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Oil and Gas Drilling Linked to Air Pollution

Key Facts

- Fracking Provides Many Opportunities For The Release Of Air Pollutants.
- Colorado School Of Public Health: Residents Living Within One Half Mile Of Natural Gas Wells Are At Greater Risk For Potential Health Problems.
- Pipeline Leaks Are Main Contributor For Methane Emissions; Fracking Growing Contributor.
- EPA: Emissions From Drilling, Including Fracking, And Leaks From Transmission Pipes, Totaled 225 Million Metric Tons Of Carbon-Dioxide Equivalents During 2011, Second Only To Power Plants.
- Truck Emissions Carrying Materials To And From Sites Increase Air Pollution Around Fracking Operations.
- Environment America Estimate: Single Uncontrolled Gas Well Produced Annual Emissions Of 7,000 Cars.
- Increased Emissions Caused By More Fracking Could Speed Climate Change.

FACT SHEET:

Fracking has been linked to increased air pollution that is hazardous to the health of residents near wells, and may contribute to the larger problem of climate change. According to the Pennsylvania Department of Environmental Protection, fracking creates many opportunities for the release of air pollutants. The construction of drilling pads results in air pollution, as does the increased truck traffic back and forth from the well sites. Drilling itself results in more air pollution from diesel fuel engines, evaporation of wastewater, release of fracturing fluid, flaring of wells (burning or venting of gas at the wells), condensate material, and fugitive emissions from compressor stations. A report in the Scientific American found that fracked wells leak 40 to 60 percent more methane than conventional natural gas wells.



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Proximity to oil and gas drilling presents an increased risk for potentially negative health effects. According to the Colorado School of Public Health, “Residents living [less than one half of a] mile from wells are at greater risk for health effects from NGD than are residents living [greater than one half of a] mile from wells.” Effects can range from headaches to throat irritation, and while the long term effects are not known, health impacts inevitably will carry with them higher health care costs.

Natural gas drilling has been suggested as an alternate to coal power, which could help reduce human impact on climate change. However, fracking contributes large amounts of methane to the atmosphere. In fact, two Cornell scientists predicted that methane would contribute 44% of greenhouse gases produced in the United States by 2032, 17% of which would be produced by fracking operations.

FRACKING IS LINKED TO AIR POLLUTION

Fracking Provided Many Opportunities For The Release Of Air Pollutants.

According to a 2011 report by the Pennsylvania Department of Environmental Protection, “The extraction of natural gas from Marcellus Shale involves many stages and provides many opportunities for the release of air pollutants during the process.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]

- **Pad, Impoundment And Road Construction** – “All drilling operations need a flat area of certain acreage to conduct the drilling activities. Impoundments for fresh water or wastewater may also be built. Pollutants are emitted from diesel engines and dust is produced from truck traffic and heavy equipment.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]
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- **Drilling** – “Drilling rigs require power from diesel engines. Again more emissions from these engines. [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]
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- **Fracturing** – “During this stage, large amounts of water and fracturing fluid are pumped into the well to create fractures for the gas to escape from the shale. A portion of the fluid is returned into a wastewater impoundment where it is eventually trucked for treatment. Emissions can come from diesel engines, the evaporation of the wastewater and the release of fracturing fluid chemicals, heavy metals and volatile organic compounds.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]
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- **Flaring** – “Flaring is done to test the gas well before production. Emissions are created from the burning of gas and atmospheric venting of non-combusted gas.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]
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- **Condensate Tanks** – “Gas pumped from the well may contain brine and other volatile organic compounds that condense into collection tanks. Air space in the tanks is vented to the atmosphere during periods of filling. If the nature of the gas is considered ‘wet’ (vs. ‘dry’), the condensate may contain many other compounds such as benzene, toluene and xylenes.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]
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- **Compressor Stations** – “Raw gas is piped from wells to compressor stations where the gas is pre-treated and compressed. Emissions from engines that power the compressors, fugitive emissions from compression equipment, pipes and tanks are possible.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]

Pipeline Leaks Were Main Contributor For Methane Emissions; Fracking Growing Contributor. According to an article in Scientific American, “Currently, pipeline leaks are the main culprit, but fracking is a quickly growing contributor. [Cornell environmental engineer Anthony] Ingraffea pointed out that although 25,000 high-volume shale-gas wells are already operating in the U.S., hundreds of thousands are scheduled to go into operation within 20 years, and millions will be operating worldwide, significantly expanding emissions and keeping atmospheric



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methane levels high despite the 12-year dissipation time.” [Scientific American, [1/20/12](#)]

Methane Trapped 25 Times More Heat In The Atmosphere Than Carbon Dioxide, But Dissipated Faster. According to an article in Scientific American, “Molecule for molecule, methane traps 20 to 25 times more heat in the atmosphere than does carbon dioxide. The effect dissipates faster, however: airborne methane remains in the atmosphere for about 12 years before being scrubbed out by ongoing chemical reactions, whereas CO₂ lasts 30 to 95 years.” [Scientific American, [1/20/12](#)]

Higher Emissions From Shale Gas Occurred At The Time Wells Are Hydraulically Fractured. According to an article in the Journal of Climatic Change, “The higher emissions from shale gas occur at the time wells are hydraulically fractured—as methane escapes from flow-back return fluids—and during drill out following the fracturing. Methane is a powerful greenhouse gas, with a global warming potential that is far greater than that of carbon dioxide, particularly over the time horizon of the first few decades following emission.” [Journal of Climatic Change, Volume 106, Issue 4, pp 679-690, [6/1/11](#)]

Gas Vented Into The Atmosphere After Fracking Process. According to the Network for the Health Law, “Following the initial fracking process, a mixture of gas and flowback fluid returns to the surface for several weeks. During this period, it is not economical to separate the mixture of gas and water. As a result, the gas may be either vented – released directly into the atmosphere – or flared – burned upon release. EPA indicates these methods account for one of the largest sources of air emissions prior to well production.” [Network for Public Health Law, Environmental Impacts Associated with Hydraulic Fracturing, accessed [2/13/13](#); Environmental Protection Agency, Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources, November [2011](#)]

Chemicals Released by Fracking

Fracking has the potential for increased air pollution that can be hazardous to the health of residents near wells, and may contribute to a larger problem of climate change. According to the Pennsylvania Department of Environmental Protection the process of fracking has many opportunities for the release of air pollutants. Pollution occurs from the construction of drilling pads emits pollutants from increased truck traffic. Drilling itself emits more emissions from diesel fuel engines, evaporation of wastewater, release of fracturing fluid, flaring of wells (burning or venting of gas at the wells), condensate material, and fugitive emissions from



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compressor stations. A report in the Scientific American found that that fracked wells leak 40 to 60 percent more methane than conventional natural gas wells.

EPA: Emissions From Drilling, Including Fracking, And Leaks From Transmission Pipes Totaled 225 Million Metric Tons Of Carbon-Dioxide Equivalents During 2011, Second Only To Power Plants. According to an article in Bloomberg, “In its second-annual accounting of emissions that cause global warming from stationary sources, the U.S. Environmental Protection Agency for the first time included oil and natural- gas production. Emissions from drilling, including fracking, and leaks from transmission pipes totaled 225 million metric tons of carbon-dioxide equivalents during 2011, second only to power plants, which emitted about 10 times that amount.” [Bloomberg, [2/8/13](#)]

- **Top Emitters Were ConocoPhillips And Apache Corp.** According to an article in Bloomberg, “The EPA report on oil and gas looked at emissions from basins, or large production areas, not individual wells. Among the top emitters were ConocoPhillips’ operations in the San Juan basin in New Mexico, and Apache Corp.’s operations in the Permian basin in Texas. Both companies are based in Houston.” [Bloomberg, [2/8/13](#)]

Environment America: “Pennsylvania Department Of Environmental Protection Detected Components Of Natural Gas, Particularly Methane, In The Air Near Marcellus Shale Drilling Operation.” According to a report by Environment America, “Less extensive testing conducted by the Pennsylvania Department of Environmental Protection detected components of natural gas, particularly methane, in the air near Marcellus Shale drilling operations.” [Environment America, The Cost of Fracking, Fall [2012](#)]

Pennsylvania Department Of Environmental Protection Found Traces Of Harmful Gases In Air Near Marcellus Shale Drilling Operations. According to a 2011 report by the Pennsylvania Department of Environmental Protection, “Concentrations of certain natural gas constituents including methane, ethane, propane and butane, and associated compounds, in the air near Marcellus Shale drilling operations were detected during the four sampling weeks.” [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]

Pennsylvania Department Of Environmental Protection Found Elevated Levels Of Methane Gas At Compressor And Well Sites. According to a 2011 report by the Pennsylvania Department of Environmental Protection, “Elevated methane levels were detected in the ambient air during short-term sampling



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conducted at two compressor stations (the Lathrop and Teel compressor stations) and two well sites (Carter Road and Loomis well sites)." [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]

Pennsylvania Department Of Environmental Protection Found Compounds That Produce Odors At Drilling Sites. According to a 2011 report by the Pennsylvania Department of Environmental Protection, "Certain compounds, mainly methyl mercaptan, were detected at levels which generally produce odors." [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]

Pennsylvania Department Of Environmental Protection Did Not Find Compounds That Would Cause Air-Related Health Issues. According to a 2011 report by the Pennsylvania Department of Environmental Protection, "Results of the limited ambient air sampling initiative in the northeast region did not identify concentrations of any compound that would likely trigger air related health issues associated with Marcellus Shale drilling activities." [Pennsylvania Department of Environmental Protection, Northeastern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report, [1/12/11](#)]

Elevated Levels Of Volatile Organic Compounds Found In The Air Of Drilling Sites In Arkansas. According to the Arkansas Department of Environmental Quality, "Ambient air monitoring was performed around the perimeter of six drilling sites, three hydraulic fracturing sites, four compressor stations, and one control site. Although most pollutant concentrations were below detection limits, VOC concentrations at drilling sites were often elevated around site perimeters with average daily concentrations reaching 678 parts per billion (ppb). The spatiotemporal distribution of VOC concentrations at drilling sites was significantly affected by wind direction and suggests open tanks of oil-based drilling mud and cuttings were the source of VOC emissions." [Arkansas Department of Environmental Quality, Emissions Inventory and Ambient Air Monitoring of Natural Gas Production in the Fayetteville Shale Region, [11/22/11](#)]

- **Compressor Engines, Drilling Rigs, And Hydraulic Fracturing Pumps Were Primarily Responsible For Emissions.** According to the Arkansas Department of Environmental Quality, "Compressor engines, drilling rigs, and hydraulic fracturing pumps were primarily responsible for emissions of NOX, CO, PM10, SO2, and CO2. Relative to gas production, NOX emissions in the Fayetteville Shale (18.3 tons NOX per BCF) were similar to the Barnett Shale (18.6 tons NOX per BCF)." [Arkansas Department of



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Environmental Quality, Emissions Inventory and Ambient Air Monitoring of
Natural Gas Production in the Fayetteville Shale Region, [11/22/11](#)]

Report: Fracked Wells Leaked 40 To 60 Percent More Methane Than Conventional Natural Gas Wells. According to an article in Scientific American, “Robert Howarth, an ecologist and evolutionary biologist, and Anthony Ingraffea, a civil and environmental engineer, reported that fracked wells leak 40 to 60 percent more methane than conventional natural gas wells. When water with its chemical load is forced down a well to break the shale, it flows back up and is stored in large ponds or tanks. But volumes of methane also flow back up the well at the same time and are released into the atmosphere before they can be captured for use. This giant belch of ‘fugitive methane’ can be seen in infrared videos taken at well sites.” [Scientific American, [1/20/12](#)]

Truck Emissions

Truck emissions from increased traffic associated with fracking contribute to air pollution. According to Environment America, “Fracking is a significant source of air pollution in areas experiencing large amounts of drilling. A 2009 study in five Dallas-Fort Worth-area counties experiencing heavy Barnett Shale drilling activity found that oil and gas production was a larger source of smog-forming emissions than cars and trucks.”

Truck Emissions Carrying Materials To And From Sites Increase Air Pollution Around Fracking Operations. According to Environment America, “Emissions from trucks carrying water and materials to well sites, as well as from compressor stations and other fossil fuel fired machinery, also contribute to the formation of smog and soot that threatens public health.” [Environment America, The Cost of Fracking, Fall [2012](#)]

2009 Study Of Dallas-Fort-Worth Area Found That Emissions From Oil And Gas Production Was Larger Source Of Smog Than Cars And Trucks. According to Environment America, “Fracking is a significant source of air pollution in areas experiencing large amounts of drilling. A 2009 study in five Dallas-Fort Worth-area counties experiencing heavy Barnett Shale drilling activity found that oil and gas production was a larger source of smog-forming emissions than cars and trucks.” [Environment America, The Cost of Fracking, Fall [2012](#); Environmental Defense Fund, Emissions from Natural Gas in the Barnett Shale Area and Opportunities for Cost-Effective Improvements, [1/26/09](#)]



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Environment America Estimate: Single Uncontrolled Gas Well Produced Annual Emissions Of 7,000 Cars.

According to Environment America, “Completion of a single uncontrolled natural gas well produces approximately 22.7 tons of volatile organic compounds (VOC) per well—equivalent to the annual VOC emissions of about 7,000 cars—as well as 1.7 tons of hazardous air pollutants and approximately 156 tons of methane, which contributes to global warming.”

[Environment America, The Cost of Fracking, Fall [2012](#); U.S. Environmental Protection Agency Office of Air and Radiation Office of Air Quality Planning and Standards, Oil and Natural Gas Sector: Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution, April [2012](#)]

HEALTH IMPACTS

Proximity to oil and gas drilling presents an increased risk for potentially negative health effects. According to the Colorado School of Public Health, “Residents living [less than one half of a] mile from wells are at greater risk for health effects from NGD than are residents living [greater than one half of a] mile from wells.” Effects can range from headaches to throat irritation, and while the long term effects are not known, health impacts inevitably will carry with them higher health care costs.

2012: Colorado School Of Public Health: Residents Living Within One Half Mile Of Natural Gas Wells Were At Greater Risk For Potential Health Effects.

According to a study by the Colorado School of Public Health, “Residents living [less than one half of a] mile from wells are at greater risk for health effects from NGD than are residents living [greater than one half of a] mile from wells.

Subchronic exposures to air pollutants during well completion activities present the greatest potential for health effects. The subchronic non-cancer hazard index (HI) of 5 for residents [less than one half of a] mile from wells was driven primarily by exposure to trimethylbenzenes, xylenes, and aliphatic hydrocarbons. Chronic HIs were 1 and 0.4. for residents [less than one half of a] mile from wells and [greater than one half of a] mile from wells, respectively. Cumulative cancer risks were 10 in a million and 6 in a million for residents living [less than one half of a] mile and [greater than one half of a] mile from wells, respectively, with benzene as the major contributor to the risk.” [Colorado School of Public Health, Human Health Risk Assessment Of Air Emissions From Development Of Unconventional Natural Gas Resources, [5/1/12](#)]

- **Study Found Headaches And Throat Irritation Were Consistent With Health Effects Of Known Hydrocarbons.** According to a study by the



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Colorado School of Public Health, "Health effects, such as headaches and throat and eye irritation reported by residents during well completion activities occurring in Garfield County, are consistent with known health effects of many of the hydrocarbons evaluated in this analysis." [Colorado School of Public Health, Human Health Risk Assessment Of Air Emissions From Development Of Unconventional Natural Gas Resources, [5/1/12](#)]

- **Health Impacts Had Significant Health Care Costs.** According to Environment America, "These health impacts are unacceptable regardless of the economic cost. But they also have significant economic impacts, including: Health care costs, including inpatient, outpatient and prescription drug costs; Workplace absenteeism; 'Presenteeism,' or reduced productivity at work." [Environment America, The Cost of Fracking, Fall [2012](#); Institute for Health and Productivity Studies, Cornell University, Health, Absence, Disability, And Presenteeism Cost Estimates Of Certain Physical And Mental Health Conditions Affecting U.S. Employers, April [2004](#)]

Study Found That Technology Used To Recover Natural Gas Contained Hazardous Chemicals That May Have Long-Term Health Effects. According to an article in the Human and Ecological Risk Assessment Journal, "The technology to recover natural gas depends on undisclosed types and amounts of toxic chemicals. A list of 944 products containing 632 chemicals used during natural gas operations was compiled. Literature searches were conducted to determine potential health effects of the 353 chemicals identified by Chemical Abstract Service (CAS) numbers. More than 75% of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40-50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations. These results indicate that many chemicals used during the fracturing and drilling stages of gas operations may have long-term health effects that are not immediately expressed." [Human and Ecological Risk Assessment: an International Journal, Natural Gas Operations from a Public Health Perspective, September [2011](#)]

Inhalation Of Silica Sand Was Specific Air Borne Risk To Fracking Workers. According to Environment America, "Workers at fracking well sites are vulnerable to many of these same dangers, as well as one that is specific to fracking: inhalation of silica sand. Silica sand is used to prop open the cracks formed in underground rock formations during fracking. As silica is moved from trucks to the well site, silica dust can become airborne. Without adequate protection, workers



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who breathe in silica dust can develop an elevated risk of contracting silicosis, which causes swelling in the lungs, leading to the development of chronic cough and breathing difficulty. Silica exposure can also cause lung cancer.” [Environment America, The Cost of Fracking, Fall [2012](#)]

Environment America: Fracking Contributes To Regional Air Pollution Problems, Threatened Health Of Children And Elderly. According to Environment America, “Air pollution from fracking also threatens the health of people living far from the wellhead—especially children, the elderly and those with respiratory disease. Fracking produces a variety of pollutants that contribute to regional air pollution problems. VOCs in natural gas formations contribute to the formation of ozone ‘smog,’ which reduces lung function among healthy people, triggers asthma attacks, and has been linked to increases in school absences, hospital visits and premature death.” [Environment America, The Cost of Fracking, Fall [2012](#)]

Financial Impact Of Ozone Smog On Public Health Estimated At \$1,648 Per Ton Of Nox And Volatile Organic Compound. According to Environment America, “The public health costs of pollution from fracking are significant. The financial impact of ozone smog on public health has been estimated at \$1,648 per ton of NOx and VOCs.” [Environment America, The Cost of Fracking, Fall [2012](#); Michael Chan and Michael D. Jackson, TIAx, for the American Lung Association in California, Comparing the Benefits of Clean Car Regulations (Powerpoint), 5/4/11]

Benzene Levels In Texas Air Caused Health Concerns. According to a report by Environment America, “Emissions from fracking well sites contain numerous substances that make people sick. In Texas, monitoring by the Texas Department of Environmental Quality detected levels of benzene—a known cancer causing chemical—in the air that were high enough to cause immediate human health concern at two sites in the Barnett Shale region, and at levels that pose long-term health concern at an additional 19 sites.” [Environment America, The Cost of Fracking, Fall [2012](#)]

CLIMATE CHANGE

Natural gas drilling has been suggested as an alternate to coal power, which could help limit the carbon pollution that is linked to climate change. However, fracking contributes large amounts of methane to the atmosphere. In fact, two Cornell scientists predicted that methane would contribute 44% of greenhouse gases



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produced in the United States by 2032, 17% of which would be produced by fracking operations.

2012: Cornell Scientists Predicted Methane Would Contribute 44 Percent Of Greenhouse Gases Produced In The United States By 2032. According to an article in Scientific American, “Nevertheless, recent data from the two Cornell scientists and others indicate that within the next 20 years, methane will contribute 44 percent of the greenhouse gas load produced by the U.S. Of that portion, 17 percent will come from all natural gas operations.” [Scientific American, [1/20/12](#)]

Increased Emissions Caused By More Fracking Could Speed Climate Change, Undermine Efforts To Reduce Carbon Dioxide. According to an article in Scientific American, “[Cornell ecologist and evolutionary biologist Robert] Howarth said he is particularly concerned about fracking emissions because recent data indicates that the planet is entering a period of rapid climate change. He noted that the average global temperature compared with the early 1900s is now expected to increase by 1.5 degrees Celsius within the next 15 to 35 years, which he called ‘a tipping point’ toward aggressive climate change. More and more fracking would speed the world to that transition or undermine efforts to reduce emissions of CO₂ and other greenhouse gases. The notion, [Cornell environmental engineer Anthony] Ingraffea said, that shale gas is a desirable ‘bridge fuel’ from oil to widespread renewable energy supplies several decades from now ‘makes no sense’ in terms of climate change.” [Scientific American, [1/20/12](#)]

Cornell Scientists Found That 3.6 To 7.9 Percent Of Methane From Shale-Gas Production Escapes Into Atmosphere In Venting Leaks Over Lifetime Of A Well. According to an article in the Journal of Climatic Change, “Natural gas is composed largely of methane, and 3.6% to 7.9% of the methane from shale-gas production escapes to the atmosphere in venting and leaks over the lifetime of a well. These methane emissions are at least 30% more than and perhaps more than twice as great as those from conventional gas.” [Journal of Climatic Change, Volume 106, Issue 4, pp 679-690, [6/1/11](#)]

2011: Methane Contributed Substantially To The Greenhouse Gas Footprint Of Shale Gas On Shorter Time Scales, Dominate It On A 20-Year Time Horizon. According to an article in the Journal of Climatic Change, “Methane contributes substantially to the greenhouse gas footprint of shale gas on shorter time scales, dominating it on a 20-year time horizon. The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years. Compared to coal, the footprint of shale gas is at



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least 20% greater and perhaps more than twice as great on the 20-year horizon and is comparable when compared over 100 years." [Journal of Climatic Change, Volume 106, Issue 4, pp 679-690, [6/1/11](#)]

Journal of Climatic Change: Substituting Gas For Coal Would Not Reduce Magnitude Of Climate Change Unless Leakage Levels Could Be Kept Below 2 Percent. According to an article in the Journal of Climatic Change, "The most important result, however, in accord with the above authors, is that, unless leakage rates for new methane can be kept below 2%, substituting gas for coal is not an effective /means for reducing the magnitude of future climate change." [Journal of Climatic Change, [8/26/11](#)]

Environment America: "Emissions Of Methane During Well Completion From Each Uncontrolled Fracking Well Impose Approximately \$130,000 In Social Costs Related To Global Warming." According to a report by Environment America, "Fracking also produces methane pollution that contributes to global warming. Emissions of methane during well completion from each uncontrolled fracking well impose approximately \$130,000 in social costs related to global warming." [Environment America, The Cost of Fracking, Fall [2012](#)]