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Summary Brief: Toxic Air Pollution from Natural Gas Development
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In July 2011, the community-based organisation, the Global Community Monitor, released the report, *Citizen Investigation of Toxic Air Pollution from Natural Gas Development*.[1] Air samples were collected from neighbours of natural gas operations as well as targeted sampling sites including the well pad, compressor station, gas separation plant, dehydrator and waste disposal site. Analysis detected 22 toxic air contaminants associated with natural gas development, resulting in significant air pollution.

The report identified the following priority sources:

- **Air emissions from fracking compounds**
  Air pollution caused by fracking compounds during their use, storage, or waste disposal.

- **Pits**
  Waste from drilling, fracking, or production, which may be stored or disposed of in open-air pits to allow some of the toxic material to evaporate into the air.

- **Land application (including land farming)**
  Waste from drilling, fracking, or production may be spread on the ground or otherwise applied to the land (eg sprayed as dust suppression on roads).

- **Flaring**
  Unwanted gases in the exploration and production processes are burned off in the open air using flares. These produce toxic gases as a result.

- **Venting**
  During various stages of gas exploration, production and maintenance, gases are vented directly into the air rather than contained or flared. Venting can release large volumes of toxic gases.

- **Fugitive emissions**
  Leaks in pumps, valves, compressors, pipes and tanks can result in

[1] Citizen Investigation of Toxic Air Pollution from Natural Gas Development July 2011, Global Community Monitor, www.gcmonitor.org

significant air pollution releases because of the large number of components in gas processing.

- **Compressors**
  Where the gas from the wells is collected and then compressed into smaller volumes, the compressors may release a range of toxic gases.

- **Condensate tanks**
  Some wells produce semi-liquid gases along with natural gas that are stored in tanks, which can leak various toxic gases.
- **Dehydrators**
  These systems are needed to remove water from natural gas and can release toxic gases in the process.

- **Gas processing plant**
  The last stage of gas production involves the refining of the raw gas into the final product. This occurs at large gas processing plants, which have many sources of air emissions.

- **Additional waste disposal sites**
  Wastes from various stages of gas production and processing may be sent to treatment sources including landfills, injection sites and wastewater treatment sites, which can also release air pollution.

Air Sampling Results
A total of 22 toxic chemicals were detected in the nine air samples, including four carcinogens, toxins known to damage the nervous system and respiratory irritants. The levels were between three to 3,000 times higher than levels established by public health agencies to estimate increased risk of serious health effects and cancer based on long-term exposure.

- ***Benzene***, a known carcinogen, was found at high concentrations in four air samples at levels between 6.3 and 47 µg/m3. These levels are 48.5 to 800 times higher than the level set by the US EPA of 0.13 µg/m3 to estimate increased cancer risk from long-term exposure. Levels of benzene in one of the nine samples, collected near the local Elementary School, exceeded the level set by the U.S. EPA for benzene (30 µg/m3) to estimate increased risk of non-cancer health effects.

- ***Acrylonitrile***, a human carcinogen, was found in five samples at levels between 7.9 and 30 µg/m3. These levels are 790 to 3000 times above the U.S. EPA level of 0.01 µg/m3, set to estimate an increased risk of cancer from long term exposure. All of these levels correspond to what EPA would consider an “unacceptable cancer risk” in that long-term exposure is associated with a cancer risk of greater than 100 in a million. Acrylonitrile is also a respiratory irritant, causing degeneration and inflammation of nasal epithelium. Levels of acrylonitrile in the five samples exceeded the level set by U.S. EPA for risk of increased non-cancer health effects from long term exposure (2 µg/m3) by 3 to 15 times.19

- ***Methylene chloride***, a human carcinogen, was found in five samples at levels between 7.9 and 17 µg/m3. These levels are 3 to 8 times higher than the level set by the U.S. EPA (2.0 µg/m3.) to estimate an increased risk of cancer from long-term exposure.

- ***Ethylbenzene***, a human carcinogen, was found in five samples at levels between 5.1 to 22 µg/m3. These levels are 12 to 55 times higher than the level set by the US EPA (0.4µg/m3) to estimate increased cancer risk cancer from long-term exposure.
- ***Xylene***, were found at a level of 100 and 154 µg/m3. These levels exceed the U.S. EPA's level for estimating increased non-cancer health risks of 100 µg/m3.

- ***Hydrogen sulfide*** was found in one sample at 370 µg/m3 which is more than 185 times above the long term level set by the U.S. EPA (2 µg/m3) to estimate increased risk of serious health effects. Long-term exposure to hydrogen sulfide is associated with an elevated incidence of respiratory infections, irritation of the eye and nose, cough, breathlessness, nausea, headache, and mental symptoms, including depression. The World Health Organization's Guideline Value for exposure to hydrogen sulfide is 7 µg/m3 over a 30-minute period.

These results demonstrate that local communities, workers and the environment are at risk of exposure to multiple chemicals from natural gas operations. At the levels detected, the individual exposures can cause an increased risk of cancer and other serious health effects ad there are no health-based standards for exposure to multiple chemicals either in US or Australia.

As well as high levels of the toxic BTEX, two cancer-causing chemicals were found at very high levels, acrylonitrile and methylene chloride. Acrylonitrile was detected in five out of the nine samples.

Acrylonitrile is not listed by the Australian industry body, Australian Petroleum Production and Exploration Association as one of the ingredients of fracking compounds.[2] However, APPEA does list acrylic copolymers for use as a lubricant. An acrylic polymer must include 85% acrylonitrile units [3] whereas an acrylic copolymer may also include other toxic components like methyl acrylate, methyl methacrylate, styrene, vinyl chloride and or butadiene.

The air pollution identified in this report indicates an urgent need for all current natural gas development sites including well pads, compressors, gas plants, and waste sites to undergo continuous monitoring for volatile organic compounds and hydrogen sulfide and to provide that data to regulators and the public. Those facilities unable to eliminate toxic emissions should be

[2] Australian Petroleum Production & Exploration Association Ltd (APPEA), Chemicals that may be used in Australian fracking fluid, http://www.appea.com.au
[3] Halliburton Patent 7799744, Polymer-Coated-Particulates, http://www.docstoc.com/docs/58860687/Polymer-Coated-Particulates---Patent-7799744

required to cease operations. All new applications should require a full assessment of the risks and hazards to air quality.