Submission No 47

INQUIRY INTO COSTS FOR REMEDIATION OF SITES CONTAINING COAL ASH REPOSITORIES

Organisation: Doctors for the Environment Australia

Date Received: 16 February 2020

Submission to NSW Legislative Council Inquiry into the costs for remediation of sites containing coal ash repositories

February 2020

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Healthy planet, healthy people.

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Doctors for the Environment (DEA) is a non-profit national organisation of Australian doctors and medical students with an emphasis on preserving health and wellbeing with respect to the environment. It is our stance that human health is indivisible from environmental health.
This submission primarily concerns itself with Term of Reference (f) of this Inquiry, namely: *"risks and liabilities associated with inadequate remediation including community and environmental health impacts".*

1. Health Implications of Coal Ash and its Components

The process of coal combustion leads to a concentration of trace elements in the resulting waste ash. While exposure to the traces of these elements in nature does not usually result in toxicity, their concentration in coal ash has the potential for dysfunction of multiple organ systems.
The toxic components of coal ash include but are not limited to:

Lead
Lead is a heavy metal that can cause toxicity of the blood system, nervous system, heart and kidneys [1]. Lead is not essential for human health and all exposure is toxic. Exposure to lead is particularly harmful for children due to the neurotoxicity in the developing brain, and children are at high risk of oral consumption due to child behaviour.
Lead is consumed through ingestion of contaminated water or soil.

Mercury
Mercury is a metal that causes significant toxicity of the nervous system, including the brain. [2]. Developing brains of children, including children *in utero*, are at high risk of permanent damage due to this exposure.
Mercury consumption via ingestion of contaminated water and fish is the primary route of toxic exposure. It can also be transmitted via breast milk.

Arsenic
Arsenic is an element that can cause acute illness and death in high doses, however chronic low-level exposure also has multiple potential adverse health effects [2]. One of the primary risks from arsenic ingestion is urinary tract cancer, however arsenic has also been attributed to increased risk of skin cancer, lung cancer, cardiovascular disease and diabetes.
Arsenic can cause toxicity through ingestion in drinking water, inhalation, or skin contact (the latter particularly a risk for children as discussed below).

Selenium
While Selenium in small amounts is an essential nutrient for human health, excess is toxic, increasing the risk of skin cancer, prostate cancer, type 2 diabetes and all-cause mortality.[3]
Exposure to high levels of selenium contributing to potential toxicity can occur through ingestion. Consumption of plants and animals which have bio-accumulated a high concentration of selenium is a high-risk behaviour. [2]
High levels of selenium have been identified in Lake Macquarie in New South Wales, and current public health advice is to limit the consumption of certain kinds of seafood caught in areas of the Lake exposed to water contamination from the Vales Point and Eraring power station ash dams. [4] A 70kg adult has been advised to consume no more than 1.35kg of Lake Macquarie seafood on a weekly basis over the course of a lifetime.

Cadmium
Cadmium is a metal which has no beneficial role for humans. Exposure to cadmium can result in lung disease including Chronic Obstructive Pulmonary disease (COPD) and potentially lung cancer, as well as kidney disease and osteoporosis. There have been

studies demonstrating an association between high levels of cadmium and diabetic-related kidney disease in the Torres Strait [5], where the primary exposure is hypothesised to be via contaminated seafood. In Lake Macquarie NSW, shellfish with high levels of cadmium have been identified, attributed to lake contamination from the Vales Point and Eraring ash dams. This has led to public health advice limiting the amount of shellfish recommended for human consumption. [4]
The primary sources of toxic cadmium exposure are via inhalation or ingestion.

Other elemental exposures
Elements such as boron, thallium, chromium, molybdenum and antimony are also present in coal ash. Multiple organ dysfunctions can be attributable to toxic levels of these elements.

Particulate air pollution
Particulate air pollution is associated with wind resuspension from coal ash dams, and despite industry standards to reduce community exposure with means such as wet storage and caps these have been demonstrated to be fallible. There is also significant potential risk to workers during transport and remediation of sites.
Particulate air pollution includes the small particles (PM10 or 10 microns in size) down to very small particles (PM2.5 or 2.5 microns). This pollution causes respiratory disease, however PM2.5 particles are small enough to pass into the bloodstream and cause disease across many organ systems including heart disease, diabetes, stroke and low birth weight in infants.

Coal Ash
While the individual components of coal ash are recognised for their toxicity, a full accounting of the health impacts of coal ash as the combination of these and other unrecognised components must be considered. It is well recognised in the medical literature that two or more risk exposures can have a multiplicative rather than an additive risk. Exemplifying this is the fact that risk of lung cancers and disease in smokers exposed to asbestos is well recognised to be much higher than the risk of smoking plus the risk of asbestos exposure. The combination of these exposures produces a risk profile that is much higher than would be expected from assessing each exposure individually.

When it comes to exposure to coal ash, which contains multiple substances known to be toxic in isolation, the health risks should not be underestimated by neglecting any potential exponential increase in risk from multiple toxicities. The accepted safe threshold for exposure to substance A does not account for the effect of simultaneous exposure to substance B, and this effect may not be well known or characterised. This is incredibly complex looking at the multi-substance nature of coal ash.

We conducted a literature review to find evidence for the health effects of exposure to coal ash specifically. This is less well established than the toxicological basis of individual toxic components of the ash considered above, however there have been relatively few key studies internationally. A large systemic review of the evidence in 2018 established that there is a significant overall health burden associated with residential exposure to coal fired power stations and coal ash dams. Further research was called for, such that regions could establish specific risks in the local context.
Unfortunately, we could not identify any studies in the literature establishing health burdens associated specifically with coal ash dam exposure conducted in the Australian context.

To exemplify some of the health risks identified internationally, Hagemeyer et al.[6] identified that adults residing near coal fired power plants with associated ash storage in Kentucky, USA self-reported higher rates of cough, shortness of breath, hoarseness and respiratory infections. An epidemiological survey conducted by Sears et al.[7] in the same location identified that children living near a coal power plant and ash dam experienced significantly significant higher rates of allergic disease, gut disorders, behavioural disorders (including Attention Deficit Hyperactivity Disorder) and learning

difficulties, compared with a control group of children living at least 60 miles from the power station.

2. Populations at high risk

Residents
People residing near coal ash dams can be considered at higher risk, which is supported by the findings of the studies by Hagemeyer et al.[6] and Sears et al.[7] discussed above.
Formal clarification of health risks associated with certain localities has profound implications for current residents. As well as the ongoing direct physical impact of that residence, there is awareness in residents of potential health impacts for themselves and their families [8], and further research endeavours must support the social and mental health needs of communities.

Children
Children are at specific risk from particulate and heavy metal exposure relative to adults for a variety of reasons. Their respiratory rate (breaths per minute) is higher relative to adults, and they are more susceptible to lung damage from air pollutants. They are also at higher risk of toxicity from soil contamination due to heavy metals due to their patterns of activity and personal hygiene habits, being more likely to incidentally consume soil be it intentionally or unintentionally. Having ingested heavy metals such as lead or mercury, they can also have particularly detrimental effects on the developing brain that can have negative health consequences throughout a child's life. The survey of child health in areas exposed to coal power station and ash dam pollution identified multiple physical and mental / behavioural conditions occurred at higher rates in those areas.

The wide variety of health disorders potentially exacerbated by these exposures suggests that carefully designed studies are required to confirm the safety of residence near ash dams for children. Cursory evaluation of single-system disease (i.e. lung disease) may avoid identification of, for example, learning disorders.

Workers
Employees of coal fired power stations have high levels of potential exposure to the multimodal toxicities of coal ash. This has been demonstrated by Chen et al. [9], who identified DNA damage in the cells of workers exposed to coal ash. Elevated blood levels of arsenic and mercury have also been identified in workers exposed to fly ash[10], which also established a evidence of those elements interfering with cellular repair pathways.
At present, there are no state guidelines for occupational health screening and monitoring for workers in coal fired power stations or ash dams.
This stands in contrast to the rigorous guidelines that are applied to the health monitoring for employees in the mining industry. These monitoring standards in the coal mining industry have led to a high-quality level of understanding about the ongoing health impacts of that industry
Workers in ash dams both during the operational life of coal fired power stations and in the remediation phase require rigorous occupational health standards and protections.

3. Liabilities

As the risks associated with ash damn have not been quantified in the Australian context, the financial costs associated with those liabilities are also difficult to quantify.
All poor health carries a cost. This cost may be to the state government, through hospital or publicly funded health services. This cost may be to the federal government, through access to Medicare rebates. This cost may be to the patient, in gap fees in excess of either health service provided. And finally, and least tangibly, there is the cost to the local community in lost economic output.
None of these costs are borne by the agents of poor health in the case of poor health incurred by exposure to industrial pollution.

This is a "negative externality" that clouds the assessment of the cost/benefit ratio of coal fired energy generation.
DEA has previously maintained that the negative externalities of coal energy generation be incorporated into the business model of coal.
The health budgets of state and federal governments, and private individuals, should not have to bear the sole burden of health expenses incurred from industrial pollution.

Summary

There is copious evidence that suggests that exposure to coal ash is harmful to nearby residents (particularly children) and workers, so a precautionary approach must limit population exposure wherever possible. Research is urgently needed to clarify this risk in relation to the New South Wales populations under discussion. Appropriate epidemiologic assessment will help support health-related decision-making regarding ash dams at the individual and public health level.

Recommendations

DEA recommends:

1. That the NSW Government undertakes to adequately resource an epidemiological assessment of the health of NSW residents near coal ash dams due to the lack of evidence regarding health impacts
2. That monitoring of water and airborne exposure pathways be conducted around every coal ash repository.
3. Community consultation and co-design of all future medical research to meet the physical, mental and social health needs of affected communities
4. That the NSW Government Department of Health supports health care practitioners in affected areas, both in hospital and community practice, to identify environmental impacts for improved identification and case-finding of residents whose health has been affected by exposure to coal ash
5. That the NSW Government develop enforceable standards for occupational health standards for workers in coal ash dam maintenance and remediation to protect the health of workers.
6. That the financial liabilities in respect of health sector costs at the state and federal level due to coal ash dam be accounted for, and means to recoup this expense considered.

Citations

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