Rowan, E. L., Engle, M. A., Kirby, C. S., & Kraemer, T. F. (2011, September 7). *Radium content of oil- and gas-field produced waters in the northern Appalachian basin (USA): Summary and discussion of data*. (Rep United States Geological Survey. Retrieved June 10, 2014, from http://pubs.usgs.gov/sir/2011/5135/ http://water.epa.gov/drink/contaminants/basicinformation/radionuclides.cfm.
166 Urbina, I. (2011, February 26). Regulation lax as gas wells' tainted water hits rivers. *The New York Times*. Retrieved June 10, 2014, from http://www.nytimes.com/2011/02/27/us/27gas.html?pagewanted=all&_r=0
167 New York State Department of Environmental Conservation. (2011). *Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program, well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* (5-133, 5-141, 7-60, Appendix 12, Appendix 13, Rep.).

Earthquakes and seismic activity

124 Fountain, H. (2012, January 1). Disposal halted at well after new quake in Ohio. *The New York Times*. Retrieved June 10, 2014, from http://www.nytimes.com/2012/01/02/science/earth/youngstown-injection-well-stays-shut-after-earthquake.html
144 Bryant, B. (2014, December 2). The only fracked site in the United Kingdom suffered structural failure. *Vice News*. Retrieved from https://news.vice.com/article/the-only-fracking-site-in-the-united-kingdom-suffered-structural-failure
220 Barnhart, W. D., H. M. Benz, G. P. Hayes, J. L. Rubinstein, and E. Bergman (2014), Seismological and geodetic constraints on the 2011 Mw5.3 Trinidad, Colorado earthquake and induced deformation in the Raton Basin, *J. Geophys. Res. Solid Earth*, *119,* 7923–7933, doi:10.1002/2014JB011227. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/2014JB011227/abstract
221 Zuckerman, L. (2014, October 29). Gas wastewater likely triggered 2011 quake in Colorado: USGS. *Reuters*. Retrieved from http://www.reuters.com/article/2014/10/29/us-usa-earthquake-colorado-idUSKBN0II2NP20141029
222 Beiersdorfer, R. (2014, September 23). View: On fracking, earthquakes and Indian Point. *Journal Online.* Retrieved from http://www.lohud.com/story/opinion/contributors/2014/09/23/view-geologist-warns-fracking-ties-earthquakes/16100755/ 225 Rubinstein, J.L., Ellsworth, W.L., Arthur McGarr, A. and Benz, H.M. (2014), The 2001-present induced earthquake sequence in the Raton Basin of Northern New Mexico and Southern Colorado [abstract]. *Bulletin of the Seismological Society of America*. Retrieved September 15, 2014 from http://www.bssaonline.org/content/104/5/2162.abstract?stoc
226 Smyth, J.C. (2014, September 6). Ohio halts injections at two wells for fracking wastewater after quake. *Associated Press*. Retrieved from http://www.dispatch.com/content/stories/local/2014/09/06/ohio-halts-2-wells-for-fracking-wastewater-after-quake.html
227 Maclean, R. (2014, September 1). Earthquake hazard linked with deep well injection in Alberta: Deep well disposal of oilfield waste over time leads to increased earthquake risk. *CBC News*. Retrieved from http://www.cbc.ca/news/canada/calgary/earthquake-hazard-linked-with-deep-well-injection-in-alberta-1.2751963
228 Rangel, L. (2014, August 26). Prague resident files lawsuit against two Okla. energy companies following earthquake injury. *Newschannel 4 (kfor.com)*. Retrieved from http://kfor.com/2014/08/26/prague-resident-files-lawsuit-against-two-okla-energy-companies-following-earthquake-injury/
229 Eaton, J. (2014, July 31). Oklahoma grapples with earthquake spike—and evidence of industry's role: Spike in seismic activity is linked with oil and gas wastewater disposal. *National Geographic*. Retrieved from http://news.nationalgeographic.com/energy/2014/07/140731-oklahoma-earthquake-spike-wastewater-injection/
230 Keranen, K.M., Weingarten, M., Abers, G.A., Bekins, B.A., and Ge, S. (2014). Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection. *Science*, *345*(6195), 448-451 doi: 10.1126/science.1255802.
231 Schmall, E. and Jouzapavicius, J. (2014, July 14). States with fracking see surge in earthquake activity. *Associated Press*. Retrieved from http://www.huffingtonpost.com/2014/07/14/fracking-earthquake_n_5585892.html
232 Nayak, A. and Dreger, D. (2014, July 1). Moment tensor inversion of seismic events associated with the sinkhole at Napoleonville Salt Dome, Louisiana. Bulletin of Seismological Society of America. Retrieved from http://www.seismosoc.org/society/press_releases/BSSA_104-4_Nayak_and_Dreger_Press_Release.pdf
233 Tomasic, J. (2014, June 24). Colorado drilling regulators halt injection-well activity in reaction to Greeley quake. *Colorado Independent*. Retrieved from http://www.coloradoindependent.com/147934/colorado-drilling-regulators-halt-injection-well-activity-in-reaction-to-greeley-quake (see also Baker, B. (2014, June 24). Colorado regulators halt fracking wastewater injection operation after earthquake strikes area for second time in a month. *Ecowatch*. Retrieved from http://ecowatch.com/2014/06/24/colorado-wastewater-injection-earthquake/)

234 Geological Survey Joint Statement. (2014, May 2). Record number of Oklahoma tremors raises possibility of damaging earthquakes. United States Geological Survey. Retrieved June 23, 2014, from http://earthquake.usgs.gov/regional/ceus/products/newsrelease_05022014.php
235 Branson-Potts, H. (2014, June 17). Oklahoma coming to terms with unprecedented surge in earthquakes. *Los Angeles Times*. Retrieved June 23, 2014, from http://www.latimes.com/nation/la-na-oklahoma-earthquakes-20140618-story.html#page=1
236 Walsh, B. (2014, May 1). The seismic link between fracking and earthquakes. *Time*. Retrieved June 9, 2014, from http://time.com/84225/fracking-and-earthquake-link/
237 Kiger, P. J. (2014, May 2). Scientists warn of quake risk from fracking operations. *National Geographic*. Retrieved June 9, 2014, from http://news.nationalgeographic.com/news/energy/2014/05/140502-scientists-warn-of-quake-risk-from-fracking-operations/
238 Dave, P. (2014, April 12). Ohio finds link between fracking and sudden burst of earthquakes. *Los Angeles Times*. Retrieved June 9, 2014, from http://www.latimes.com/nation/nationnow/la-na-nn-ohio-finds-link-fracking-earthquakes-20140411-story.html#axzz2yrnpHW1h
239 Godoy, E. (2014, April 3). Fracking, seismic activity grow hand in hand in Mexico. *Inter Press Service*. Retrieved June 9, 2014, from http://www.ipsnews.net/2014/04/fracking-seismic-activity-grow-hand-hand-mexico/
240 Schultz, R., V. Stern, and Y. J. Gu (2014). An investigation of seismicity clustered near the Cordel Field, west central Alberta, and its relation to a nearby disposal well. *J. Geophys. Res. Solid Earth, 119,* 3410–3423, doi:10.1002/2013JB010836
241 Trynacity, K., Siekierska, A. (2014, November 13). Fracking linked to Alberta earthquakes, study indicates. *CBC News*. Retrieved from http://www.cbc.ca/news/canada/edmonton/fracking-linked-to-alberta-earthquakes-study-indicates-1.2829484
242 Sumy, D. F., Cochran, E. S., Keranen, K. M., Wei, M., & Abers, G. A. (2013). Observations of static Coulomb stress triggering of the November 2011 M5.7 Oklahoma earthquake sequence [Abstract]. *Journal of Geophysical Research: Solid Earth, 119*(3), 1904-1923. doi: 10.1002/2013JB010612
243 Oskin, B. (2014, March 07). Wastewater injection triggered Oklahoma's earthquake cascade. *Live Science*. Retrieved June 9, 2014, from http://www.livescience.com/43953-wastewater-injection-earthquake-triggering.html
244 McClurg, L. (2014, January 30). Earthquakes in southern Colorado linked to oil and gas production. *Colorado Public Radio*. Retrieved June 9, 2014, from http://www.cpr.org/news/story/earthquakes-southern-colorado-linked-oil-and-gas-production#sthash.UVvw0JWe.UQwWtYJS.dpuf
238 Dave, P. (2014, April 12). Ohio finds link between fracking and sudden burst of earthquakes. *Los Angeles Times*. Retrieved June 9, 2014, from http://www.latimes.com/nation/nationnow/la-na-nn-ohio-finds-link-fracking-earthquakes-20140411-story.html#axzz2yrnpHW1h
239 Godoy, E. (2014, April 3). Fracking, seismic activity grow hand in hand in Mexico. *Inter Press Service*. Retrieved June 9, 2014, from http://www.ipsnews.net/2014/04/fracking-seismic-activity-grow-hand-hand-mexico/
240 Schultz, R., V. Stern, and Y. J. Gu (2014). An investigation of seismicity clustered near the Cordel Field, west central Alberta, and its relation to a nearby disposal well. *J. Geophys. Res. Solid Earth, 119,* 3410–3423, doi:10.1002/2013JB010836
241 Trynacity, K., Siekierska, A. (2014, November 13). Fracking linked to Alberta earthquakes, study indicates. *CBC News*. Retrieved from http://www.cbc.ca/news/canada/edmonton/fracking-linked-to-alberta-earthquakes-study-indicates-1.2829484
242 Sumy, D. F., Cochran, E. S., Keranen, K. M., Wei, M., & Abers, G. A. (2013). Observations of static Coulomb stress triggering of the November 2011 M5.7 Oklahoma earthquake sequence [Abstract]. *Journal of Geophysical Research: Solid Earth, 119*(3), 1904-1923. doi: 10.1002/2013JB010612
243 Oskin, B. (2014, March 07). Wastewater injection triggered Oklahoma's earthquake cascade. *Live Science*. Retrieved June 9, 2014, from http://www.livescience.com/43953-wastewater-injection-earthquake-triggering.html
244 McClurg, L. (2014, January 30). Earthquakes in southern Colorado linked to oil and gas production. *Colorado Public Radio*. Retrieved June 9, 2014, from http://www.cpr.org/news/story/earthquakes-southern-colorado-linked-oil-and-gas-production#sthash.UVvw0JWe.UQwWtYJS.dpuf
245 Fountain, H. (2013, December 12). Experts eye oil and gas industry as quakes shake Oklahoma. *The New York Times*. Retrieved June 9, 2014, from http://www.nytimes.com/2013/12/13/science/earth/as-quakes-shake-oklahoma-scientists-eye-oil-and-gas-industry.html
246 Gillam, C. (2013, November 19). In Oklahoma, water, fracking - and a swarm of quakes. *Reuters*. Retrieved June 9, 2014, from http://www.reuters.com/article/2013/11/19/us-usa-earthquakes-fracking-oklahoma-idUSBRE9AI12W20131119
247 Kim, W. (2013). Induced seismicity associated with fluid injection into a deep well in Youngstown, Ohio. *Journal of Geophysical Research: Solid Earth, 118*(7), 3506-3518. doi: 10.1002/jgrb.50247
248 Chameides, B. (2013, September 5). Fracking waste wells linked to Ohio earthquakes. *Scientific American*. Retrieved June 9, 2014, from http://www.scientificamerican.com/article/fracking-waste-wells-linked-to-ohio-earthquakes/
249 Begley, S. (2013, July 11). Study raises new concern about earthquakes and fracking fluids. *Reuters*. Retrieved June 9, 2014, from http://www.reuters.com/article/2013/07/11/us-science-fracking-earthquakes-idUSBRE96A0TZ20130711
250 Davies, R., Foulger, G., Bindley, A., & Styles, P. (2013). Induced seismicity and hydraulic fracturing for the recovery of hydrocarbons. *Marine and Petroleum Geology, 45*, 171-185. doi: 10.1016/j.marpetgeo.2013.03.016.
251 Drajem, M., & Efstathiou, J., Jr. (2013, March 26). Quake tied to oil-drilling waste adds pressure for rules. *Bloomberg*. Retrieved June 9, 2014, from http://www.bloomberg.com/news/2013-03-26/oklahoma-earthquake-in-2011-tied-to-wastewater-wells-in-fracking.html
252 Behar, M. (2013, March/April). Fracking's latest scandal? Earthquake swarms. *Mother Jones*. Retrieved June 9, 2014, from http://www.motherjones.com/environment/2013/03/does-fracking-cause-earthquakes-wastewater-dewatering?page=1
253 Leber, J. (2012, December 14). Studies link earthquakes to wastewater from fracking. *MIT Technology Review*. Retrieved June 9, 2014, from http://www.technologyreview.com/news/508151/studies-link-earthquakes-to-wastewater-from-fracking/
254 New York City Department of Environmental Protection. (2009, December 22). *New York City comments on: Draft supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program - Well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus Shale and other low-permeability gas reservoirs* (Rep.). Retrieved June 9, 2014, from http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_final_12-22-09.pdf
255 New York City Department of Environmental Protection. (2012, January 11). *Comments on the revised draft supplemental generic environmental impact statement*. (Rep.). Retrieved June 11, 2014, from http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_on_rdsgeis_for_hvhf_20120111.pdf
256 New York City Department of Environmental Protection. (2012, November 30). *Comments on the revised high-volume hydraulic fracturing regulations* (Rep.). Retrieved June 9, 2014, from http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/revised_high_volume_hydraulic_fracturing_regulations_comments_letter_010713.pdf
257New York City Department of Environmental Protection. (2012, November 30). *Comments on the revised high-volume hydraulic fracturing regulations* (Rep.). 7. Retrieved June 9, 2014, from http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/revised_high_volume_hydraulic_fracturing_regulations_comments_letter_010713.pdf
258 New York City Department of Environmental Protection. (2012, November 30). *Comments on the revised high-volume hydraulic fracturing regulations* (Rep.). 28. Retrieved June 9, 2014, from http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/revised_high_volume_hydraulic_fracturing_regulations_comments_letter_010713.pdf
259 The Canadian Press. (2012, September 06). Fracking causes minor earthquakes, B.C. regulator says. *CBC News*. Retrieved June 9, 2014, from http://www.cbc.ca/news/canada/british-columbia/fracking-causes-minor-earthquakes-b-c-regulator-says-1.1209063
260 Ellsworth, W. (2011, April 18). Are seismicity rate changes in the midcontinent natural or manmade? Retrieved June 9, 2014, from http://www2.seismosoc.org/FMPro?-db=Abstract_Submission_12&-sortfield=PresDay&-sortorder=ascending&-sortfield=Special+Session+Name+Calc&-sortorder=ascending&-sortfield=PresTimeSort&-sortorder=ascending&-op=gt&PresStatus=0&-lop=and&-token.1=ShowSession&-token.2=ShowHeading&-recid=224&-format=%2Fmeetings%2F2012%2Fabstracts%2Fsessionabstractdetail.html&-lay=MtgList&-find
261 Soraghan, M. (2012, March 29). 'Remarkable' spate of man-made quakes linked to drilling, USGS team says. *E&E Publishing, LLC*. Retrieved June 11, 2014, from http://www.eenews.net/stories/1059962190
262 Zilk, C. (2011, July 31). Permanent disposal-well moratorium issued. *Arkansas Online*. Retrieved June 9, 2014, from http://www.arkansasonline.com/news/2011/jul/31/permanent-disposal-well-moratorium-issued-20110731/
263 Frohlich, C., Hayward, C., Stump, B., & Potter, E. (2011). The Dallas-Fort Worth Earthquake Sequence: October 2008 through May 2009. *Bulletin of the Seismological Society of America, 101*(1), 327-340. doi: 10.1785/0120100131
264 Casselman, B. (2009, June 12). Temblors rattle Texas town. *The Wall Street Journal*. Retrieved from http://online.wsj.com/news/articles/SB124476331270108225

Inherent engineering problems that worsen with time

151 Ingraffea, A. R. (2013). Some scientific failings within high volume hydraulic fracturing proposed regulations. Retrieved June 10, 2014, from http://www.psehealthyenergy.org/data/NYS_DEC_Proposed_REGS_comments_Ingraffea_Jan_2013.pdf
152New York State Department of Environmental Conservation. (2011). *Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program, well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* (2-1, Rep.).

153 Watson, T. L., & Bachu, S. (2009). Evaluation of the potential for gas and CO2 leakage along wellbores, society of petroleum engineers. *SPE Drilling & Completion*, 115-126.
154 Brufatto, C. (2003). From mud to cement - Building gas wells. *Oilfield Review, 15*(3). Retrieved June 10, 2014, from http://www.slb.com/resources/publications/industry_articles/oilfield_review/2003/or2003aut06_building_gas_wells.aspx
155 Dusseault, M. B., Gray, M. N., & Nawrocki, P. A. (2000). Why oil wells leak: Cement behavior and long-term consequences. *Society of Petroleum Engineers*. Retrieved June 10, 2014, from http://www.hydrorelief.org/frackdata/references/65704543-Casing-Leaks.pdf
156 Campbell, J. (2014, May 8). Fracking critics keep pushing for state-backed health study. *Politics on the Hudson*. Retrieved June 9, 2014, from http://polhudson.lohudblogs.com/2014/05/08/fracking-critics-keep-pushing-state-backed-health-study/
157 Nelson, A. W., May, D., Knight, A. W., Eitrheim, E. S., Mehrhoff, M., Shannon, R., ... Schultz, M. K. (2014). Matrix complications in the determination of radium levels in hydraulic fracturing flowback water from Marcellus shale. *Environmental Science & Technology, 1*(3), 204-208. doi: 10.1021/ez5000379
158 Kelly, S. (2014, March 24). Research shows some test methods miss 99 percent of radium in fracking waste. *Desmogblog.com*. Retrieved June 9, 2014, from http://www.desmogblog.com/2014/03/23/some-testing-methods-can-miss-99-percent-radium-fracking-waste-new-research-reports
159 Brown V.J. (Feb 2014). Radionuclides in fracking wastewater. *Enviro. Health Perspect. 122*(2), A50-A55.
160 Warner, N. R., Christie, C. A., Jackson, R. B., & Vengosh, A. (2013). Impacts of shale gas wastewater disposal on water quality in Western Pennsylvania. *Environmental Science & Technology, 47*(20), 11849-11857. doi: 10.1021/es402165b
161 Efstathiou, J., Jr. (2013, October 2). Radiation in Pennsylvania creek seen as legacy of fracking. *Bloomberg*. Retrieved June 11, 2014, from http://www.bloomberg.com/news/2013-10-02/radiation-in-pennsylvania-creek-seen-as-legacy-of-frackin.html
162 Rich, A. L., & Crosby, E. C. (2013). Analysis of reserve pit sludge from unconventional natural gas hydraulic fracturing and drilling operations for the presence of technologically enhanced naturally occurring radioactive material (TENORM). *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy, 23*(1), 117-135. doi: 10.2190/NS.23.1.h
163 Environmental Protection Agency. (2012, January 11). *EPA comments on revised draft NYSDEC revised dSGEIS for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* [Press release]. Retrieved June 10, 2014, from http://www.epa.gov/region2/newsevents/pdf/EPA%20R2%20Comments%20Revised%20dSGEIS%20Enclosure.pdf
164 Rowan, E. L., & Kraemer, T. F. (2012). *Radon - 222 content of natural gas samples from upper and middle Devonian sandstone and shale reservoirs in Pennsylvania: Preliminary data*. United States Geological Survey. (Rep.). Retrieved June 10, 2014, from http://pubs.usgs.gov/of/2012/1159/ofr2012-1159.pdf
165 Rowan, E. L., Engle, M. A., Kirby, C. S., & Kraemer, T. F. (2011, September 7). *Radium content of oil- and gas-field produced waters in the northern Appalachian basin (USA): Summary and discussion of data*. (Rep United States Geological Survey. Retrieved June 10, 2014, from http://pubs.usgs.gov/sir/2011/5135/
http://water.epa.gov/drink/contaminants/basicinformation/radionuclides.cfm.
166 Urbina, I. (2011, February 26). Regulation lax as gas wells' tainted water hits rivers. *The New York Times*. Retrieved June 10, 2014, from http://www.nytimes.com/2011/02/27/us/27gas.html?pagewanted=all&_r=0
167 New York State Department of Environmental Conservation. (2011). *Supplemental generic environmental impact statement on the oil, gas and solution mining regulatory program, well permit issuance for horizontal drilling and high-volume hydraulic fracturing to develop the Marcellus shale and other low-permeability gas reservoirs* (5-133, 5-141, 7-60, Appendix 12, Appendix 13, Rep.).

Weitere Liste Internationaler Studien aus:

PSE Database Appendix 2014, "PSE Healthy Energy, Physicians Scientists and Engeneers"
"Toward an understanding of the environmental and public health impacts of shale gas development: an analysis of the peer-reviewed scientific literature, 2009-2014"

Original Research - Indication of potential public health risks or actual adverse health outcomes:

1. Bamberger M, Oswald RE. 2012. Impacts of Gas Drilling on Human and Animal Health. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 22:51–77; doi:10.2190/NS.22.1.e.
2. Colborn T, Kwiatkowski C, Schultz K, Bachran M. 2011. Natural Gas Operations from a Public Health Perspective. Human and Ecological Risk Assessment: An International Journal 17:1039–1056; doi:10.1080/10807039.2011.605662.
3. Colborn T, Schultz K, Herrick L, Kwiatkowski C. 2014. An Exploratory Study of Air Quality near Natural Gas Operations. Human and Ecological Risk Assessment: An International Journal 0:null; doi:10.1080/10807039.2012.749447.
4. Esswein EJ, Breitenstein M, Snawder J, Kiefer M, Sieber WK. 2013. Occupational exposures to respirable crystalline silica during hydraulic fracturing. J Occup Environ Hyg 10:347–356; doi:10.1080/15459624.2013.788352.
5. Esswein EJ, Snawder J, King B, Breitenstein M, Alexander-Scott M, Kiefer M. 2014. Evaluation of Some Potential Chemical Exposure Risks During Flowback Operations in Unconventional Oil and Gas Extraction: Preliminary Results. Journal of Occupational and Environmental Hygiene 11:D174–D184; doi:10.1080/15459624.2014.933960.
6. Ferrar KJ, Kriesky J, Christen CL, Marshall LP, Malone SL, Sharma RK, et al. 2013. Assessment and longitudinal analysis of health impacts and stressors perceived to result from unconventional shale gas development in the Marcellus Shale region. International Journal of Occupational and Environmental Health 19:104–112; doi:10.1179/2049396713Y.0000000024.
7. Kassotis CD, Tillitt DE, Davis JW, Hormann AM, Nagel SC. 2013. Estrogen and Androgen Receptor Activities of Hydraulic Fracturing Chemicals and Surface and Ground Water in a Drilling-Dense Region. Endocrinology 155:897–907; doi:10.1210/en.2013-1697.
8. Macey GP, Breech R, Chernaik M, Cox C, Larson D, Thomas D, et al. 2014. Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. Environmental Health 13:82; doi:10.1186/1476-069X-13-82.
9. McKenzie LM, Guo R, Witter RZ, Savitz DA, Newman LS, Adgate JL. 2014. Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado. Environmental Health Perspectives 122; doi:10.1289/ehp.1306722.
10. McKenzie LM, Witter RZ, Newman LS, Adgate JL. 2012. Human health risk assessment of air emissions from development of unconventional natural gas resources. Sci. Total Environ. 424:79–87; doi:10.1016/j.scitotenv.2012.02.018.
11. Rabinowitz PM, Slizovskiy IB, Lamers V, Trufan SJ, Holford TR, Dziura JD, et al. 2014. Proximity to Natural Gas Wells and Reported Health Status: Results of a Household Survey in Washington County, Pennsylvania. Environmental Health Perspectives; doi:10.1289/ehp.1307732.
12. Saberi P, Propert KJ, Powers M, Emmett E, Green-McKenzie J. 2014. Field Survey of Health Perception and Complaints of Pennsylvania Residents in the Marcellus Shale Region. Int J Environ Res Public Health 11:6517–6527; doi:10.3390/ijerph110606517.
13. Steinzor N, Subra W, Sumi L. 2013. Investigating Links between Shale Gas Development and Health Impacts Through a Community Survey Project in Pennsylvania. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 23:55–83; doi:10.2190/NS.23.1.e.

All Papers - Indication of potential public health risks or actual adverse health outcomes:

1. Adgate JL, Goldstein BD, McKenzie LM. 2014. Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development. Environ. Sci. Technol. 48:8307–8320; doi:10.1021/es404621d.
2. Bamberger M, Oswald RE. 2012. Impacts of Gas Drilling on Human and Animal Health. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 22:51–77; doi:10.2190/NS.22.1.e.
3. Bamberger M, Oswald RE. 2014. Unconventional oil and gas extraction and animal health. Environ. Sci.: Processes Impacts; doi:10.1039/C4EM00150H.
4. Chalupka S. 2012. Occupational silica exposure in hydraulic fracturing. Workplace Health Saf 60:460; doi:10.3928/21650799-20120926-70.
5. Colborn T, Kwiatkowski C, Schultz K, Bachran M. 2011. Natural Gas Operations from a Public Health Perspective. Human and Ecological Risk Assessment: An International Journal 17:1039–1056; doi:10.1080/10807039.2011.605662.
6. Colborn T, Schultz K, Herrick L, Kwiatkowski C. 2014. An Exploratory Study of Air Quality near Natural Gas Operations. Human and Ecological Risk Assessment: An International Journal 0:null; doi:10.1080/10807039.2012.749447.
7. Coram A, Moss J, Blashki G. 2014. Harms unknown: health uncertainties cast doubt on the role of unconventional gas in Australia's energy future. Med. J. Aust. 200.
8. Down A, Armes M, Jackson RB. 2013. Shale Gas Extraction in North Carolina: Research Recommendations and Public Health Implications. Environ Health Perspect 121:A292–A293; doi:10.1289/ehp.1307402.
9. Esswein EJ, Breitenstein M, Snawder J, Kiefer M, Sieber WK. 2013. Occupational exposures to respirable crystalline silica during hydraulic fracturing. J Occup Environ Hyg 10:347–356; doi:10.1080/15459624.2013.788352.
10. Esswein EJ, Snawder J, King B, Breitenstein M, Alexander-Scott M, Kiefer M. 2014. Evaluation of Some Potential Chemical Exposure Risks During Flowback Operations in Unconventional Oil and Gas Extraction: Preliminary Results. Journal of Occupational and Environmental Hygiene 11:D174–D184; doi:10.1080/15459624.2014.933960.
11. Ferrar KJ, Kriesky J, Christen CL, Marshall LP, Malone SL, Sharma RK, et al. 2013. Assessment and longitudinal analysis of health impacts and stressors perceived to result from unconventional shale gas development in the Marcellus Shale region. International Journal of Occupational and Environmental Health 19:104–112; doi:10.1179/2049396713Y.0000000024.
12. Finkel M, Hays J, Law A. 2013a. The Shale Gas Boom and the Need for Rational Policy. American Journal of Public Health e1–e3; doi:10.2105/AJPH.2013.301285.
13. Finkel ML, Hays J. 2013. The implications of unconventional drilling for natural gas: a global public health concern. Public Health 127:889–893; doi:10.1016/j.puhe.2013.07.005.
14. Finkel ML, Hays J, Law A. 2013b. Modern Natural Gas Development and Harm to Health: The Need for Proactive Public Health Policies. ISRN Public Health; doi:http://dx.doi.org/10.1155/2013/408658.
15. Finkel ML, Law A. 2011. The rush to drill for natural gas: a public health cautionary tale. Am J Public Health 101:784–785; doi:10.2105/AJPH.2010.300089.
16. Goldstein BD. 2014. The importance of public health agency independence: marcellus shale gas drilling in pennsylvania. Am J Public Health 104:e13–15; doi:10.2105/AJPH.2013.301755.
17. Goldstein BD, Kriesky J, Pavliakova B. 2012. Missing from the Table: Role of the Environmental Public Health Community in Governmental Advisory Commissions Related to Marcellus Shale Drilling. Environ Health Perspect 120:483–486; doi:10.1289/ehp.1104594.
18. Hill M. 2014. Shale gas regulation in the UK and health implications of fracking. The Lancet 383:2211–2212; doi:10.1016/S0140-6736(14)60888-6.
19. Kaktins NM. 2011. Drilling the Marcellus shale for natural gas: environmental health issues for nursing. Pa Nurse 66: 4–8; quiz 8–9.
20. Kassotis CD, Tillitt DE, Davis JW, Hormann AM, Nagel SC. 2013. Estrogen and Androgen Receptor Activities of Hydraulic Fracturing Chemicals and Surface and Ground Water in a Drilling-Dense Region. Endocrinology 155:897–907; doi:10.1210/en.2013-1697.
21. Korfmacher KS, Elam S, Gray KM, Haynes E, Hughes MH. 2014. Unconventional natural gas development and public health: toward a community-informed research agenda. Reviews on Environmental Health; doi:10.1515/reveh-2014-0049.
22. Korfmacher KS, Jones WA, Malone SL, Vinci LF. 2013. Public Health and High Volume Hydraulic Fracturing. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 23:13–31; doi:10.2190/NS.23.1.c.
23. Kovats S, Depledge M, Haines A, Fleming LE, Wilkinson P, Shonkoff SB, et al. 2014. The health implications of fracking. The Lancet 383:757–758; doi:10.1016/S0140-6736(13)62700-2.
24. Lauver LS. 2012. Environmental health advocacy: an overview of natural gas drilling in northeast Pennsylvania and implications for pediatric nursing. J Pediatr Nurs 27:383–389; doi:10.1016/j.pedn.2011.07.012.
25. Law A, Hays J, Shonkoff SB, Finkel ML. 2014. Public Health England's draft report on shale gas extraction. BMJ 348:g2728–g2728; doi:10.1136/bmj.g2728.
26. Macey GP, Breech R, Chernaik M, Cox C, Larson D, Thomas D, et al. 2014. Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. Environmental Health 13:82; doi:10.1186/1476-069X-13-82.
27. Mackie P, Johnman C, Sim F. 2013. Hydraulic fracturing: a new public health problem 138 years in the making? Public Health 127:887–888; doi:10.1016/j.puhe.2013.09.009.
28. Mash R, Minnaar J, Mash B. 2014. Health and fracking: Should the medical profession be concerned? S. Afr. Med. J. 104: 332–335.
29. McDermott-Levy BR, Kaktins N, Sattler B. 2013. Fracking, the Environment, and Health. AJN, American Journal of Nursing 113:45–51; doi:10.1097/01.NAJ.0000431272.83277.f4.
30. McDermott-Levy R, Kaktins N. 2012. Preserving health in the Marcellus region. Pa Nurse 67: 4–10; quiz 11–12.
31. McKenzie LM, Guo R, Witter RZ, Savitz DA, Newman LS, Adgate JL. 2014. Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado. Environmental Health Perspectives 122; doi:10.1289/ehp.1306722.
32. McKenzie LM, Witter RZ, Newman LS, Adgate JL. 2012. Human health risk assessment of air emissions from development of unconventional natural gas resources. Sci. Total Environ. 424:79–87; doi:10.1016/j.scitotenv.2012.02.018.
33. Penning TM, Breysse PN, Gray K, Howarth M, Yan B. 2014. Environmental Health Research Recommendations from the Inter-Environmental Health Sciences Core Center Working Group on Unconventional Natural Gas Drilling Operations. Environmental Health Perspectives; doi:10.1289/ehp.1408207.
34. Perry SL. 2013. Using Ethnography to Monitor the Community Health Implications of Onshore Unconventional Oil and Gas Developments: Examples from Pennsylvania's Marcellus Shale.

NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 23:33–53; doi:10.2190/NS.23.1.d.
35. Rabinowitz PM, Slizovskiy IB, Lamers V, Trufan SJ, Holford TR, Dziura JD, et al. 2014. Proximity to Natural Gas Wells and Reported Health Status: Results of a Household Survey in Washington County, Pennsylvania. Environmental Health Perspectives; doi:10.1289/ehp.1307732.
36. Rafferty MA, Limonik E. 2013. Is shale gas drilling an energy solution or public health crisis? Public Health Nurs 30:454–462; doi:10.1111/phn.12036.
37. Rosenman KD. 2014. Hydraulic Fracturing and the Risk of Silicosis: Clinical Pulmonary Medicine 21:167–172; doi:10.1097/CPM.0000000000000046.
38. Saberi P. 2013. Navigating Medical Issues in Shale Territory. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 23:209–221; doi:10.2190/NS.23.1.m.
39. Saberi P, Propert KJ, Powers M, Emmett E, Green-McKenzie J. 2014. Field Survey of Health Perception and Complaints of Pennsylvania Residents in the Marcellus Shale Region. Int J Environ Res Public Health 11:6517–6527; doi:10.3390/ijerph110606517.
40. Schmidt CW. 2011. Blind Rush? Shale Gas Boom Proceeds Amid Human Health Questions. Environ Health Perspect 119:a348–a353; doi:10.1289/ehp.119-a348.
41. Shonkoff SB, Hays J, Finkel ML. 2014. Environmental Public Health Dimensions of Shale and Tight Gas Development. Environmental Health Perspectives 122; doi:10.1289/ehp.1307866.
42. Steinzor N, Subra W, Sumi L. 2013. Investigating Links between Shale Gas Development and Health Impacts Through a Community Survey Project in Pennsylvania. NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy 23:55–83; doi:10.2190/NS.23.1.e.
43. Witter RZ, McKenzie L, Stinson KE, Scott K, Newman LS, Adgate J. 2013. The use of health impact assessment for a community undergoing natural gas development. Am J Public Health 103:1002–1010; doi:10.2105/AJPH.2012.301017.
44. Witter RZ, Tenney L, Clark S, Newman LS. 2014. Occupational exposures in the oil and gas extraction industry: State of the science and research recommendations. Am. J. Ind. Med. n/a–n/a; doi:10.1002/ajim.22316.
45. Ziemkiewicz PF, Quaranta JD, Darnell A, Wise R. 2014. Exposure pathways related to shale gas development and procedures for reducing environmental and public risk. Journal of Natural Gas Science and Engineering 16:77–84; doi:10.1016/j.jngse.2013.11.003.

Indication of potential, positive association, or actual incidence of water Contamination:

1. Darrah TH, Vengosh A, Jackson RB, Warner NR, Poreda RJ. 2014. Noble gases identify the mechanisms of fugitive gas contamination in drinking-water wells overlying the Marcellus and Barnett Shales. PNAS 201322107; doi:10.1073/pnas.1322107111.
2. Davies RJ, Almond S, Ward RS, Jackson RB, Adams C, Worrall F, et al. 2014. Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation. Marine and Petroleum Geology 56:239–254; doi:10.1016/j.marpetgeo.2014.03.001.
3. Ferrar KJ, Michanowicz DR, Christen CL, Mulcahy N, Malone SL, Sharma RK. 2013. Assessment of effluent contaminants from three facilities discharging Marcellus Shale wastewater to surface waters in Pennsylvania. Environ. Sci. Technol. 47:3472–3481; doi:10.1021/es301411q.
4. Fontenot BE, Hunt LR, Hildenbrand ZL, Carlton Jr. DD, Oka H, Walton JL, et al. 2013. An Evaluation of Water Quality in Private Drinking Water Wells Near Natural Gas Extraction Sites in the Barnett Shale Formation. Environ. Sci. Technol. 47:10032–10040; doi:10.1021/es4011724.
5. Gassiat C, Gleeson T, Lefebvre R, McKenzie J. 2013. Hydraulic fracturing in faulted sedimentary basins: Numerical simulation of potential contamination of shallow aquifers over long time scales. Water Resour. Res. 49:8310–8327; doi:10.1002/2013WR014287.
6. Gross SA, Avens HJ, Banducci AM, Sahmel J, Panko JM, Tvermoes BE. 2013. Analysis of BTEX groundwater concentrations from surface spills associated with hydraulic fracturing operations. J Air Waste Manag Assoc 63: 424–432.
7. Heilweil VM, Stolp BJ, Kimball BA, Susong DD, Marston TM, Gardner PM. 2013. A Stream-Based Methane Monitoring Approach for Evaluating Groundwater Impacts Associated with Unconventional Gas Development. Groundwater 51:511–524; doi:10.1111/gwat.12079.
8. Hladik ML, Focazio MJ, Engle M. 2014. Discharges of produced waters from oil and gas extraction via wastewater treatment plants are sources of disinfection by-products to receiving streams. Science of The Total Environment 466–467:1085–1093; doi:10.1016/j.scitotenv.2013.08.008.
9. Ingraffea AR, Wells MT, Santoro RL, Shonkoff SBC. 2014. Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000–2012. PNAS 201323422; doi:10.1073/pnas.1323422111.
10. Jackson RB, Vengosh A, Darrah TH, Warner NR, Down A, Poreda RJ, et al. 2013. Increased stray gas abundance in a subset of drinking water wells near Marcellus shale gas extraction. PNAS 110:11250–11255; doi:10.1073/pnas.1221635110.
11. Kassotis CD, Tillitt DE, Davis JW, Hormann AM, Nagel SC. 2013. Estrogen and Androgen Receptor Activities of Hydraulic Fracturing Chemicals and Surface and Ground Water in a Drilling-Dense Region. Endocrinology 155:897–907; doi:10.1210/en.2013-1697.
12. Myers T. 2012. Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers. Ground Water 50:872–882; doi:10.1111/j.1745-6584.2012.00933.x.
13. Olmstead SM, Muehlenbachs LA, Shih J-S, Chu Z, Krupnick AJ. 2013. Shale gas development impacts on surface water quality in Pennsylvania. Proc. Natl. Acad. Sci. U.S.A. 110:4962–4967; doi:10.1073/pnas.1213871110.
14. Osborn SG, Vengosh A, Warner NR, Jackson RB. 2011. Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. PNAS 108:8172–8176; doi:10.1073/pnas.1100682108.
15. Papoulias DM, Velasco AL. 2013. Histopathological Analysis of Fish from Acorn Fork Creek, Kentucky, Exposed to Hydraulic Fracturing Fluid Releases. Southeastern Naturalist 12:92–111; doi:10.1656/058.012.s413.
16. Parker KM, Zeng T, Harkness J, Vengosh A, Mitch WA. 2014. Enhanced Formation of Disinfection By-Products in Shale Gas Wastewater-Impacted Drinking Water Supplies. Environ. Sci. Technol.; doi:10.1021/es5028184.
17. Rozell DJ, Reaven SJ. 2012. Water pollution risk associated with natural gas extraction from the Marcellus Shale. Risk Anal. 32:1382–1393; doi:10.1111/j.1539-6924.2011.01757.x.
18. Trexler R, Solomon C, Brislawn CJ, Wright JR, Rosenberger A, McClure EE, et al. 2014. Assessing impacts of unconventional natural gas extraction on microbial communities in headwater stream ecosystems in Northwestern Pennsylvania. Front. Microbiol 5:522; doi:10.3389/fmicb.2014.00522.
19. Warner NR, Christie CA, Jackson RB, Vengosh A. 2013a. Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania. Environ. Sci. Technol.; doi:10.1021/es402165b.
20. Warner NR, Darrah TH, Jackson RB, Millot R, Kloppmann W, Vengosh A. 2014. New Tracers

Identify Hydraulic Fracturing Fluids and Accidental Releases from Oil and Gas Operations. Environ. Sci. Technol.; doi:10.1021/es5032135.
21. Warner NR, Jackson RB, Darrah TH, Osborn SG, Down A, Zhao K, et al. 2012. Geochemical evidence for possible natural migration of Marcellus Formation brine to shallow aquifers in Pennsylvania. PNAS; doi:10.1073/pnas.1121181109.

Indication of elevated air pollutant emissions and/or atmospheric concentrations:

1. Brown D, Weinberger B, Lewis C, Bonaparte H. 2014. Understanding exposure from natural gas drilling puts current air standards to the test. Rev Environ Health; doi:10.1515/reveh-2014-0002.
2. Colborn T, Schultz K, Herrick L, Kwiatkowski C. 2014. An Exploratory Study of Air Quality near Natural Gas Operations. Human and Ecological Risk Assessment: An International Journal 20:86-105; doi:10.1080/10807039.2012.749447.
3. Eapi GR, Sabnis MS, Sattler ML. 2014. Mobile measurement of methane and hydrogen sulfide at natural gas production site fence lines in the Texas Barnett Shale. Journal of the Air & Waste Management Association 64:927–944; doi:10.1080/10962247.2014.907098.
4. Edwards PM, Brown SS, Roberts JM, Ahmadov R, Banta RM, deGouw JA, et al. 2014. High winter ozone pollution from carbonyl photolysis in an oil and gas basin. Nature; doi:10.1038/nature13767.
5. Gilman JB, Lerner BM, Kuster WC, de Gouw JA. 2013. Source Signature of Volatile Organic Compounds from Oil and Natural Gas Operations in Northeastern Colorado. Environ. Sci. Technol. 47:1297–1305; doi:10.1021/es304119a.
6. Helmig D, Thompson C, Evans J, Park J-H. 2014. Highly Elevated Atmospheric Levels of Volatile Organic Compounds in the Uintah Basin, Utah. Environ. Sci. Technol.; doi:10.1021/es405046r.
7. Kemball-Cook S, Bar-Ilan A, Grant J, Parker L, Jung J, Santamaria W, et al. 2010. Ozone Impacts of Natural Gas Development in the Haynesville Shale. Environ. Sci. Technol. 44:9357–9363; doi:10.1021/es1021137.
8. Macey GP, Breech R, Chernaik M, Cox C, Larson D, Thomas D, et al. 2014. Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. Environmental Health 13:82; doi:10.1186/1476-069X-13-82.
9. McKenzie LM, Witter RZ, Newman LS, Adgate JL. 2012. Human health risk assessment of air emissions from development of unconventional natural gas resources. Sci. Total Environ. 424:79–87; doi:10.1016/j.scitotenv.2012.02.018.
10. Olaguer EP. 2012. The potential near-source ozone impacts of upstream oil and gas industry emissions. J Air Waste Manag Assoc 62: 966–977.
11. Pacsi AP, Alhajeri NS, Zavala-Araiza D, Webster MD, Allen DT. 2013. Regional air quality impacts of increased natural gas production and use in Texas. Environ. Sci. Technol. 47:3521–3527; doi:10.1021/es3044714.
12. Pekney NJ, Veloski G, Reeder M, Tamilia J, Rupp E, Wetzel A. 2014. Measurement of atmospheric pollutants associated with oil and natural gas exploration and production activity in Pennsylvania's Allegheny National Forest. Journal of the Air & Waste Management Association 64:1062–1072; doi:10.1080/10962247.2014.897270.
13. Pétron G, Frost G, Miller BR, Hirsch AI, Montzka SA, Karion A, et al. 2012. Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study. J. Geophys. Res. 117:D04304; doi:10.1029/2011JD016360.
14. Pétron G, Karion A, Sweeney C, Miller BR, Montzka SA, Frost G, et al. 2014. A new look at methane and non-methane hydrocarbon emissions from oil and natural gas operations in the Colorado Denver-Julesburg Basin. J. Geophys. Res. Atmos. 2013JD021272; doi:10.1002/2013JD021272.
15. Rich A, Grover JP, Sattler ML. 2014. An exploratory study of air emissions associated with shale gas development and production in the Barnett Shale. Journal of the Air & Waste Management Association 64:61–72; doi:10.1080/10962247.2013.832713.
16. Rodriguez MA, Barna MG, Moore T. 2009. Regional impacts of oil and gas development on ozone formation in the western United States. J Air Waste Manag Assoc 59: 1111–1118. 17. Roy AA, Adams PJ, Robinson AL. 2014. Air pollutant emissions from the development, production, and processing of Marcellus Shale natural gas. Journal of the Air & Waste Management Association 64:19–37; doi:10.1080/10962247.2013.826151.
18. Schnell RC, Oltmans SJ, Neely RR, Endres MS, Molenar JV, White AB. 2009. Rapid photochemical production of ozone at high concentrations in a rural site during winter. Nature Geosci 2:120–122; doi:10.1038/ngeo415.
19. Thompson CR, Hueber J, Helmig D. 2014. Influence of oil and gas emissions on ambient atmospheric non-methane hydrocarbons in residential areas of Northeastern Colorado. Elementa: Science of the Anthropocene 2:000035; doi:10.12952/journal.elementa.000035.
20. Warneke C, Geiger F, Edwards PM, Dube W, Pétron G, Kofler J, et al. 2014. Volatile organic compound emissions from the oil and natural gas industry in the Uinta Basin, Utah: point sources compared to ambient air composition. Atmos. Chem. Phys. Discuss. 14:11895–11927; doi:10.5194/acpd-14-11895-2014.
21. Zavala-Araiza D, Sullivan DW, Allen DT. 2014. Atmospheric Hydrocarbon Emissions and Concentrations in the Barnett Shale Natural Gas Production Region. Environ. Sci. Technol. 48:5314–5321; doi:10.1021/es405770h.