

20 IMPACTS OF SHALE OIL & GAS

- **Water Use**

A single frack uses 5-10 Olympic size swimming pools of water. The fracking industry removes water from the water cycle and turns clean water into polluted water that must be treated and disposed of. In the US, water auctions see farmers bidding against the oil and gas industry for water. Picture shows a tanker filling up from a standpipe in a residential area that already suffers from low water pressure at Banks, Lancashire.

- **Water Pollution**

Massive volumes of toxic water are returned to the surface. Known as produced water it is contaminated with chemicals used in the fracking process and materials leached from the shale rock including heavy metals and radioactive elements. Additional pollution of aquifers and surface water is caused by methane migration, leaking wells, spills and accidents. Picture shows tanks of radioactive produced water at Preese Hall, Lancashire.

- **Fugitive Emissions**

Shale Gas extraction inevitably leads to methane being emitted (leaked) directly into the atmosphere. Methane is 100x worse (on 20yr time frame) than carbon dioxide as a greenhouse gas. Research shows that this makes Shale Gas more polluting than coal.

- **Air Pollution**

A wide variety of dangerous pollutants, including ozone, aromatic hydrocarbons and silica dust are produced by the drilling and fracking process. The ozone levels in previously pristine areas are now higher than central Los Angeles. Additional air pollution is created by construction work, drill rigs and machinery. There is a growing catalog of human and animal health impacts associated with this industrial activity. Picture shows emissions from a condensate tank taken with an infrared camera.

- **Methane Migration into Aquifers**

Hydraulic Fracturing is designed to extract methane from shale rock and inevitably disrupts the geology of an area. The gas wells themselves are the most common pathway for methane migration (leakage). This can lead to high levels of methane in streams, aquifers and eventually drinking water. Methane build up in enclosed spaces (such as buildings) results in the threat of explosions.

- **Leaking Wells**

Industry reports show that 6% of gas wells leak immediately and 50% of all gas wells leak within 15 years. Shale gas exploration requires many wells to be drilled (800 planned for Lancashire alone). These wells can never be removed or recycled, the steel and concrete structures plunged deep into the geology decay slowly over time. All gas wells will leak eventually.

- **Sites & Enclosures**

Many wells require many sites which in turn require access roads, foundations, floodlights and enclosures. This pattern of development divides countryside, threatens rights of way and damages and slowly destroys the natural beauty and diversity of an area. Picture shows site at Preese Hall, Lancashire.

- **Dangerous Work Environments**

The jobs created by the fracking industry are small in number for the size of the investment. Local job creation is short term, unskilled and in high risk areas/occupations. These workers are at increased risk of industrial disease and accidents. Exposure to chemicals and produced water creates acute health risks for workers. The large volumes of sand (silica) used in the fracking process is causing a dramatic rise in cases of silicosis (lung disease) in the US.

- **Pipelines, Compressor Stations & Flaring**

Pipelines used for transporting gas and waste create the additional danger of leaks and explosions. Pipeline construction cuts scars across the countryside and blights surrounding areas with planning restrictions. A sprawling temporary gas infrastructure is needed to connect thousands of sites across the landscape. Flare stacks burn off unwanted gasses on every site and cause noise/light pollution and toxic emissions. Noise pollution and further emissions of methane and airborne pollutants occur as the gas is processed and pressurised.

- **Industrialised Countryside**

The result of this type of industrial development on the countryside is catastrophic. Wildlife corridors are disrupted. Edge effects created by the cutting up of habitats into smaller and smaller pieces threaten biodiversity and the release and distribution of toxic compounds adds to the cumulative impact.

20 IMPACTS OF SHALE OIL & GAS...

- **Corporate Profit vs Community Cost**

The more the oil and gas industry invest in drilling and fracking equipment the more drilling and fracking will happen. The impacts and dangers are acute and borne by local communities who find themselves living in gasfields. The rewards go to an elite of shareholders, directors and investors. Stopping this industry in the UK will send a clear message to other countries that the impacts and dangers are unacceptable.

- **Damage to existing industries**

Farming and food production, recreation and tourism suffer at all stages of shale gas exploration, production and legacy. An areas reputation, population and landbase are exposed to long term damage that exists long after the shale industry has gone.

- **Toxic Support Industries (Chemicals, Sand and Waste)**

Fracking requires large volumes of sand and chemicals and produces large volumes of drilling waste and effluent that must be treated. Areas that have no drilling are still threatened by accidents, emissions and spills from these toxic support industries. Picture shows a fire at Magnablend (fracturing & drilling fluid manufacturer), Waxahachie, Texas.

- **Human & Animal Health Impacts**

Wherever fracking is happening, including Texas, Colorado, Pennsylvania and Queensland, people are getting sick as a result of the toxic, carcinogenic and hormone-disrupting chemicals they are exposed to via both air and water, with symptoms from headaches and breathing difficulties to neurological impairment and cancer. Animals and crops have been killed in Alberta, North Dakota, New Mexico, California and Pennsylvania as a result of exposure to chemicals from fracking and drilling operations.

- **Bubble & Bust**

Many areas of the country bear the scars of previous industrial development. Extractive industries destroy long term sustainable jobs and create unsustainable bubbles and busts. Any short term gains from this destructive industry will be far outweighed by medium and long term losses.

- **Heavy Vehicle Traffic**

Just bringing water to site requires 1,000 – 4,000 tanker movements per frack. With 10 wells per site and 80 sites planned in Lancashire alone this would require millions of tanker movements. Because the lifetime of each shale well is short (2-5 years) this armada of heavy vehicles will roll across the countryside.

- **Road Damage, Subsidence & Earthquakes**

Road damage is an inevitable consequence of shale exploration due to intensive transportation of materials and machinery. Subsidence may occur and the earthquakes caused by the first use of hydraulic fracturing in Lancashire were sufficiently powerful to distorted the companies own steel and concrete well which is now unusable.

- **Property Blight**

Home owners in fracking zones can find themselves trapped in a house they can not sell, re-mortgage, insure or develop. An area already suffering from a decline in existing industries is further impacted by industrialisation (sites, pipelines, flare stacks), air and water pollution and the resultant health impacts.

- **Energy Dependency**

The current economic system is addicted to cheap and abundant fossil fuels. Investment in increasingly dirty and dangerous fossil fuel extraction and a new wave of extreme industrialisation undermines any attempt to reduce energy consumption or become self sufficient. Fracking will not reduce or set people free from their energy bills. It is a direct threat to investment in insulation, localisation, energy saving, energy efficiency and renewable energy technologies. It perpetuates our dependence on finite resources and sabotages the life chances of future generations.

- **Climate Change**

Shale Gas and Oil will not replace other fossil fuels, it will be burned in addition to the oil, coal and gas that has already been discovered. By developing these new energy extraction techniques we are expanding global reserves of hydrocarbons and increasing emissions. The chemistry of the atmosphere is changing and due to drought, flood and starvation the death toll already stands at 450,000 annually.

20 IMPACTS OF COAL BED METHANE

- **Produced Water**

To get methane out of coal seams the groundwater trapping the methane must be continually pumped out. The water contains a cocktail of chemicals including carcinogenic hydrocarbons such as benzene, toluene, ethyl-benzene and heavy metals such as arsenic, cadmium, lead and mercury. In Australia between 10-40% of coal bed methane wells are hydraulically fractured to increase the flow of water and gas.

- **Water Disposal**

Millions of litres of produced water has to be disposed of from each well. Over time this represents a massive volume of water and toxic material released into rivers, estuaries and the sea. In most cases the industry claims that the water does not require treatment or detailed monitoring. Picture shows a "designated outfall" taking untreated water from a CBM site at Airth, Scotland into the Firth of Forth.

- **Lowering of Water Table**

Continuous removal of water from coal seams depletes ground water and may eventually lower farmers boreholes and surface water flows (streams and rivers). It can also change the flow of groundwater drawing fresh water into the coal seams. Lowering the water table has allowed methane and other gases to be released indiscriminately in Australia.

- **Air Pollution & Flaring**

Methane, hydrogen sulphide, nitrogen oxides (Nox) and other aromatic hydrocarbons are emitted from sites. Noise pollution and further emissions of methane and airborne pollutants occur as the gas is processed and pressurised in sprawling temporary infrastructure. Flare stacks burn off unwanted gasses and cause noise and light pollution and more toxic emissions.

- **Methane Migration into Aquifers**

The Coal Bed Methane (CBM) process along with hydraulic fracturing is designed to extract methane from coal seams. The gas wells themselves are the most common pathway for methane migration (leakage). This can lead to high levels of methane in streams, aquifers and eventually drinking water. Methane is 100x worse (on a 20 year time frame) than carbon dioxide as a greenhouse gas. Picture shows the Condamine river in Queensland bubbling with gas.

- **Leaking Wells**

6% of gas wells leak immediately and 50% of all gas wells leak within 15 years. CBM exploration requires many thousands of wells to be drilled. These wells can never be removed or recycled, the steel and concrete structures plunged deep into the geology will decay slowly over time. All gas wells will leak eventually.

- **Sites & Enclosure**

Many wells require many sites which in turn require access roads, foundations, floodlights and enclosures. This pattern of development divides countryside, threatens rights of way and damages and slowly destroys the natural beauty and diversity of an area. Picture shows site at Airth near Falkirk, Scotland.

- **Dangerous Work Environments**

The jobs created by the fracking industry are small in number for the size of the investment. Local job creation is short term, unskilled and in high risk areas/occupations. These workers are at increased risk of industrial disease and accidents. Exposure to chemicals and produced water creates acute health risks for workers. The large volumes of sand (silica) used in the fracking process is causing a dramatic rise in cases of silicosis (lung disease) in the US.

- **Pipelines, Compressor Stations & Flaring**

Pipelines used for transporting gas and waste create the additional danger of leaks and explosions. Pipeline construction cuts scars across the countryside and blights surrounding areas with planning restrictions. A sprawling temporary gas infrastructure is needed to connect thousands of sites across the landscape. Flare stacks burn off unwanted gasses on every site and cause noise/light pollution and toxic emissions. Noise pollution and further emissions of methane and airborne pollutants occur as the gas is processed and pressurised.

- **Industrialise Countryside**

The result of this type of industrial development on the countryside is catastrophic. Wildlife corridors are disrupted. Edge effects created by the cutting up of habitats into smaller and smaller pieces threaten biodiversity and the release and distribution of toxic compounds adds to the cumulative impact. Picture shows 70 CBM sites in Queensland Australia.

20 IMPACTS OF COAL BED METHANE...

- **Corporate Profits vs Community Costs**

If this industry is allowed to get a foot in the door in the UK the number of communities under threat will increase massively. The impacts and dangers are acute and borne by local communities who find themselves living in a gasfield. The rewards go to an elite of shareholders, directors and investors. Stopping this industry in the UK will send a clear message to other countries that the impacts and dangers are unacceptable.

- **Damage to Existing Industries**

Farming and food production, recreation and tourism suffer at all stages of coal bed methane exploration, production and legacy. An areas reputation and landbase are exposed to long term dangers that exist long after the industry has gone.

- **More Coal Extraction**

Coal is the dirtiest of the fossil fuels and 70% of UK coal is considered un-mineable. Companies are already speculating that once coal seams are de-watered and degassed the coal can be extracted using other techniques. Open cast mining or burning the coal in situ (Underground Coal Gasification) will increase our use of coal and have devastating impacts for our land and climate.

- **Human & Animal Health Impacts**

Wherever fracking is happening, including Texas, Colorado, Pennsylvania and Queensland, people are getting sick as a result of the toxic, carcinogenic and hormone-disrupting chemicals they are exposed to via both air and water, with symptoms from headaches and breathing difficulties to neurological impairment and cancer. Animals and crops have been killed in Alberta, North Dakota, New Mexico, California and Pennsylvania as a result of exposure to chemicals from fracking and drilling operations.

- **Bubble & Bust**

Many areas of the country bear the scars of previous industrial development. Extractive industries destroy long term sustainable jobs and create unsustainable bubbles and busts. Any short term gains from this destructive industry will be far outweighed by medium and long term losses.

- **Heavy Vehicle Traffic**

Just removing drilling mud and waste from wells will require many tanker/truck movements for each site . This is in addition to construction vehicles and drilling and fracking equipment when the site is commissioned. Because the lifetime of each CBM well is short (2-5 years) this armada of heavy vehicles will roll across the countryside.

- **Road Damage, Subsidence & Earthquakes**

Road damage is an inevitable consequence of CBM exploration due to intensive transportation of materials and machinery. Subsidence and earthquakes may be caused by the process and are quite common in conventional coal mining.

- **Property Blight**

Home owners in CBM extraction areas can find themselves trapped in a house they can not sell, re-mortgage, insure or develop. An area already suffering from a decline in existing industries is further impacted by industrialisation (sites & pipelines), air and water pollution and the resultant health impacts.

- **Energy Dependency**

The current economic system is addicted to cheap and abundant fossil fuels. Investment in increasingly dirty and dangerous fossil fuel extraction and a new wave of extreme industrialisation undermines any attempt to reduce energy consumption or become self sufficient. CBM will not reduce or set people free from their energy bills. It is a direct threat to investment in insulation, localisation, energy saving, energy efficiency and renewable energy technologies. It perpetuates our dependence on finite resources and sabotages the life chances of future generations.

- **Climate Change**

CBM will not replace other fossil fuels, any gas produced will be burned in addition to the oil, coal and gas that has already been discovered. By developing these new energy extraction techniques we are expanding global reserves of hydrocarbons and increasing emissions. The chemistry of the atmosphere is changing and due to drought, flood and starvation the death toll already stands at 450,000 annually.

20 IMPACTS OF UNDERGROUND COAL GASIFICATION

- **Toxic Waste**

Coal is the dirtiest of the fossil fuels containing many highly toxic materials. The process of Underground Coal Gasification (UCG) involves the partial burning of coal underground. This produces even more toxic and carcinogenic hydrocarbons including benzene, toluene, ethyl-benzene and xylene. Large volumes of these compounds are brought to the surface by the process.

- **Waste Disposal**

Large volumes of highly contaminated water will be produced and the industry has not publicly addressed what will happen to it. The water used to control the process will emerge along with other liquids and particulates drawn up with the exhaust gasses. Vast volumes of liquid and solid waste will require treatment if companies are going to gasify billions of tonnes of coal as they are proposing here in the UK.

- **Air Pollution & Flaring**

Trials have shown that significant quantities of toxic and carcinogenic hydrocarbons (e.g. phenols and benzene) are produced as by-products of the gasification process. Much of this will be carried to the surface by the product gas. Large volumes of carbon dioxide and other combustion products will be emitted from sites and power stations. Emergency flaring and uncontrolled emissions will inevitably occur.

- **Pollution of Aquifers**

Previous trials have consistently resulted in contamination with toxic and carcinogenic materials. The heat and pressure produced by the burning coal provides a mechanism to spread this pollution. Perfectly controlling the reaction to prevent this is impossible when it is happening deep underground. However the most common paths to the surface is via the wells themselves. Of three recent tests projects in Australia two have been shut down following these compounds being released into the biosphere.

- **Pollution of Sea & Coastline**

UCG has never been tested offshore or near shore (under the sea). This targeting of sub-sea locations appears to be a tacit admission of the threat of water contamination, but UCG licencing is now creeping onshore due to industry pressure, with a proposed licence in the Warwickshire countryside.

- **Toxic Residues**

Large volumes of partly burnt coal will be left underground by the process. The industry claims that they will flush out these residues but this would not be consistently possible on an industrial scale, due to collapses in the burn cavity. Over time toxic materials will be leached out by groundwater flows and follow the path of least resistance up leaking wells to the surface.

- **Subsidence**

As the fire burns along the coal seams the space created will collapse. This can cause collapse of the overlying geology and could lead to subsidence and damage to buildings and infrastructure including the UCG boreholes themselves.

- **Underground Coal Fires**

The geology of the British Isles is littered with faults and abandoned mine workings. If a supply of oxygen from an uncontrolled source reached the burning coal, the coal seam could continue to burn indefinitely. An uncontrolled fire would not be confined to the offshore coal seam.

- **Explosions & Poisoning**

Hydrogen and methane gas are produced by the UCG process. Both are colourless, odourless, and highly explosive. Large volumes of carbon monoxide are also produced. It is a colourless, odourless gas that can kill humans and animals at very low concentrations. The process also produces waxes and tars that gradually build up in wells and pipes and make the process unstable. A significant number of test projects have been terminated by explosions in wells and pipes.

- **Dangerous Work Environments**

The jobs created by the UCG industry are small in number for the size of the investment. Employment would be in high risk areas/occupations. These workers are at increased risk of industrial disease and accidents.

20 IMPACTS OF UNDERGROUND COAL GASIFICATION...

- **Corporate Profit vs Community Cost**

The more the coal and gas industry invest in drilling and gasification equipment, the more drilling and gasification will happen. The dangers are acute and borne by the local community. The rewards go to an elite of shareholders, directors and investors. Stopping this industry in the UK will send a clear message to other countries that the impacts and dangers are unacceptable.

- **Industrialised Coastline**

The equipment at surface will include the drilling rigs, wellheads, connecting pipework, and process plant for handling the injection/production gases. A commercial UCG scheme will require permanent connections to power stations. This industrialisation will change the character of our coastal areas. Placing infrastructure in areas at risk from tidal surges, coastal erosion and sea level rise is reckless and irresponsible.

- **Toxic Pipelines**

The industrialisation required for this industry will spread beyond the limits of the main sites into urban and residential areas. As sections of the coal seams are burnt, drill rigs will leave a trail of sites along the coast. Pipelines carrying toxic and explosive gas at high pressures and temperatures will follow the rigs, linking the wells to the processing plant.

- **Damage to Other Industries**

Fishing, tourism and recreation will suffer at all stages of UCG exploration, production and legacy. An areas reputation and landbase are exposed to long term dangers that exist long after the UCG industry has gone.

- **Bubble & Bust**

Many areas of the country bear the scars of previous industrial development. Extractive industries destroy long term sustainable jobs and create unsustainable bubbles and busts. Any short term gains from this destructive industry will be far outweighed by medium and long term losses.

- **Heavy Vehicle Traffic**

Just removing drilling mud and waste from wells will require many tanker/truck movements for each site. Waste disposal traffic will become a common sight on local roads. This is in addition to construction vehicles and drilling equipment when the sites are commissioned and pipelines are constructed through rural and suburban areas.

- **Road Damage, Subsidence & Earthquakes**

Road damage is an inevitable consequence of UCG exploration due to intensive transportation of materials and machinery. Subsidence and earthquakes may be caused by the process and are quite common in conventional coal mining.

- **Property Blight**

Home owners in UCG areas can find themselves trapped in a house they can not sell, re-mortgage, insure or develop. An area already suffering from a decline in existing industries is further impacted by industrialisation (sites & pipelines), air and water pollution and the resultant health impacts.

- **Energy Dependency**

The current economic system is addicted to cheap and abundant fossil fuels. Investment in increasingly dirty and dangerous fossil fuel extraction and a new wave of extreme industrialisation undermines any attempt to reduce energy consumption or become self sufficient. UCG will not reduce or set people free from their energy bills. It is a direct threat to investment in insulation, localisation, energy saving, energy efficiency and renewable energy technologies. It perpetuates our dependence on finite resources and sabotages the life chances of future generations.

- **Climate Change**

The Underground Coal Gasification process allows companies to access coal that has previously been considered unminable. By developing this new energy extraction technique we are expanding global reserves of hydrocarbons and increasing emissions. The chemistry of the atmosphere is changing and due to drought, flood and starvation the death toll already stands at 450,000 annually.