



**Opening statement:  
Middle Arm Inquiry  
Doctors for the Environment Australia  
June 18th 2024**

Doctors for the Environment Australia (DEA) is Australia's leading medical voice on health and climate. We recognise that human health and wellbeing require a healthy environment and that we have breached the safe operating zone for six out of nine planetary health boundaries, including climate change, biogeochemical flows, freshwater change and biosphere integrity.<sup>1</sup>

We oppose the Middle Arm Industrial Precinct (MAIP) due to the unacceptable health impacts it holds for the Darwin region, the Northern Territory and the wider community. We refer the inquiry to our MAIP Submission 2023.<sup>2</sup>

According to information provided on the Middle Arm Development website, industries planned for inclusion include Liquefied Natural Gas (LNG) and its petrochemical by-products (methanol, ethylene, urea and ammonia).<sup>3</sup> Processing of LNG produces toxic substances such as volatile organic compounds (VOCs), which include the carcinogen benzene<sup>4,5</sup> and the neurotoxin toluene<sup>6</sup>. It also releases dangerous air pollutants like nitrogen oxides, sulphur dioxide and particulate matter (PM) 2.5 and 10.

We direct the Committee to the following medical research, which underscores our grave concerns about the potential health harms associated with the proposed development.

**Local effects for Darwin and Palmerston:**

Malignancy:

A 2020 systematic review and meta-analysis investigating the association between haematological malignancies and living near petrochemical facilities, found a 30% increased risk of leukaemia in fence-line communities, presumed due to exposure to air pollutants, notably VOCs like benzene.<sup>7</sup> The study defined 'fence-line' as living up to 5km from a facility, which is comparable to the distance from the MAIP and the residential areas of Palmerston and Darwin.

Notably, the National Environment Protection Council's "Benzene Health Review" states: "the critical human health effects from long-term exposure to benzene are bone marrow depression and leukaemia, specifically acute non-lymphocytic leukaemia (also known as acute myeloid leukaemia)". It further specifies that "no safe levels of benzene exposure can be recommended".<sup>8</sup>

In 2023, the Inpex LNG plant, located four kilometres south of Darwin's Central Business District, emitted 3,900,000 kgs of VOCs, including 6,100 kgs of benzene.<sup>9</sup> Consequently, the

health of Darwinians is already being unacceptably affected by LNG processing, and risks will surely increase if the MAIP is allowed to proceed.

### Air pollution

According to National Pollutant Inventory data, the Inpex LNG plant is also a significant emitter of PM2.5 and PM10, as well as various gases including nitrogen oxides, sulphur dioxides and carbon monoxide. These emissions carry extensive health risks, contributing to increased rates of asthma,<sup>10</sup> heart disease,<sup>11</sup> cancer,<sup>12</sup> learning delays<sup>13 14 15</sup> and poor pregnancy outcomes.<sup>16 17</sup>

Modelling, based on information presented in 2021 by the Executive Director of the NT's Gas Taskforce regarding the likely industrial composition of the MAIP, indicates the development may cause increases in PM2.5 and PM10 concentrations by 233% and 391% in the Greater Darwin Region, respectively. Further, it projects that emissions of carbon monoxide may increase by 805%, sulphur dioxide by 245%, nitrogen oxides by 192% and volatile organic compounds by 233%.<sup>18</sup>

It is clear that the Middle Arm Development poses significant health risks for the people of Darwin and Palmerston which should not be overlooked.

### **Health effects of unconventional gas extraction in the Northern Territory:**

As outlined in our aforementioned MAIP submission, there is substantial evidence that the development of Middle Arm is closely linked with expansion of the gas industry in the Northern Territory, including unconventional gas extraction (fracking) in the Beetaloo Basin.

DEA's deep concerns regarding the health impacts of unconventional gas extraction are also detailed in our submission, and for the sake of brevity, will not be repeated here. We do, however, wish to draw the Committee's attention to a recently published cohort study notable for its size and the geographic region covered.<sup>19</sup>

This study followed over 15 million elderly individuals living in all major unconventional gas development regions in the United States over a 15-year period. It showed that residing within 10-15 km of an unconventional gas development was associated with higher all cause mortality, with the risk particularly elevated in down-wind communities. This suggests that airborne contaminants represent a key exposure pathway.

### **Health effects of climate change:**

Climate change is accepted in the medical community as being the greatest public health threat that we all face.<sup>20</sup> Climate change has diverse impacts including increased death and disease from heat waves, fires, smoke, flooding and extreme weather events, as well as the food and water insecurity, displacement and mental illness that goes with them.<sup>21</sup>

LNG is primarily methane, a highly potent greenhouse gas with global warming potential 28 times that of carbon dioxide.<sup>22</sup> Analysis demonstrates that domestic emissions from fracking in the Beetaloo Basin and gas processing at the MAIP would produce up to 49 million tonnes of carbon dioxide equivalent emissions per year.<sup>23</sup> As such, this development poses enormous and unacceptable climate-health risks.

## **Conclusions**

To conclude, the proposed MAIP represents a dangerous health hazard. It places the local community at an increased risk of leukaemia and extensive health harms from air pollution. As a precinct designed to facilitate expansion of the gas industry in the NT, it also enables the health harms associated with gas extraction and climate change.

To allow a project of this nature to proceed would be contrary to the ethical principles of beneficence and nonmaleficence. For those reasons Doctors for the Environment Australia strongly opposes the MAIP.

We thank the Senate Environment and Communications Committee for considering this submission and for the opportunity to appear as witnesses at the MAIP Inquiry.

# Endnotes

1. Richardson K, Steffen W, Lucht W, Bendtsen J, Rockstrom J et al, "Earth beyond six of nine planetary boundaries". Science Advances. 13 Sep 2023. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10499318/>
2. Doctors for the Environment Australia, Middle Arm Industrial Precinct Submission. <https://www.dea.org.au/submissions>
3. Middle Arm Precinct - Industries. [https://middlearmprecinctsubmissions - Doctors for the Environment Australia.nt.gov.au/ data/assets/pdf\\_file/0007/1204747/middle-arm-precinct-industries.pdf](https://middlearmprecinctsubmissions - Doctors for the Environment Australia.nt.gov.au/ data/assets/pdf_file/0007/1204747/middle-arm-precinct-industries.pdf)
4. Exposure to benzene: A major Public Health Concern, World Health Organization, 1 May 2019. Accessed Jun 16th 2024.
5. Chiavarini, M et al, Benzene exposure and lung cancer risk: A systemic review and meta-analysis of human studies. *Int J Environ Res Public Health* 2024 Feb 9;21(2):205. doi: 10.3390/ijerph21020205.
6. Gandjean, P, Landrigan PJ. Neurobehavioral effects of developmental toxicity. *Lancet Neurol* 2014 Mar;13(3):330-8. doi: 10.1016/S1474-4422(13)70278-3. Epub 2014 Feb 17. <https://pubmed.ncbi.nlm.nih.gov/24556010/>
7. Jephcote, C et al. A systematic review and meta-analysis of haematological malignancies in residents living near petrochemical facilities. *Environmental Health* 19, 53: (2020)
8. Benzene Health Review, May 2003 Australian Government, National Environment Protection Council, EPHC Archive - Air Toxics NEPM. <https://www.nepc.gov.au/publications/archive/ephc-archive/ephc-archive-air-toxics-nepm>
9. 2022/2023 report for ICHTHYS LNG PTY LTD, INPEX Operations Australia - Onshore - Wickham, NT. National Pollutant Inventory, <https://www.npi.gov.au/npidata/action/load/emission-by-individual-facility-result/criteria/state/NT;jsessionid=B7C2D1E9AAEA0002200409A55F48BD0C/year/2023/jurisdiction-facility/NT545>
10. Tiotiu AI, Novakova P, Nedeva D, Chong-Neto HJ, Novakova S, Steiropoulos P, Kowal K. Impact of Air Pollution on Asthma Outcomes. *Int J Environ Res Public Health*. 2020 Sep; 17(17):6212. doi: 10.3390/ijerph17176212
11. Rajagopalan S, Al-Kindi SG, Brook RD. Air Pollution and Cardiovascular Disease: JACC State-of-the-Art Review. *J of Am Coll of Cardiology*. 2018 Oct 23;72(17):2054-2070. doi.org/10.1016/j.jacc.2018.07.099
12. Turner MC, Andersen ZJ, Baccarelli A , Diver WR, Gapstur SM, Pope, CA, Prada D, Samet J, Thurston G, Cohen A. Outdoor Air Pollution and Cancer: An Overview of the Current Evidence and Public Health Recommendations. *CA Cancer J Clin*. 2020 Aug 25;10.3322 DOI: 10.3322/caac.21632
13. Perera F. Pollution from Fossil-Fuel Combustion is the Leading Environmental Threat to Global Pediatric Health and Equity: Solutions Exist. *Int J Environ Res Public Health*. 2018 Jan; 15(1):16. doi: 10.3390/ijerph15010016
14. Madaniyazi I, Jung CR, Ng CFS , Seposo X, Hashizume M, Nakayama SJ ,Early life exposure to indoor air pollutants and the risk of neurodevelopmental delays: The Japan Environment and Children's Study. *Env Int*. 2022 Han, 158, 107004. <https://doi.org/10.1016/j.envint.2021.107004>
15. Sandie H, Air pollution and neurological development in children. *Dev Med & Child Neur*. 2020 Dec 9. <https://doi.org/10.1111/dmcn.14758>
16. Muacevic A and Adler JR. Effects of Pollution on Pregnancy and Infants. *Cureus*. 2023 Jan 15(1): e33906. [10.7759/cureus.33906](https://doi.org/10.7759/cureus.33906)
17. Aweke AM, Zewotir T, North D, Jenna P, Asharam K, Mutto, S, Tularam H, Naidoo RN. Impact of ambient air pollution exposure during pregnancy on adverse birth outcomes: generalized structural equation modeling approach. *BMC Public Health*. 2023 Jan 06, 23, 45. <https://doi.org/10.1186/s12889-022-14971-3>
18. Patroni M, Expert Opinions Related to Potential Environmental and Human Health Impacts of the Middle Arm Sustainable Development Precinct as well as the Adequacy of the Draft Terms of Reference for Strategic Assessment. For ECNT [https://assets.nationbuilder.com/ecnt/pages/652/attachments/original/1660190794/MASDP\\_Expert\\_Report\\_Michael\\_Petroni\\_%28003%29.pdf?1660190794](https://assets.nationbuilder.com/ecnt/pages/652/attachments/original/1660190794/MASDP_Expert_Report_Michael_Petroni_%28003%29.pdf?1660190794)
19. Li Longxiang, et al. Exposure to Unconventional Oil and Gas Development and All-cause Mortality in Medicare Beneficiaries. *Nat Energy*. 2022 Feb; 7(2):177-185
20. The Lancet Countdown on Health and Climate Change <https://www.thelancet.com/countdown-health-climate>
21. Doctors for the Environment Australia, How Climate change affects your health: the facts. Aug 2021 [https://www.dea.org.au/how\\_climate\\_change\\_affects\\_your\\_health\\_the\\_facts](https://www.dea.org.au/how_climate_change_affects_your_health_the_facts)
22. Australian Government, Clean Energy Regulator. Global Warming Potential <https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme/about-emissions-and-energy-data/global#:~:text=For%20example%2C%20methane%20has%20a.more%20potent%20than%20carbon%20dioxide.>
23. Emissions Impossible, Climate analytics. Oct 23 [https://ca1-clm.edcdn.com/assets/emissions\\_impossible.pdf](https://ca1-clm.edcdn.com/assets/emissions_impossible.pdf)