

Health Impact

This objection follows on from the information contained in Hilltop Action Group's objections relating to **Air Quality, Noise and Communities affected by the Hilltop Scheme** regarding the results that surface mining and its various activities can have on people's physical and mental health.

Included in Hilltop Action Group's **Communities affected by the Hilltop Scheme Objection** is information relating to the large **number of people** (up to 7000) whose health could be affected by the amount of dust particulates which will be released into the air.

The Hilltop Action Group's **Air Quality Objection** under the heading **HEALTH**, identifies the various illnesses resulting from the pollution.

The Hilltop Action Group's **Noise Objection** includes information regarding just how intrusive the surface mining operations would be to so many people, judging by the mitigation measures Provectus propose to put in place. Constant unpleasant noise can also affect a person's health.

Coal contains amongst others, lead, mercury, nickel, tin, cadmium, antimony, and arsenic, as well as radio isotopes of thorium and strontium which are contained in the dust created during the process of coal extraction and which escape into the air we breathe.

The Health Impacts...

People living in coal mining communities report higher rates of

- CARDIOPULMONARY DISEASE
- CHRONIC OBSTRUCTIVE PULMONARY DISEASE
- HYPERTENSION
- DIABETES
- LUNG AND KIDNEY DISEASE

than other communities.

There is no such thing as a safe health threshold for coal dust.

This is confirmed by the World Health Organisation, which states:

"There may be no safe threshold for fine particulate matter and the effects are linearly related to concentration."

Coal dust particulates are of particular concern because they contain heavy metals which are toxic at low concentrations.

This conclusion is supported both by the World Health Organisation and several research studies.

The factors that may influence the health effects related to exposure to particles include:

- the chemical composition and physical properties of the particles
- the mass concentration of the airborne particles
- the size of the particles (smaller particles may be associated with more adverse effects because they can be inhaled more deeply into the lungs)
- the duration of exposure (short and long term, possibly in years)
- 5.4 million people in the UK are currently receiving treatment for asthma: 1.1 million children (1 in 11) and 4.3 million adults (1 in 12)
- Asthma prevalence is thought to have plateaued since the late 1990s, although the UK still has some of the highest rates in Europe and on average 3 people a day die from asthma. There were 1,167 deaths from asthma in the UK in 2011 (18 of these were children aged 14 and under)
- An estimated 75% of hospital admissions for asthma are avoidable and as many as 90% of the deaths from asthma are preventable
- One in 11 children has asthma and it is the most common long-term medical condition.
- On average there are two children with asthma in every classroom in the UK.
- The UK has among the highest prevalence rates of asthma symptoms in children worldwide.
- There were 25,073 emergency hospital admissions for children in the UK in 2011-2012. That means on average there were 69 per day, or one every 21 minutes.

Asthma/Respiratory Disease

A study in North East Derbyshire in mid-1994 by Ken Coates MEP and Dr Dick van Steenis, a well known expert on air pollution revealed that out of a total of 8,318 children from 42 primary schools inhaler usage for asthma, local and downwind from polluting chimneys and open cast mining, was at between 12 and 18 percent, dropping to 7 percent under one mile from the high band, then to a more normal 4.5 percent clear of the pollution in North Mansfield, Clay Cross and the southern edge of Sheffield. At Arkwright Primary School inhaler incidence was 33 percent near the centre of a huge open cast coal mine, where there was new housing and a school which were affected by the surface soil and coal dust churned up by diesel exhaust emitting machinery. The area affected by the coal mining particulates had a radius of some 3 miles. At Grassmoor Primary School, just over two miles from Arkwright open cast, the inhaler usage rose from 11 percent after the open cast opened to 16 percent during the second year and 21 percent by October 1996, confirming the cumulative damage caused by particulate inhalation, with usage of inhalers varying with the daily weather.

Microscopy of dust samples within and outside buildings at Calow, Grassmoor and Bolsover revealed copious PM1 size coal particulates which would inevitably be inhaled by those exposed. For example at Calow, where 27 percent of 9 to 11 year olds took inhalers to school, PM1 coal was even discovered inside the local hospital building and at the bus shelter outside. With the prevailing wind, amounts of the PM1 coal particulates were slightly higher at Bolsover where 28 percent of 8 and 9 year olds took inhalers to school. Council SO2 monitoring revealed that the highest levels in the county were at Staveley near a factory, which strongly suggests that the asthmatic problem is due to the particulates.

Ref INDUSTRIAL AIR POLLUTION AND ASTHMA A Failure of Regulation by Dick van Steenis MB, BS

The University of Newcastle-Upon-Tyne in 1995 compiled a report entitled "Do particulates From Opencast Mining Impair Children's Health?" Although this report does indeed conclude that the respiratory health of children living close to opencast sites was very similar to that of children living distant from such sites it also made other conclusions namely:

Although overall numbers of GPs consultations were similar for both communities - however the number of consultations for respiratory, skin and eye conditions was increased for those living in opencast communities. The increase was statistically significant.

Following Welsh Office concerns about apparently excessive prescribing for asthma in 1983 Glynneath doctors practice in Wales started to audit its treatment of new asthma episodes following commencement of surface mining in the area. The results showed a marked increase in new episodes.

Ref: Asthma and open cast mining BMJ - Temple/Sykes

Dr. Michael Hendryx, an associate professor of community medicine at West Virginia University has made a number of studies and written numerous articles in American journals concerning the effects of surface mining pollution on people living near to a site. His findings include these illnesses.

Kidney Disease

Chronic Kidney Disease (CKD)— also called chronic renal disease, a progressive loss of renal function over a period of months or years. Often considered hereditary, it also occurs within populations adjacent to open-cast coal mines for undetermined reason. However a study found that low levels of environmental lead exposure accelerate progressive renal insufficiency in patients with chronic kidney disease. (Lin et al. 2006)

Cadmium exposure increases risk of renal dysfunction.

Nishijo et al. 2006; Noonan et al. 2002

Mercury from industrial activity has been linked to kidney disease mortality (Hodgson et al. 2007).

Ref Michael Hendryx "Relations between Health Indicators and Residential Proximity to Coal Mining in West Virginia"

Cardiovascular Disease

Cardiovascular diseases are disorders that affect the normal function of the heart.

In one study by Brook, et al., relating to the disease an evaluation was made of the effects of fine particles and ozone on the diameter of the brachial artery in 25 healthy adults. The behaviour of brachial arteries is thought to be representative of the behaviour of coronary and cerebral arteries. This double blind, randomized, crossover study evaluated the cardiovascular response to a two-hour inhalation of fine particles (approximately 150 µg/m³) and ozone (120 ppb). These concentrations, which are encountered routinely in urban settings, resulted in a significant reduction in the diameter of the brachial artery, implying narrowing of other arteries. In spite of this evidence, important questions remain, e.g., are these participants representative of the population at greatest risk (screened healthy controls versus patients with significant coronary artery disease)? Animal studies are well suited to studying pulmonary inflammation and oxidative stress, mechanisms that may be important in cardiac disease pathogenesis. Roberts, et al., instilled particles into the lungs of animals pre-treated with a drug (dimethylthiourea) believed to blunt the response to reactive oxygen species. The treated animals showed less evidence of pulmonary injury, as evidenced by a blunted inflammatory response and other markers of pulmonary damage. There was also a reduction in the activity of genes controlling cytokines.

Cytokines, molecules involved in cellular signalling and communication, are critical in the development and control of immunological responses. In a similar study, Rhoden, et al., instilled standardized urban air particles into the lungs of rats and measured the formation

of super oxide ions, a reactive oxygen species. Again, pre-treatment with an inhibitor blocked the adverse effects of the particles, as shown by measured reductions in the level of several markers of lung inflammation. In a study of hyper lipidemic rabbits, Suwa, et al., found that a four-week exposure to PM10 was associated with acceleration of atherosclerosis, an increase in the turnover of cells in atherosclerotic plaques, and an increase in the total lipid content of aortic lesions.

References

Brook RD, Brook JR, Urch B, Vincent R, Rajagopalan S, Silverman F. Inhalation of fine particulate air pollution and ozone causes acute arterial vasoconstriction in healthy adults. Circulation 2002;

Roberts ES, Richards JH, Jaskot R, Dreher KL. Oxidative stress mediates air pollution particle-induced acute lung injury and molecular pathology. Inhal Toxicol 2003

Rhoden CR, Ghelfi E, Gonzalez-Flecha B. Pulmonary inflammation by ambient air particles is mediated by superoxide anion. Inhal Toxicol 2008;

Suwa T, Hogg JC, Quinlan KB, Ohgami A, Vincent R, van Eeden SF. Particulate air pollution induces progression of atherosclerosis. J Am Coll Cardiol 2002

In America the group “**Physicians for Social Responsibility**” produced a report stating that the nervous system is also a target for coal pollution’s health effects, as the same mechanisms thought to mediate the effect of air pollutants on coronary arteries also apply to the arteries that nourish the brain. These include stimulation of the inflammatory response and oxidative stress, which can lead to stroke and other cerebral vascular disease.

Several studies have shown a correlation between coal-related air pollutants and stroke. In Medicare patients, ambient levels of PM2.5 have been correlated with cerebrovascular disease, and PM10 with hospital admission for ischemic stroke, which accounts for eighty-seven percent of all strokes.

Mental Health

Glenn Albrecht (born 1953) is Professor of Sustainability at Murdoch University in Western Australia. In 2008 Albrecht finished as the Associate Professor in Environmental Studies in University of Newcastle in New South Wales. He is an environmental philosopher with both theoretical and applied interests in the relationship between ecosystem and human health. He has pioneered the research domain of 'psychoterratic' or earth related mental health conditions with the concept of 'solastalgia' - the lived experience of negative environmental change.

He believes people experience “heart’s ease” when on home ground. If you force them off that ground, if you take them away from their land, they feel the loss of heart’s ease as a kind of vertigo, a disintegration of their whole life. Australian aborigines, Navajos and any number of indigenous peoples have reported this sense of mournful disorientation after being displaced from their land. What Albrecht realised was that this “place pathology,” (as one philosopher has called it) wasn’t limited to natives. Albrecht’s petitioners were anxious, unsettled, despairing, depressed — just as if they had been forcibly removed from the valley. **Only they hadn’t; the valley changed around them.**

Ref DANIEL B. SMITH Published: January 27, 2010

Yet another study by Michael Hendryx together with Kestrel A. Innes-Wimsatt reports that numerous writers have argued that human beings have an innate connection to the living world. (Kellert & Wilson, 1995). Wilson (1984) describes this phenomenon as “biophilia,” or the human bond that we all have with other species both plant and animal. Studies have documented this connection, finding that both physical and mental well-being are enhanced by proximity to parks, gardens, wilderness areas, and other natural features (Grinde & Patil, 2009; Maller et al., 2006.) It follows that the disturbance or elimination of these natural features may lead to distress or psychological harm. In this study, we examine evidence for the effects of one form of severe environmental disturbance, mountaintop removal coal mining, on psychological health as measured by symptoms of depression including symptoms indicative of diagnosable major depression. Depression is a serious mental health disorder characterized by clinically significant psychological distress and impairment of daily functioning. Symptoms include depressed mood, fatigue, loss of interest in activities, insomnia or hypersomnia, suicidal ideation, psychomotor retardation or agitation, large weight changes, and/or excessive feelings of guilt or worthlessness (American Psychiatric Association, 1994). Major depressive disorder impacts approximately 7% of the US population (Kessler et al., 2005) and is second only to ischemic heart disease in terms of years lost either to disability or premature death (U.S. Department of Health and Human Services, 1999). Minor depressive disorder, in contrast, is associated with fewer depressive symptoms and less functional impairment than major depression (Rapaport et al., 2002). However, minor depression has been linked with increased medical care service utilization, increased risk of developing major depressive disorder, impairments in social function, low quality of life, and reduced psychological well-being (Johnson et al., 1992, 2009; Nierenberg et al., 2010; Rapaport et al., 2002).

Alzheimer's/dementia

Increasing evidence indicates Alzheimer's Disease and other neurodegenerative disorders are at least partially mediated by oxidative stress. Oxidative stress is the state of redox imbalance that results from a production of reactive oxygen species (ROS) that exceeds the capacity of antioxidant defense mechanisms. Environmental exposures such as air pollution can enhance an organism generation of ROS; thus, air pollution exposure could very well represent a risk factor for Alzheimer's Disease by enhancing oxidative stress processes capable of inducing physiological alterations of the central nervous system.

Air pollution is a prevalent environmental hazard. In the USA, National Ambient Air Quality Standards (NAAQSs) have been established for six principal air pollutants—criteria air pollutants—proved to represent a threat for human health. These pollutants include (1) ozone (O₃), (2) particulate matter (PM), (3) carbon monoxide (CO), (4) nitrogen oxides (NO_x), (5) sulfur dioxide (SO₂), and (6) lead. In spite of the current standards, it is estimated that in the USA over one hundred million people live in areas that exceed the recommended air quality levels.

The large number of individuals exposed to air pollution levels above the recommended standards and population ageing are two factors that could act synergistically to increase the prevalence of Alzheimer's Disease. Even after accounting for the predicted increase in Alzheimer's frequency due to population ageing, the significant prevalence of air pollution could very well exacerbate the impact of this disease on public health. Granting that air pollution could be one of the factors involved in AD causality, its widespread occurrence makes ascertaining its association with AD a public health priority. The association between air pollution—specifically PM and O₃—and AD via oxidative stress is the focus of this paper.

Ref Air Pollution, Oxidative Stress, and Alzheimer's Disease

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An extract from an article in the Lancet headed “**New studies cast dark cloud over air pollution**” includes the following information relating to a study in America by Jennifer Weuve, MPH, ScD; Robin C. Puett, MPH, PhD; Joel Schwartz, PhD; Jeff D. Yanosky, MS, ScD; Francine Laden, MS, ScD; Francine Grodstein, ScD.

Chronic exposure to particulate air pollution may accelerate cognitive decline in older adults, although data on this association are limited. Our objective was to examine long-term exposure to particulate matter (PM) air pollution, both coarse ([PM 2.5-10 μm in diameter [PM_{2.5-10}]) and fine (PM <2.5 μm in diameter [PM_{2.5}]), in relation to cognitive decline.

The study population comprised the Nurses' Health Study Cognitive Cohort, which included 19 409 US women aged 70 to 81 years. We used geographic information system–based spatiotemporal smoothing models to estimate recent (1 month) and long-term (7-14 years) exposures to $PM_{2.5-10}$, and $PM_{2.5}$ preceding baseline cognitive testing (1995-2001) of participants residing in the contiguous United States. We used generalized estimating equation regression to estimate differences in the rate of cognitive decline across levels of $PM_{2.5-10}$ and $PM_{2.5}$ exposures. The main outcome measure was cognition, via validated telephone assessments, administered 3 times at approximately 2-year intervals, including tests of general cognition, verbal memory, category fluency, working memory, and attention.

Higher levels of long-term exposure to both $PM_{2.5-10}$ and $PM_{2.5}$ were associated with significantly faster cognitive decline. Two-year decline on a global score was 0.020 (95% CI, -0.032 to -0.008) standard units worse per 10 $\mu\text{g}/\text{m}^3$ increment in $PM_{2.5-10}$ exposure and 0.018 (95% CI, -0.035 to -0.002) units worse per 10 $\mu\text{g}/\text{m}^3$ increment in $PM_{2.5}$ exposure. These differences in cognitive trajectory were similar to those between women in our cohort who were approximately 2 years apart in age, indicating that the effect of a 10- $\mu\text{g}/\text{m}^3$ increment in long-term PM exposure is cognitively equivalent to aging by approximately 2 years.

Long-term exposure to $PM_{2.5-10}$ and $PM_{2.5}$ at levels typically experienced by many individuals in the United States is associated with significantly worse cognitive decline in older women.

COPD - chronic obstructive pulmonary disease

A review of the effect that coal mining had on workers health was made by Dr Santos Tomas.

The important finding in his report was the results relating to relatively new workers.

PURPOSE OF REVIEW:

Coal mining remains a major industry that has workers at risk for developing chronic lung disease. Aside from simple coal workers' pneumoconiosis and progressive massive fibrosis, the development of emphysema and obstructive lung disease independent of smoking may be underappreciated. This article reviews more recent studies that may help rectify this faulty view.

RECENT FINDINGS:

Cumulative exposure to coal dust is a significant risk factor for the development of emphysema and has an additive effect to smoking. Increased coal dust exposure is associated with increased risk of death from chronic obstructive pulmonary disease (COPD). **In newly employed coal miners, bronchitic symptoms are associated with a rapid decline in lung function within 2 years after starting work.** In evaluating impairment, the chest radiograph may be helpful as a marker of exposure but the diffusing capacity is most correlated with dyspnea, whereas the emphysema computed tomography score has good association with expiratory flow limitation.

SUMMARY:

Latest studies further support the association of emphysema and COPD with coal dust exposure. Increased cumulative exposure may also increase risk of death from these diseases.

Ref Emphysema and chronic obstructive pulmonary disease in coal miners

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Noise

Relating to both Mental and Physical Health must come the effect that NOISE has on people – especially children.

Noise is defined as any unwanted or disagreeable sound and is often dismissed simply as a “nuisance.” However, noise can become harmful when it interferes with a child’s normal activities, such as sleeping or talking, or disrupts or diminishes a child’s health or quality of life.

Noise, like all sounds, is measured by the intensity and frequency of the sound waves that hit the ear. The unit used to measure the volume of sound is the decibel (dB). The greater the number of decibels, the louder the noise and the more harmful it is to our ears.

Noise can pose a serious threat to a child's physical and psychological health, including learning and behaviour.

For example, noise can:

INTERFERE WITH SPEECH AND LANGUAGE. Repeated exposure to noise during critical periods of development may affect a child's acquisition of speech, language, and language-related skills, such as reading and listening.

IMPAIR LEARNING. The inability to concentrate in a noisy environment can affect a child's capacity to learn.

IMPAIR HEARING. Tinnitus, often described as a ringing or buzzing sound in the ear, is a symptom associated with many forms of hearing loss. NIHL is a permanent hearing impairment resulting from prolonged exposure to high levels of noise.

A report by the Commons Environmental Audit Select Committee published 8 December 2014 states that building regulations should be changed so that any schools which already exist within 150m of a major road should be fitted with an air filtration system to protect children against fumes from traffic. 25% of PM10 particulates come from construction, mining and other industries.

Taking into account all of the above information the applicant has failed yet again to mention the large number of people, especially children, whose health will be affected by this scheme and Hilltop Action Group therefore strongly object to the Provectus Remediation Ltd proposal.

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